

Augmented Reality-Based Learning Media to Improve Elementary School Students Motivation and Learning Outcomes: A PRISMA Review

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ABSTRACT

This research is motivated by the low motivation and learning outcomes of elementary school students, which are influenced by limited student engagement during the learning process and the lack of variation in learning media utilized by teachers. One potential solution to address these challenges is the implementation of Augmented Reality (AR)-based learning media. This study aims to examine the reported effects of Augmented Reality-based learning media on students' learning motivation and learning outcomes in elementary education. The research method employed is a Systematic Literature Review (SLR) using the PRISMA 2020 guidelines for transparent reporting of the review process. Literature searches were conducted through Google Scholar, resulting in 15 primary research articles published between 2022 and 2026 that met the predetermined inclusion criteria. The reviewed studies generally reported positive effects of Augmented Reality-based learning media on students' motivation and learning outcomes, particularly in learning topics that require visualization and interactive representations. However, the findings should be interpreted with consideration of variations in research designs, learning contexts, and implementation conditions across the reviewed studies. This study concludes that Augmented Reality has potential as an innovative learning medium to support elementary education, although its effectiveness depends on factors such as technological infrastructure, teacher readiness, and appropriate instructional design.

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1. INTRODUCTION

Education is a conscious and planned effort to create a learning process that enables students to optimally develop their potential, encompassing spiritual, intellectual, emotional, social, and skills aspects necessary for social, national, and state life (Septiyaningsih et al., 2025). In today's increasingly complex world, education serves not only as a means of transferring knowledge but also as a vehicle for character formation and competency development relevant to future needs (Sihab & Achmad, 2025). Therefore, the education system is required to continuously improve the quality and equity of educational services through various innovations, including the use of technology in the learning process. In line with the implementation of the Independent Curriculum, the integration of digital technology in elementary schools is an effective strategy for creating more interactive, flexible, and meaningful learning through the use of various educational devices and applications. The use of this technology not only supports improving the quality of learning, but also contributes to equipping students with the 21st century skills needed to face global challenges (Prasetyo, 2024; Septiyaningsih et al., 2025).

The use of technology in learning allows students to learn at their own pace and style, creating a more personalized, flexible, and meaningful learning experience (Prasetyo, 2024). In this regard, learning media serves as a strategic tool that facilitates the delivery of material in a more effective, engaging, and understandable manner. The use of technology-based media not only improves the efficiency and quality of learning but also helps to concretely reinforce learned concepts and encourages active student involvement in the learning process (Septiyaningsih et al., 2025).

However, the digital transformation in learning also requires teachers to continuously improve their competencies, particularly in mastering technology and utilizing digital learning media. Teachers play a crucial role in selecting, designing, and implementing media that aligns with student characteristics and learning objectives to ensure optimal learning. Learning media serves as an intermediary that helps convey information

from teachers to students, while facilitating their understanding of the material and creating a more engaging and enjoyable learning environment (Tafonao dalam Septiyaningsih et al., 2025). In addition to supporting cognitive development, the use of appropriately designed media also contributes to the development of students' character, emotional, and spiritual well-being, thereby supporting their holistic development.

One of the important factors in the success of the teaching and learning process is student motivation. Motivation acts as an internal drive that encourages students to be actively involved, put in optimal effort, and achieve better learning outcomes. High learning motivation is positively correlated with improved learning outcomes, while low motivation often arises from material that is considered difficult or learning that is monotonous and uninteresting (Nurfritri et al., 2020). Therefore, teachers have a strategic role in fostering and maintaining student motivation through the implementation of various innovative learning strategies, including the use of digital media that is interesting and relevant to student characteristics (Fernando et al., 2024).

Learning outcomes are an important indicator for measuring the level of achievement of learning objectives, which encompass cognitive, affective, and psychomotor aspects. Low learning outcomes are often influenced by suboptimal learning processes, whether related to teachers, students, methods, or the learning media used. Learning practices that are still dominated by lecture methods without the support of innovative media tend to make students passive and less engaged in the learning process, resulting in less effective learning interactions and impacting low student learning outcomes (Lasmini, 2019).

The use of digital-based learning media is an effective innovation for improving the motivation and learning outcomes of elementary school students. Through more interactive, engaging, and multimodal presentation of materials, digital media can increase student engagement, foster curiosity, and facilitate understanding of the concepts being studied. This encourages students to participate more actively in the learning process, thus positively impacting motivation and learning outcomes. Therefore, teachers' ability to design and integrate digital media appropriately is a crucial factor in creating effective, enjoyable, and meaningful learning.

One of the rapidly developing technology-based learning media innovations in education is Augmented Reality (AR). AR technology enables the integration of virtual objects with real-time environments, creating a more interactive, immersive, and contextual learning experience (Samala et al., 2023). In learning, AR has great potential to visualize abstract concepts in a more concrete way, making it easier for students to understand the material. Furthermore, the use of AR has been shown to increase student engagement and motivation, making it an effective alternative learning medium to support improvements in the quality of learning processes and outcomes (Socrates & Mufit, 2022).

Various previous studies have shown that the use of Augmented Reality (AR)-based learning media has a positive impact on improving students' conceptual understanding and learning interest (Muali et al., 2020; Samala et al., 2023). These findings indicate that AR has great potential as a learning medium capable of creating more interactive and meaningful learning experiences (Socrates & Mufit, 2022). However, although the effectiveness of AR in supporting the learning process has been widely reported, studies specifically examining its impact on elementary school students' motivation and learning outcomes still need to be deepened and comprehensively synthesized. Therefore, this study aims to analyze and synthesize research findings related to the influence of Augmented Reality-based learning media on elementary school students' motivation and learning outcomes. This study is expected to provide a more comprehensive picture of the effectiveness of AR as a learning medium and serve as a basis for the development and implementation of technology-based learning in elementary schools.

2. METHOD

The method used in this study is the Systematic Literature Review (SLR) method by following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines to examine the effect of using Augmented Reality-based learning media on student motivation and learning outcomes. The selection of this method is based on its suitability in identifying, classifying, and analyzing student motivation and learning outcomes by applying a structured approach and strict selection criteria. The PRISMA approach in this research method consists of several stages, namely: (1) Identification, (2) Screening, (3) Eligibility, and (4) Included. An illustration of the flow of the research stages is shown in Figure 1.



Figure 1. PRISMA Approach Stage Flow

The explanation of each stage of the PRISMA approach is as follows.

- 1) Identification. The identification stage was carried out by searching relevant literature from various sources using pre-designed keywords. Article searches were conducted through several academic databases (Page et al., 2021). In this study, data were collected using Google Scholar.
- 2) Screening. After the identification process is complete, the next stage is screening, where the collected literature is selected to ensure that the articles meet the inclusion and exclusion criteria. At this stage, the title and abstract of each article are reviewed to assess their relevance (Polanin et al., 2019).
- 3) Eligibility. At this stage, articles that have passed the screening process are reviewed in depth by reading the entire text. This review aims to evaluate the quality and relevance of the articles more comprehensively, to ensure that each article meets the established methodological standards.
- 4) Included. Articles that have met the criteria at the eligibility stage are then analyzed at this stage to formulate conclusions regarding the influence of Augmented Reality-based learning media on the motivation and learning outcomes of elementary school students (Sabbah et al., 2023).

The criteria for determining the eligibility of articles included in this study are presented in Table 1.

Table 1. Article Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Year of publication	Articles published within the last 5 years, namely between 2022 and 2026.	Articles published before 2022.
Publication type	Publications in the form of journal articles, conference proceedings, and research reports that have gone through an academic review process.	Articles that are opinions, general reviews, or editorial writings.
Language	Articles in English or Indonesian.	Articles written in languages other than English or Indonesian.
Research subjects	Focus on students at the elementary school level.	Focus on populations other than elementary schools.
Research result	An article examining the influence of Augmented Reality on student motivation and outcomes.	Articles that do not directly examine the influence of Augmented Reality on student motivation and outcomes.
Accessibility	Articles that have full access to the full content.	Articles that are only available in abstract form or are not accessible in full text.

3. RESULTS AND DISCUSSION

The review process began with a selection of 550 articles obtained through Google Scholar. An initial screening process was conducted based on the title and abstract using Excel, resulting in 460 articles being excluded or discarded due to irrelevance. After further identification, 90 suitable articles were identified. However, 60 articles were excluded for not meeting the established eligibility criteria. In the final stage, a full-text review of 30 articles was conducted, resulting in 15 ineligible articles and 15 final articles suitable for further analysis. This literature selection and screening process is visualized in the flowchart shown in Figure 2.

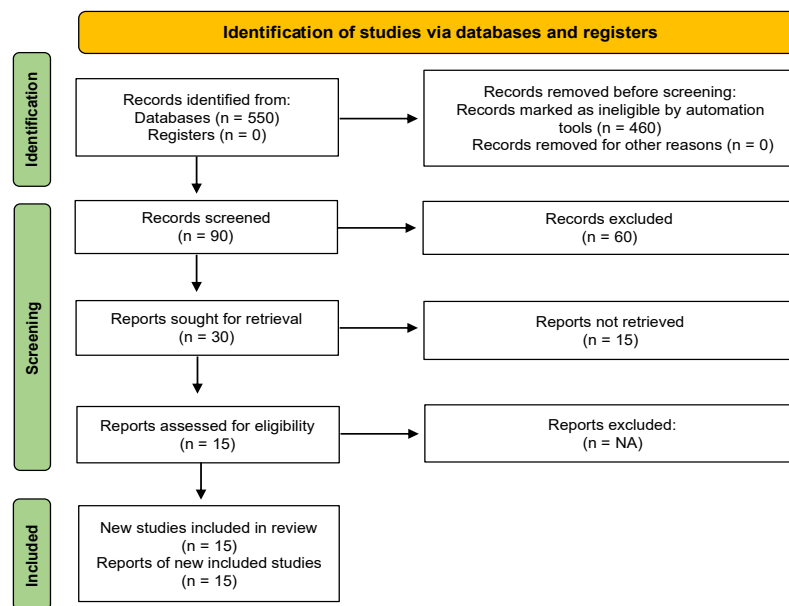


Figure 2. PRISMA Approach Flowchart

A total of 15 articles were selected and analyzed in depth to answer this research question. The results of the analysis of these 15 articles can be seen in Table 2.

Table 2. Article Analysis Results

No	Author	Year	Methods	Measured Aspects	Research Result
1	Sucitra et al.	2025	Quasi Experimental Group Design	Motivation and Science Learning Outcomes	The results of the study show that interactive learning media based on Augmented Reality has a significant effect on increasing motivation and learning outcomes of elementary school students in science.
2	Hidayat	2024	Research and Development (R&D)	Motivation to Learn Science	The results of the study showed that the science learning media based on the Augmented Reality application on the Solar System material for grade VI elementary school students was declared suitable for use and effective in improving student learning outcomes.
3	Dewi et al.	2024	Quasi Experimental Design	Science Learning Outcomes	The results of the study show that the use of Augmented Reality media has a significant effect on improving the science learning outcomes of fifth grade elementary school students.
4	Suhati et al.	2023	Research and Development (R&D)	Science Learning Outcomes	The results of the study showed that the SOLCAR (Solar System Card Augmented Reality) media assisted by Assemblr Edu was declared suitable for use and effective in improving the science learning outcomes of sixth grade elementary school students.
5	Huda et al.	2024	Multimedia Development Life Cycle	Science Learning Outcomes	The results of the study show that Augmented Reality-based human respiratory system learning media is effective in improving the science learning outcomes of elementary school students.
6	Nursyafitri et al.	2024	Quasi Experimental Design	Motivation to Study Social Sciences	The results of the study show that Augmented Reality-based learning media has a positive effect on increasing elementary school students' motivation to learn social studies.
7	Susanto & Aramudin	2024	Systematic Literature Review (SLR)	Motivation and Learning Outcomes of Social Sciences	The results of the study show that Augmented Reality-based learning media has a positive effect on increasing elementary school students' motivation to learn social studies.

No	Author	Year	Methods	Measured Aspects	Research Result
8	Indrayati et al.	2024	Teacher Action Research (TAR)	Mathematics Learning Outcomes	The results of the study show that the use of Augmented Reality (AR) technology in mathematics learning has a positive impact on improving numeracy and learning outcomes of elementary school students.
9	Nurmaliah & Sudianto	2024	Systematic Literature Review (SLR)	Motivation to Learn Mathematics	The results of the study show that Augmented Reality (AR) learning media has a positive impact on increasing elementary school students' motivation to learn mathematics.
10	Suwardi et al.	2024	Research and Development (R&D)	Mathematics Learning Outcomes	The results of the study show that Augmented Reality (AR) digital media has an effect on improving the mathematics learning outcomes of sixth grade elementary school students.
11	Mursyidah & Saputra	2022	Research and Development (R&D)	Motivation to Learn Mathematics	The results of the study show that the AR Space Building application is effective in improving the understanding of the concept of spatial building in grade VI elementary school students and supporting more meaningful learning.
12	Ripadli & Erpansyah	2024	Quasi Experimental Design	Motivation to Learn Mathematics	The results of the study show that the application of Augmented Reality (AR) technology in mathematics learning increases the motivation, engagement, and conceptual understanding of elementary school students.
13	Widodo et al.	2023	Research and Development (R&D)	Motivation and Learning Outcomes of Civics	The results of the study showed that the Augmented Reality (AR) learning media developed was declared very suitable for use and effective in increasing the motivation and learning outcomes of elementary school students.
14	Dzulfikar et al.	2025	Research and Development (R&D)	Motivation to Learn Civics	The results of the study showed that Augmented Reality (AR) media was declared very suitable for use and effective in increasing the motivation to learn civics in elementary school students.
15	Pahlevi et al.	2024	Quasi Experimental Design	English Learning Outcomes	The results of the study show that the use of Augmented Reality (AR) based storybooks is more effective than conventional media in improving the English learning outcomes of elementary school students.

The articles in Table 2 were analyzed comprehensively, from the abstract to the conclusion, resulting in the following findings.

Problem

Based on the analysis of 15 articles listed in Table 2, it was found that elementary school students still experience difficulties in understanding various concepts, especially abstract concepts in subjects such as science, social studies, mathematics, civics, English, and other subjects. This problem is partly influenced by the lack of variety in learning methods and media used in the learning process. The limited use of media capable of providing visualization and interactivity causes learning to tend to be monotonous and less engaging. This condition results in low student engagement, interest, and motivation to learn, which ultimately affects their learning outcomes.

Problem Solution

Based on the various identified problems, the use of Augmented Reality (AR)-based learning media is one of the solutions widely recommended in the 15 articles analyzed in Table 2. AR technology enables the interactive integration of three-dimensional virtual objects into real environments, thereby helping students visualize abstract concepts in a more concrete and understandable way. The interactive, engaging, and immersive characteristics of AR can create a more meaningful learning experience, increase student engagement in learning, and foster interest and motivation in learning. Therefore, AR has strong potential to support improving the quality of the learning process while improving student learning outcomes.

Research conducted by Suhati et al. (2023) shows that the SOLCAR (Solar System Card Augmented Reality) learning media supported by the Assemblr Edu application is proven to be effective in supporting

science learning about the solar system in grade VI students, based on the results of N-gain. In line with these findings, research conducted by Hidayat (2024), also suggests that the use of Augmented Reality applications in science learning on the solar system material can improve student learning outcomes. Based on the results of this study, it can be concluded that the use of Augmented Reality-based learning applications is effective in increasing student motivation and learning outcomes, especially on the solar system material in elementary schools.

In addition to contributing to improved learning outcomes, Augmented Reality (AR)-based learning media has also proven effective in increasing elementary school students' learning motivation. Research findings by Nurmaliah & Sudianto (2024) indicate that the use of AR-based learning media has a positive impact on mathematics learning, particularly in increasing student motivation through more interactive and engaging presentations. These results align with research by Ripadli & Erpansyah (2024) which revealed that the application of AR technology in mathematics learning has significant potential to improve both motivation and learning outcomes for elementary school students. These findings indicate that AR's characteristics, which are capable of presenting concrete visualizations and interactive learning experiences, can encourage more active student engagement, thus positively impacting their motivation and learning achievement.

Methods Used

In the study of the 15 articles, various research methods were applied, the details of which can be seen in Table 3.

Table 3. Summary of Research Methods Used

No	Research Methods	Amount
1	Experimental	7
2	Research and Development (R&D)	4
3	Systematic Literature Review (SLR)	2
4	Multimedia Development Life Cycle (MDLC)	1
5	Teacher Action Research (TAR)	1

Based on Table 3, the development of Augmented Reality (AR)-based learning media was conducted using various research methods, such as Research and Development (R&D) and the Multimedia Development Life Cycle (MDLC). These findings indicate that AR media development can be conducted through various methodological approaches tailored to the objectives and needs of the research. In addition, experimental methods, Teacher Action Research (TAR), Systematic Literature Review (SLR), and qualitative descriptive methods are also widely used to evaluate the effectiveness of AR-based learning media in supporting the learning process. This diversity of methods reflects the broad use of AR, both in the development and testing stages, thus providing empirical evidence regarding its effectiveness in improving the quality of learning.

Advantages of Augmented Reality-Based Learning Media

Augmented Reality (AR) technology is a rapidly developing digital innovation with significant potential for supporting educational transformation. In the context of learning, AR-based media can interactively integrate virtual objects into the real environment, providing a more concrete, engaging, and meaningful learning experience. This technology enables students to visualize objects, phenomena, or concepts that are difficult to observe directly, especially in abstract materials. Therefore, AR is considered capable of improving conceptual understanding, engagement, and student learning experiences. In line with this, various experts have stated that AR-based learning media has several advantages that support the effectiveness of the learning process, including the following.

Ripadli & Erpansyah (2024) stated that Augmented Reality (AR) can provide a richer and more varied learning experience because it allows students to explore concepts and conduct virtual experiments without being limited by physical or material constraints. Through this feature, AR provides students with the opportunity to understand the material more deeply through an interactive and immersive learning experience. Similarly, Dewi et al. (2024) explained that the use of AR-based learning media in the learning process has several advantages and benefits that support learning effectiveness, as follows.

- a) Providing an interactive learning experience. AR presents interactive and engaging visual elements, allowing students to interact directly with the learning content. Through three-dimensional object visualization, graphic manipulation, and virtual environment exploration, AR can significantly increase student engagement and boost learning motivation.

- b) Visualizing abstract concepts. Many concepts in learning materials are abstract and difficult to understand through verbal explanations or static image representations alone. With the help of AR, these concepts can be visualized more concretely and realistically, making it easier for students to understand the material more deeply and meaningfully.
- c) Supporting project-based learning. AR encourages student engagement in project-based learning activities oriented towards developing critical thinking, creativity, and problem-solving skills. Through the integration of virtual environments, students can design, explore, and solve various challenges in contexts that resemble real-life situations, making learning more contextual and meaningful.
- d) Enhancing collaboration and communication. AR technology supports collaborative learning by facilitating students to work in groups, share information, and engage in interactive discussions. This contributes to the development of social skills, the ability to work together in teams, and the enhancement of effective communication skills.
- e) Improving understanding and retention of material. Through visual and interactive learning experiences, AR can help improve students' understanding and retention of learning materials. By connecting learned concepts to direct experiences and everyday contexts, students more easily internalize knowledge, making learning more meaningful and lasting.

Furthermore, Wiliyanti et al. (2024) stated that Augmented Reality (AR) has various advantages, including the ability to visualize abstract concepts in a more concrete three-dimensional form, thus facilitating student understanding. AR also creates an interactive and immersive learning experience, which can increase student attention and engagement in learning. Furthermore, this technology allows direct interaction between students and learning materials, encourages collaborative learning, and has high flexibility to be adapted to various needs and educational levels, from elementary school to university.

4. CONCLUSION

Based on the results of research conducted using the Systematic Literature Review (SLR) method, it can be concluded that Augmented Reality (AR)-based learning media has a positive and significant impact on improving the motivation and learning outcomes of elementary school students. AR's ability to present interactive three-dimensional visualizations helps students understand abstract and complex concepts, making the learning process more engaging, meaningful, and student-centered. These findings indicate that AR has great potential as an innovative learning medium in elementary schools. Therefore, further research is needed to examine the implementation of AR in broader learning contexts and evaluate its contribution to the development of 21st-century skills, particularly critical thinking and problem-solving skills.

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