

The Influence of Project Based Learning with Augmented Media Reality on Critical Thinking Skills of Science Grade 6

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Abstract

Technology-based education is an important indicator of the readiness of the education sector to face the challenges of the 21st century. Along with this, teachers must be ready to utilize the latest technology as one of the elements of their learning media. This study aims to review the literature on the application of augmented reality-assisted problem-based learning on critical thinking skills in science. The data collection technique is based on a systematic literature review (SLR). The purpose of this literature review is to analyze the results of research on Project-Based Learning assisted by Augmented Reality media on IPAS critical thinking skills. The data collection technique is based on a literature review of 20 reputable journals and accredited articles to obtain a complete picture of Augmented Reality, Project-Based Learning, and critical thinking skills. The results of the study show that Problem-Based Learning assisted by Augmented Reality media can significantly improve student learning outcomes. The conclusion of this study is that Problem-Based Learning assisted by Augmented Reality Media is suitable for use in elementary school learning because it has a significant effect on critical thinking skills.

Keywords: Augmented Reality (AR), Problem Based Learning (PBL), Critical Thinking Skills

Abstrak

Pendidikan yang berbasis teknologi menjadi indikator penting kesiapan dunia pendidikan menghadapi tantangan abad ke-21. Bersama dengan hal tersebut, kesiapan guru dalam memanfaatkan teknologi terkini sebagai salah satu unsur media pembelajarannya. Penelitian ini bertujuan untuk mengkaji literatur penerapan Problem Based Learning berbantuan Penelitian ini berbasis Tinjauan Pustaka Sistematis atau Systematic Literature Review (SLR). Tujuan dari tinjauan Pustaka ini yaitu menganalisis hasil-hasil penelitian Project Based Learning berbantuan media Augmented Reality terhadap keterampilan berpikir kritis IPAS. Teknik pengumpulan data berdasarkan tinjauan Pustaka dari 20 jurnal bereputasi dan artikel terakreditasi untuk mendapatkan gambaran penuh tentang Augmented reality, project based learning dan keterampilan berpikir kritis. Hasil penelitian menunjukkan bahwa Problem Based Learning berbantuan media Augmented reality secara signifikan dapat meningkatkan hasil belajar siswa. Simpulan dari penelitian ini adalah Problem Based Learning berbantuan Media Augmented Reality layak digunakan dalam pembelajaran sekolah dasar karena berpengaruh signifikan terhadap keterampilan berpikir kritis.

Kata kunci: Augmented Reality (AR), Problem Based Learning (PBL), Keterampilan Berpikir Kritis



INTRODUCTION

The development of technology, information, and communication has influenced various aspects of human life, including the field of education. In his philosophy, Ki Hajar Dewantara emphasized the importance of educating children according to the nature of their era. Based on this philosophical perspective, the rapid advancement of technology in education is expected to foster innovations in learning media that are relevant to the needs of the current generation.

This literature review aims to analyze the implementation of Augmented Reality (AR) technology in educational settings, evaluate its impacts and challenges, and provide recommendations for its optimal utilization. The researcher compiled and analyzed various scholarly articles discussing the use of AR and the Project-Based Learning (PjBL) model in education to identify research findings as well as the novelty they offer.

Based on the results of the Programme for International Student Assessment (PISA) 2022, Indonesia's average scores in reading literacy reached 359 points, mathematics 366 points, and science 383 points—far below the OECD average, which ranges from 475 to 490 points (OECD, 2023). Only about 9% of Indonesian students were able to solve high-level cognitive questions that require deep analytical and reasoning skills. These findings indicate that Indonesian students' critical thinking skills still require significant improvement.

One approach considered effective for developing critical thinking skills is Problem-Based Learning (PBL). This model emphasizes contextual problem-solving that encourages students to think analytically, creatively, and reflectively. On the other hand, technological advancement has introduced new opportunities in education, one of which is Augmented Reality (AR), a tool capable of transforming abstract concepts into more concrete and interactive visualizations. The integration of AR into PBL is believed to create a more meaningful learning environment, stimulate independent exploration, and enhance students' engagement as well as their critical thinking abilities.

Based on a review of existing literature, there is a limited number of systematic studies (Systematic Literature Reviews/SLRs) that specifically analyze the integration of AR and PBL in developing critical thinking skills. Most existing research still focuses on partial aspects, such as the effectiveness of AR in improving learning motivation or the implementation of PBL in enhancing cognitive learning outcomes, without examining the synergy between the two approaches in a comprehensive manner.

In the context of the Society 5.0 era, the integration of technology in education must be prepared to face challenges arising from rapid technological advancements. Therefore, educators in Indonesia need to develop learning methods that are engaging for students (Amirudin, 2019). One promising technology to support this goal is Augmented Reality, an innovation that integrates virtual and real worlds, providing students with an interactive learning experience (Kishino, 2017).

AR technology does not entirely replace reality; instead, it enhances and complements it by integrating digital content into the real world (Cahyaningtyas, 2020; Haryanti, 2023). By visualizing virtual objects in two or three dimensions, AR transforms abstract concepts into more concrete and comprehensible forms. Moreover, AR allows for the detection of predetermined objects, enabling users to interact directly with the application (Ngono & Hidayat, 2020).

The implementation of AR in learning has proven to provide positive impacts, particularly in increasing students' engagement with learning materials. The integration of this technology with the STEAM (Science, Technology, Engineering, Art, and Mathematics) approach is expected to foster children's creativity through imitation and problem-solving activities visualized via AR media (Nurdiana, 2020).

Based on the explanation above, it can be concluded that there is still a research gap in the form of problem-based learning supported by technology-based media that can bridge the gap between the availability of technology and its utilization in the learning process, particularly in integrating PBL into the development of critical thinking skills in sixth-grade elementary school science learning. Therefore, PBL supported by augmented reality media is highly urgent and relevant. This augmented reality-based media is designed independently without relying on any specific platform and is enriched with problem-based worksheets that are contextual to students' daily lives. The presence of AR-assisted PBL is expected to address three needs simultaneously: (1) helping students understand science content, (2) fostering critical thinking and problem-solving skills through the application of PBL, and (3) optimizing the use of technology, particularly in the field of instructional media.

Based on these issues, this study aims to determine the significant effect of problem-based learning assisted by augmented reality media on students' critical thinking skills in science subjects. Furthermore, its feasibility and effectiveness will be tested to determine whether AR-assisted PBL can significantly influence the critical thinking skills of sixth-grade elementary school students in IPAS learning. Therefore, the researcher will conduct an experimental study entitled "The Effect of Problem-Based Learning Assisted by Augmented Reality Media on the Critical Thinking Skills of Sixth-Grade Students in Science Subjects."

RESULT AND DISCUSSION

.This Systematic Literature Review (SLR) is based on a literature study of three variables: augmented reality-based media, project-based learning, and students' critical thinking skills. Augmented reality-based media is known as a medium that aligns with current technological advancements. It is expected that augmented reality-based media can have a significant influence on students' critical thinking skills. One of the products of ICT development that can be used as a learning medium in the field of education is Augmented Reality (AR).

Augmented Reality (AR) is a technology that combines two-dimensional or three-dimensional virtual objects and then projects these virtual objects in real time (Adzandini, n.d.). Thus, it can be concluded that the definition of Augmented Reality (AR) is a technology that can integrate virtual objects into a real environment and then display or project them in real time. The concept of Augmented Reality was first introduced by Thomas P. Caudell in 1990 in The Term 'Augmented Reality'.

There are three characteristics indicating that a technology applies the concept of Augmented Reality (Mustaqim, 2016), namely:

1. The ability to combine the real world and the virtual world.
2. The ability to provide interactive and real-time information.
3. The ability to display objects in three-dimensional form.

Kamaruddin and Thahir stated that augmented reality-based learning media integrates components of Augmented Reality technology, such as images, internet videos, and others. AR is one of the results of technological development that can combine the real world and the virtual world to produce three-dimensional (3D) objects that can be viewed through the user's smartphone screen.

The use of AR learning media is expected to assist teachers in delivering instructional material in a more engaging way (Cepy Riyana, 2012). According to an analysis conducted by Halidi et al. (n.d.), augmented reality learning media is enjoyable for students because it provides a new learning experience, which positively impacts their learning outcomes, as students become more active during the learning process. Furthermore, AR media helps students remember and organize the instructional material they receive more effectively. Based on these research findings, the researcher deems it necessary to determine whether the use of augmented reality

learning media has a significant impact on students' mastery of photosynthesis material.

CONCLUSION

The results reveal that (1) project-based learning and problem-based learning affect student's critical thinking, (2) there is a difference effect of project-based learning and augmented media on student's critical thinking, and (3) there is significant effect of project based learning on student 's critical thinking.

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