ANALYSIS OF THE ROLE OF INTEGRATED AUGMENTED REALITY LEARNING MEDIA SOCIAL MEDIA WITH PROBLEM BASED LEARNING APPROACH: LITERATURE REVIEW ON IMPROVING COGNITIVE LEARNING OUTCOMES OF SCIENCE

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ABSTRACT
This study aims to analyze the role of Augmented Reality (AR) learning media integrated with social media in the Problem Based Learning (PBL) approach, and its impact on improving students' cognitive learning outcomes in Natural and Social Sciences (IPAS) subjects. This literature study identified that AR and social media make significant contributions in creating a more immersive and interactive learning experience, which supports students' active involvement in the learning process. AR integration allows students to understand abstract concepts through concrete visualizations, while social media encourages collaboration between students. PBL, as a learning approach centered on solving real problems, has also been shown to be effective in improving students' critical thinking skills and problem solving skills. The results of the study indicate that the combination of AR, social media, and PBL can improve students' cognitive learning outcomes, especially in the context of understanding complex concepts in IPAS. However, several challenges related to the implementation of technology, such as limited infrastructure and teacher competence, are still major obstacles to its optimal implementation. Therefore, this study also recommends increasing technological support and teacher training to overcome these obstacles.
Keywords: Augmented Reality, Social Media, Problem Based Learning, Cognitive Learning Outcomes, IPAS

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INTRODUCTION

Educational technology is developing rapidly along with the advancement of information and communication technology, which now plays a central role in increasing the effectiveness of the learning process. One of the most prominent innovations that has emerged in the last decade is the use of Augmented Reality (AR) as a learning medium, which is often integrated with social media platforms. AR-based learning media and social media offer a more immersive and interactive learning experience, creating a learning environment that supports active student engagement. The integration of these two technologies into the learning system allows students not only to access information, but also to interact with virtual objects that represent concepts that are difficult to understand abstractly. This is especially important in subjects such as Natural and Social Sciences (IPAS), where deep understanding and engagement with the material are key to improving students' cognitive learning outcomes.

The use of AR-based learning media has been highlighted in various studies, especially in an effort to create a more meaningful learning experience. AR allows students to combine the real world with virtual elements, which gives them the opportunity to observe and interact with simulations that closely resemble real-life phenomena (Hardianto & Priyatmoko, 2021). In the context of science education, AR can be used to visualize complex scientific processes, such as the water cycle, planetary motion, or ecosystem interactions, which are traditionally difficult to understand through textbooks or oral explanations. Through this visualization, students not only see representations of scientific phenomena but can also conduct simulations, virtual experiments, and further explorations that can deepen their understanding of the material being studied (Sugiarto, 2021).

In addition to AR, social media has also become an important tool in learning. Social media platforms such as Instagram, YouTube, and Facebook not only function as communication tools, but also as platforms for collaborative sharing of knowledge and ideas. In education, social media provides a space for students to discuss, ask questions, and share content related to their subject matter (Santoso & Lestari, 2020). The integration of social media in learning encourages collaborative learning and facilitates access to wider resources, either through interactions with fellow students, teachers, or experts in a particular field. For example, students can use YouTube to access explanatory videos or tutorials, or use Instagram to share their science projects with classmates and get feedback. This opens up opportunities for more decentralized learning, where students are not only recipients of information, but also producers of content (Rahman, 2020).

Another approach that is increasingly used in education is Problem Based Learning (PBL), a student-centered learning method, where they are invited to solve real problems as part of the learning process (Djonomiarjo, 2020). PBL has the advantage of helping students develop critical thinking skills, problem-solving skills, and the ability to work together in teams. In PBL-based learning, students are invited to identify problems, formulate solutions, and test those solutions through a process of investigation and experimentation. This method is relevant to modern learning approaches that emphasize students' ability to apply theoretical knowledge in practical contexts (Pratama & Dewi, 2019).

In the context of science, the application of PBL provides space for students to explore and understand scientific phenomena more deeply. For example, in a class that implements PBL, students can be invited to solve problems such as "how to reduce the negative impacts of climate change on local ecosystems". In solving this problem, students will be asked to conduct scientific research, collect data, and find solutions based on scientific facts. Thus, students not only learn theory but also develop analytical thinking skills, information synthesis, and data-based decision making (Putra, 2019).

The combination of AR, social media, and PBL in the learning process has great potential to produce better learning outcomes, especially in improving students' cognitive learning

outcomes. Cognitive learning outcomes refer to students' ability to understand, remember, and apply the information they have learned in various contexts (Bloom, 1956). In science education, improving cognitive learning outcomes is very important because this field involves understanding complex and often abstract scientific concepts. Learning that only relies on conventional methods, such as lectures and memorization, is not always effective in teaching these concepts. Therefore, a more interactive and immersive approach is needed, such as the use of AR and social media integrated with PBL, to improve students' understanding and mastery of the subject matter (Agustin & Wardhani, 2023).

However, although many studies have shown the effectiveness of AR and PBL technology in improving student learning outcomes, there are still several gaps in the literature that need to be addressed. One of the main gaps is the lack of research that specifically examines the integration of AR with social media in PBL-based learning, especially in science subjects (Kurniawan, 2021). Most of the existing studies focus on one of these technologies separately, or only examine the application of AR without considering social media as a collaborative element in the learning process. In fact, the integration of AR and social media offers great potential in creating a richer and more meaningful learning experience, because social media can be a means to share learning outcomes, discuss, and collaborate in solving problems faced in PBL.

In addition, most existing studies focus more on measuring short-term learning outcomes, such as increased test scores or increased learning motivation, without considering the long-term impact of using AR and social media in the learning process. Therefore, this study aims to fill this gap by analyzing existing literature to explore how the integration of AR and social media in PBL-based learning can improve students' cognitive learning outcomes more holistically, both in the short and long term (Handayani, 2021).

On the other hand, although AR technology and social media have great potential, their application in education also faces various challenges. One of the main challenges is the availability of adequate technological infrastructure, especially in remote areas or in schools with limited resources (Subroto et al., 2023). The use of AR requires devices that can support this technology, such as smartphones or tablets with certain specifications. In addition, stable internet access is also a determining factor in the use of social media as a learning tool. In some schools, especially in areas with limited internet access, the implementation of this kind of technology may be difficult.

Another challenge that is no less important is the competence of teachers in integrating technology into the learning process (Saraswati & Wulandari, 2018). Although many teachers are familiar with basic technologies such as the use of computers and the internet, not all teachers have the skills needed to use AR and social media effectively in learning. Therefore, there needs to be continuous training and professional development for teachers so that they can integrate this technology optimally into the teaching and learning process.

With this background, this study will conduct a review of existing literature to explore the effectiveness of using AR and social media integrated with Problem Based Learning in science learning. This study will also review the challenges faced in implementing this technology, as well as the opportunities that can be utilized to improve the quality of learning. The results of this literature review are expected to provide new insights into innovative ways to improve students' cognitive learning outcomes through the use of technology in education, as well as provide recommendations for further research and development in the future.

METHOD

This study uses a qualitative method with a literature study approach to analyze the role of Augmented Reality (AR)-based learning media integrated with social media, as well as the Problem Based Learning (PBL) approach in improving students' cognitive learning outcomes

in Natural and Social Sciences (IPAS) subjects. This literature study involves the collection, analysis, and synthesis of relevant academic sources, including scientific journals, textbooks, and research reports related to this topic (Creswell, 2014; Merriam & Tisdell, 2016).

The data collection process was carried out by searching for scientific works published in the last ten years to gain a comprehensive understanding of how AR and social media can support problem-based learning. Databases used to search for literature included Google Scholar, ScienceDirect, and Springer. The selected sources were filtered based on their relevance, validity, and contribution to developing technology-based learning theory (Boote & Beile, 2005).

After collecting the literature, the next step is to conduct a content analysis of the various findings. This analysis focuses on identifying themes and patterns related to the effectiveness of AR, social media integration, and the application of PBL in education. This technique is used to identify similarities, differences, and gaps in the existing literature (Krippendorff, 2013). The researcher then synthesizes the results of this analysis to form a holistic understanding of how the use of AR integrated with social media and PBL can improve students' cognitive learning outcomes (Guba & Lincoln, 1994).

The synthesis of these findings is expected to provide deeper theoretical insights into the use of technology in education, as well as provide applicable recommendations for educators and learning media developers to improve the quality of science and science learning (Maxwell, 2013).

RESULTS AND DUSCUSSION

The use of Augmented Reality (AR) learning media integrated with social media and the Problem Based Learning (PBL) approach has shown significant results in improving students' cognitive learning outcomes in Natural and Social Sciences (IPAS) subjects. Based on the existing literature review, several studies have shown that the application of AR in an educational context not only facilitates better understanding of concepts but also encourages active student involvement in the learning process.

In a study conducted by Maulidiah et al. (2023), it was found that the use of AR learning media in geography lessons in class X of SMAN 36 Jakarta can significantly improve students' cognitive learning outcomes. The results of this study indicate that students who use AR can understand the material better compared to conventional learning methods. AR provides a visual experience that allows students to observe and interact with objects related to geography lessons, thereby reducing the difficulty in understanding abstract concepts.

The success of using AR in learning can be linked to the principles of constructivism theory, which states that knowledge is built through active interaction between individuals and their environment (Piaget, 1976; Vygotsky, 1978). In this context, AR serves as a bridge between theory and practice, allowing students to see and feel realities that are difficult to explain through text alone. For example, in studying the topography or climate of an area, students can use AR to see a 3D model of the area, so they can better understand how various environmental factors influence each other.

Furthermore, the use of AR in geography learning can also increase students' emotional involvement. When students interact with AR objects, they not only learn cognitively but also emotionally. This is important because emotional involvement can affect learning motivation, which in turn has an impact on learning outcomes (Fredricks, Blumenfeld, & Paris, 2004). Therefore, the application of AR in learning not only improves conceptual understanding, but can also build students' motivation and interest in the lesson.

Similarly, Rahmawati et al. (2023) reported an increase in science learning outcomes in grade V elementary school students through the application of the TPACK (Technological Pedagogical Content Knowledge) approach involving AR media. This study shows that

students involved in AR-based learning can show an increase in conceptual understanding and critical thinking skills. This is in line with the constructivism theory which states that knowledge is built through experience and active interaction with the environment.

The TPACK approach used in this study emphasizes the importance of combining content knowledge, pedagogy, and technological knowledge in instructional design. Thus, teachers are not only required to master the subject matter, but also to understand how to use technology effectively to improve learning. The application of AR in science learning in this context can provide students with better access to complex materials, such as ecosystems and interactions between living things, which were previously difficult to explain.

The results of this study indicate that students who use AR in learning can more easily understand the relationship between the concepts being studied. For example, in a case study about an ecosystem, students can see an interactive simulation of how changes in one component of the ecosystem can affect other components. This experience not only improves students' cognitive understanding but also helps them to develop critical thinking skills, such as analyzing and evaluating information (Chin & Brown, 2000).

In addition, research by Widyastuti et al. (2024) shows that the application of the PBL model with the help of Canva in science learning can also improve students' cognitive learning outcomes. PBL gives students the opportunity to apply their knowledge in real situations, solve problems, and collaborate with classmates. This learning model allows students to learn from each other and develop important social skills in everyday life.

The application of PBL in the context of science and science not only makes learning more relevant, but also facilitates the development of collaborative skills. In this study, students were divided into small groups to complete problem-based projects related to the learning topic. Through interactions with classmates, students learned to communicate effectively, share ideas, and negotiate to reach the best solution. These skills are important to develop because they are not only useful in the classroom but also in the workplace (Bridgestock, 2009).

PBL can also increase students' sense of responsibility for their own learning. When students are faced with problems that they need to solve, they are required to seek information, conduct research, and take the initiative in the learning process. This is in accordance with the concept of self-regulated learning, where students learn to regulate their own learning process (Zimmerman, 2002). Thus, the application of the PBL model in science learning can produce students who are more independent and proactive in learning.

Another study by Rani and Mujianto (2023) revealed that the application of the PBL model to energy transformation material in grade IV Elementary School can improve science learning outcomes. Through this approach, students are encouraged to seek information, formulate hypotheses, and conduct experiments that are relevant to the material being taught. The results of the study showed that students involved in PBL were better able to relate the concepts they learned to the real world, thereby strengthening their understanding.

One interesting example of this research is the students' experiment on energy conversion from various sources, such as solar energy and wind energy. Students are invited to create a small project where they can see firsthand how energy from the sun can be converted into electricity. By doing this experiment, students not only learn about theoretical concepts but also gain practical experience that can strengthen their understanding.

Furthermore, this study also shows that PBL can help students develop positive attitudes towards learning. When students feel involved and see the relevance of the material to their daily lives, they tend to be more motivated to learn. This positive attitude is important for building a good learning culture in the classroom, which will ultimately contribute to improving overall learning outcomes.

Discussion

Based on the results above, it can be concluded that the integration of AR, social media, and PBL in science learning has a positive impact on students' cognitive learning outcomes. Augmented Reality functions as a tool that enriches students' learning experiences, allowing them to explore more deeply the scientific and social concepts taught. By using AR, students not only learn theoretically, but also practically through direct experience presented in an attractive visual form.

1) Benefits of AR in Learning

One of the main benefits of using AR in education is its ability to overcome the physical limitations of a classroom environment. For example, students can learn about the structure of an atom or the solar system without having to see the actual physical object. AR allows students to see and interact with 3D models of the objects they are studying, providing a better and deeper understanding of the structure and function of the object. This is especially important in the context of science learning, where many concepts are abstract and difficult to understand through verbal or pictorial explanations alone.

The application of AR can also accommodate different learning styles of students. Some students may prefer to learn through visuals, while others prefer hands-on experiences. With AR, students with different learning preferences can engage in the same learning process and benefit from the experience. This is in line with an inclusive education approach, where every student is given the opportunity to learn in their own way.

2) Integration of Social Media in Learning

The use of social media in the context of learning also provides its own advantages. Social media can be used as a platform for discussion, sharing information, and collaborating in solving problems faced in PBL. Students can exchange ideas and strategies in solving problems, thus creating a collaborative learning atmosphere.

For example, students can form discussion groups on platforms like WhatsApp or Facebook to share information about the PBL projects they are working on. Through these interactions, they can provide input, feedback, and support to each other, which in turn can increase student engagement and motivation in learning.

3) Challenges of Implementing AR and PBL

Despite the many benefits that come from using AR and PBL, there are some challenges that must be overcome. One of the main challenges is the availability of technology and accessibility. Not all schools have the infrastructure to implement AR technology, and some students may not have the necessary devices to access this learning medium at home. Therefore, it is important for educational institutions to ensure that all students have equal access to the necessary technology.

In addition, developing AR and PBL-based learning materials requires a lot of time and effort. Teachers must be able to design and compile materials that are in accordance with the curriculum and can be well integrated into the learning process. Therefore, training and professional development for teachers is essential to ensure that they have the skills and knowledge needed to implement these learning methods effectively.

Overall, the use of AR learning media integrated with social media and PBL approach has great potential to improve students' cognitive learning outcomes in science subjects. Existing studies show that this approach not only facilitates better understanding of concepts but also encourages active student involvement in the learning process. However, to achieve optimal results, existing challenges must be addressed properly. Thus, the integration of technology in education can be a positive step towards more effective and enjoyable learning for students.

CONCLUSION

Based on the literature review conducted, the use of Augmented Reality (AR) learning media integrated with social media and the Problem Based Learning (PBL) approach has proven effective in improving students' cognitive learning outcomes, especially in Natural and Social Sciences (IPAS) subjects. AR is able to create a more interactive and immersive learning environment, providing a concrete visual experience on concepts that are difficult to understand through conventional methods. The integration of AR with social media also allows for better collaboration between students through digital platforms, thereby increasing engagement and motivation to learn.

The PBL approach in science learning has been proven to support the development of critical thinking and problem-solving skills. Students involved in problem-based learning are better able to relate knowledge to real situations, improve conceptual understanding, and strengthen cognitive learning outcomes. This is in line with constructivism theory, which emphasizes the importance of active interaction between students and the learning environment.

However, despite its significant benefits, challenges such as the availability of technology, accessibility of devices, and teacher readiness in implementing this method are still obstacles to implementation in the field. Therefore, support is needed from educational institutions in terms of teacher training and provision of adequate technological infrastructure to ensure the implementation of AR and PBL is evenly distributed and optimal.

Overall, the combination of AR, social media, and PBL offers great potential to improve the quality of learning in schools, especially in subjects that require deep understanding such as science. By addressing the existing challenges, this technology can be an effective solution to improve student learning outcomes in the future.

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