



Implementation of Project Based Learning (PJBL) Model Based on Augmented Reality (AR) Media in Science Learning for Fifth Class Elementary School

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ABSTRACT

This study aims to describe the implementation of the Project Based Learning (PJBL) learning model based on Augmented Reality (AR) media in the learning of science for fifth grade students of SD Negeri 1 Cau Belayu, Marga, Tabanan. The method used is descriptive qualitative research. The research subjects included fifth grade teachers and fifth grade students of SD Negeri 1 Cau Belayu. Research data were collected through observation, interviews and documentation. The research instruments consisted of observation guidelines, interview guidelines, and documentation sheets. Data analysis was carried out through the stages of data reduction, data presentation and drawing conclusions. The research findings show that the implementation of the Project Based Learning (PJBL) learning model based on Augmented Reality (AR) media is able to increase the activeness, enthusiasm and involvement of students in the science learning process. The use of Augmented Reality (AR) media helps students understand abstract science concepts through more concrete visualizations, while project-based activities encourage students to think critically, creatively and collaboratively. Learning becomes more interactive and meaningful, thus supporting the improvement of students' conceptual understanding in accordance with the learning characteristics of the Independent Curriculum.

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1. INTRODUCTION

Science teaching in elementary schools, especially in fifth grade, aims to help students understand the world around them by providing knowledge that can be applied to real-life situations. The elementary school years are the concrete operational stage, so students learn best through practical, relevant activities that build on their existing knowledge and experiences. According to Piaget's theory of cognitive development, elementary school students more easily understand abstract concepts when presented with concrete examples and practical activities (Syafawani & Safari, 2024). Therefore, teachers need to adapt learning to students' developmental needs to achieve optimal science learning outcomes (Huda et al., 2024).

Learning outcomes are the results achieved by students as a result of their participation in the learning process that includes the cognitive, affective, and psychomotor domains (Aini & Nawangsari, 2025; Ramadhanti, 2022). To maximize the benefits of science learning, students need to be involved in every stage of the learning process, from planning to completing assignments (Sunaryo & Lukman, 2023). Teachers rely on learning models as a strategy implemented to facilitate successful learning and guide students during the learning process in the classroom (Ika & Sari, 2022). However, even though science learning is designed to provide relevant learning experiences, many elementary school students still face obstacles in understanding abstract science material (Viratama et al., 2025).

Students often experience difficulties understanding science topics such as the respiratory and digestive systems, changes in the shape of objects, and certain natural phenomena that cannot be directly observed. If students are only given academic explanations, they tend to struggle to build conceptual understanding and focus more on memorization than on understanding the material in depth (Viratama et al., 2025). One model that has the potential to address this problem is *Project-Based Learning* (PjBL), which emphasizes the creation of real-life projects and encourages students to actively participate in the learning process. However, implementing PjBL on abstract material still requires the support of learning media that can illustrate concepts concretely. *Augmented Reality* (AR) is a technology that enables the integration of virtual objects into the real world so that abstract concepts become more concrete, interesting, and easier for students to understand (Nuraini, 2023). Research (Alkautsari et al., 2026) also shows that the use of AR media can significantly improve students' conceptual understanding.

The recapitulation of the results of the Breathing for Activity practical material showed an average class score of 83.4 with a 100% completion rate. Teacher notes indicated that most students were able to explain the relationship between physical activity and respiratory rate after receiving the lesson. Observations during the learning process showed that some students still needed visual aids to explain the mechanisms of the respiratory system coherently and connect concepts to real phenomena. These findings indicate that the achievement of learning outcomes needs to be supported by a learning process that can strengthen conceptual understanding, not just the achievement of grades.

The results of observations and interviews with the homeroom teacher of grade V of SD Negeri 1 Cau Belayu showed that the implementation of the *Project Based Learning* (PjBL) model based on *Augmented Reality* (AR) media provided positive changes to the learning process. Students showed higher enthusiasm, more active participation, and deeper involvement during learning activities. These findings indicate that the integration of *Project Based Learning* (PjBL) with *Augmented Reality* (AR) media is able to create a more meaningful learning experience. Research on the implementation of *Project Based Learning* (PjBL) based on *Augmented Reality* (AR) has shown that both approaches are able to improve learning outcomes and students' understanding of concepts (Alkautsari et al., 2026). Most previous studies focused on measuring the effectiveness of learning models through a quantitative approach.

This study offers novelty by describing in depth the process of implementing *Project Based Learning* (PjBL) based on *Augmented Reality* (AR) in science learning in grade V of SD Negeri 1 Cau Belayu using a qualitative approach. This study not only describes the stages of learning implementation, but also explains the obstacles faced by teachers and students, strategies for resolving them, and the impact of the implementation of the learning model on student engagement during the learning process. These characteristics provide a more comprehensive picture of the application of *Project Based Learning* (PjBL) based on *Augmented Reality* (AR) in science learning in elementary schools so that it can be a reference for teachers in developing learning that suits the needs of students. Therefore, this study aims to describe the implementation of the *Project Based Learning* (PjBL) learning model based on *Augmented Reality* (AR) media in science learning for grade V of SD Negeri 1 Cau Belayu, Marga, Tabanan as a reference in developing innovative learning strategies that are in accordance with the demands of the Independent Curriculum.

2. RESEARCH METHODOLOGY

This study employed a descriptive qualitative approach. This approach was chosen because the study aimed to provide an in-depth description of the implementation process of the *Project Based Learning* (PjBL) model using *Augmented Reality* (AR) media in fifth-grade science lessons at SD Negeri 1 Cau Belayu. The qualitative approach enabled researchers to obtain a comprehensive overview of the learning process, obstacles encountered, resolving strategies, and the impact of the learning model implementation based on the experiences of informants (Sugiyono, 2021).

The research subjects consisted of one fifth-grade teacher and 12 fifth-grade students from SD Negeri 1 Cau Belayu. Informants were selected using a purposive sampling technique, which involves deliberately selecting informants based on the consideration that they possess information relevant to the research objectives (Sugiyono, 2021). The fifth-grade teacher was selected because she played a direct role in designing and implementing *Project Based Learning* (PjBL) based on *Augmented Reality* (AR) media, while the students were selected because they

participated in the entire learning series and were therefore able to provide information about their learning experiences.

The data sources in this study consist of primary and secondary data. Primary data were obtained directly from fifth-grade teachers, fifth-grade students, and observations made during the learning process. Meanwhile, secondary data were obtained from various supporting documents, such as In-Depth Learning Plans (ILPs), school documents, learning activity records, learning activity documentation, and student assessment documents.

Data collection techniques were carried out through observation, interviews, and documentation. Observation was used to directly observe the implementation process of the *Project Based Learning* (PjBL) model based on *Augmented Reality* (AR) media in science learning. Interviews were conducted with teachers and students to obtain information regarding the implementation of learning, obstacles, solution strategies, and the impact of the implementation of the learning model. Documentation was used to complement the research data in the form of photos of activities, learning tools, student project results, and other supporting documents. The validity of the data in this study was tested using triangulation techniques. Triangulation was carried out to increase the credibility of the data by comparing information obtained from various sources and data collection techniques. Source triangulation was carried out by comparing information obtained from grade V teachers, students, observation results, and learning documentation. Technical triangulation was carried out by comparing data obtained through observation, interviews, and documentation so that the data obtained was more valid and accountable.

Data analysis used the Miles and Huberman model, which includes data reduction, data presentation, and conclusion drawing and verification (Miles et al., 2023). Data reduction was performed by selecting and simplifying relevant information according to the research focus. Data presentation was descriptive to facilitate understanding of relationships between data. The conclusion drawing and verification stages were carried out continuously throughout the research process to ensure the credibility of the findings.

3. RESULTS AND DISCUSSION

Based on the results of observations, interviews, and documentation, the implementation of the *Project Based Learning* (PjBL) learning model based on *Augmented Reality* (AR) media in the science learning of grade V of SD Negeri 1 Cau Belayu began with the preparation of a learning plan in the form of a teaching module. The teaching module is used as a guideline in the implementation of learning that contains learning objectives, activity steps, learning media, assessments, and evaluations. The fifthgrade homeroom teacher stated that "before teaching, teachers must have a teaching plan. This plan is made in a teaching module that clearly explains the stages in teaching" (Interview, April 22, 2026). Based on the documentation obtained, the teacher has prepared a teaching module as the initial step in

implementing the *Project Based Learning* (PjBL) learning model based on *Augmented Reality* (AR) media on the human respiratory system material.

Table 1. Coding Results of Research Findings

Tema	Theme	Indicators/Evidence
Instructional planning	Development of teaching modules	The teacher develops a teaching module that includes learning objectives, learning steps, media, assessment, and evaluation.
Implementation of AR-based Project-Based Learning (PjBL)	Stages of learning	The learning process is conducted through fundamental questions, project planning, scheduling, project implementation, presentations, evaluation, and a concluding session.
Utilization of AR media	Concept visualization	Students use the Assemblr Edu application to observe respiratory organs in three-dimensional form.
Implementation challenges	Technical factors	Internet network disruptions, time constraints, and classroom management.
Efforts to overcome obstacles	Solution	Provision of Wi-Fi, scheduling, task allocation, and teacher supervision.
Impact of implementation	Affective, cognitive, psychomotor	Increased motivation, conceptual understanding, collaboration, communication, and presentation skills.

Source: [Processed Data \(2026\)](#)

Table 1 shows the results of the coding process for observation, interview, and documentation data. The analysis process yielded six main themes: learning planning, implementation of *Project Based Learning* (PjBL) based on *Augmented Reality* (AR), utilization of AR media, implementation obstacles, efforts to overcome obstacles, and implementation impacts. These six themes served as the basis for compiling the research results and systematically illustrated the interrelationships between the findings.



Figure 1. Conceptual Implementation Model PjBL Berbasis *Augmented Reality* (AR)

Figure 1 shows a conceptual model for implementing *Project Based Learning* (PjBL) using *Augmented Reality* (AR) media, compiled based on observations, interviews, and documentation. The model illustrates the relationship between the learning planning stage, the implementation of PjBL assisted by AR media, the obstacles encountered and their solutions, and the impact of implementation on the affective, cognitive, and psychomotor aspects of students.

The implementation of the *Project Based Learning* (PjBL) model based on *Augmented Reality* (AR) media was carried out through the stages of determining fundamental questions, project planning, scheduling, project monitoring, presentation of results, evaluation of learning experiences, and closing. In the stage of determining fundamental questions, the teacher gave trigger questions about the human respiratory system to build students' initial knowledge. After that, students used the Assemblr Edu application to view visualizations of the respiratory organs through *Augmented Reality* (AR) media. The teacher stated that "asking questions to arouse students' curiosity, then delivering the respiratory system material with the help of *Augmented Reality* (AR) media" (Interview, April 22, 2026). One student stated, "I understand the material more easily because I can see the shape of the respiratory organs directly. So I don't just imagine from pictures in books." (Interview, April 22, 2026). These findings indicate that visualization through *Augmented Reality* (AR) media helps students understand abstract concepts more concretely.



Figure 2. Implementation of media usage *Augmented Reality* (AR)

These results indicate that the use of *Augmented Reality* (AR) media can help students understand abstract material more concretely. In addition, providing trigger questions at the beginning of the lesson encourages students to be more active in building their own understanding before entering the project creation stage. This finding is in line with research by Dewi et al., (2026) which states that the use of *Augmented Reality* (AR) in *project-based learning* can create a more interactive learning environment and improve students' critical thinking skills.



Figure 3. Presentation of the project results on the human respiratory system

The implementation of this learning process demonstrated that students were actively involved in all stages of the learning process. Students not only received information from the teacher but also collaborated in groups, designed projects, solved problems, and presented the results of their group work. This finding aligns with Lev Vygotsky's constructivist theory, which emphasizes that learning occurs through social interaction, collaboration, and the teacher's role as a facilitator in building student understanding.

Although the implementation of the *Project Based Learning* (PjBL) model based on *Augmented Reality* (AR) media went well, several obstacles were still encountered during the learning process. Based on observations and interviews, the obstacles that emerged included internet network disruptions, limited time for project work, the need for more intensive classroom management, and the abstract nature of the human respiratory system material. The teacher stated that "the internet disruption was likely caused by the presence of a banyan tree

near the school, which made the internet connection unstable" (Interview, April 22, 2026). One student also stated, "Sometimes the AR image doesn't appear immediately because the signal is not good, so we have to wait a while." (Interview, April 22, 2026). These findings indicate that internet network stability remains a factor influencing the smooth use of *Augmented Reality* (AR) media.

To overcome these obstacles, the school provides Wi-Fi facilities that students can use during the learning process. In addition, teachers and students make agreements regarding the division of tasks, project deadlines, and discipline in following the predetermined schedule. Teachers also establish rules for cell phone use and conduct direct supervision during the learning process. These efforts demonstrate cooperation between the school, teachers, and students in overcoming various obstacles that arise during the implementation of learning. This finding is in line with research by Aditia (2024) which states that the main obstacle to the use of *Augmented Reality* (AR) media is limited internet network and technological devices. Furthermore, research by Uliyanti et al., (2024) shows that good classroom management is essential for technology-based learning to run effectively and conducively. This finding is also in line with Ausubel's theory of meaningful learning which emphasizes the importance of presenting information that is easy to understand and in accordance with the cognitive structure of students.

In addition to the obstacles encountered, the implementation of the *Project Based Learning* (PjBL) model based on *Augmented Reality* (AR) media also had a positive impact on students. This impact was seen in the affective, cognitive, and psychomotor domains. In the affective domain, students showed higher enthusiasm, motivation, and activeness during learning. The teacher stated that "students are more active in asking questions about the respiratory system and prefer learning using AR media" (Interview, April 22, 2026). One student stated, "Learning is more fun because we can create our own projects and see the respiratory organs using AR media. So the material is easier to understand" (Interview, April 22, 2026). These findings indicate that the implementation of *Project Based Learning* (PjBL) based on *Augmented Reality* (AR) media provides a more interesting learning experience and increases student engagement during the learning process.

In the cognitive domain, students find it easier to understand the human respiratory system material because *Augmented Reality* (AR) media presents visualizations of organs in three-dimensional form that can be observed from various perspectives. The three-dimensional visualizations displayed through *Augmented Reality* (AR) media allow students to observe the shape, location, and function of the respiratory organs more realistically than two-dimensional images in books. This visual representation helps students build connections between abstract concepts and objects observed directly, thus reducing the cognitive load in understanding the material. This process encourages the formation of a deeper conceptual understanding because students not only receive verbal explanations but also gain interactive visual learning experiences. A teacher stated that "the application of the *Project Based Learning* (PjBL) learning

model based on *Augmented Reality* (AR) media makes students understand the human respiratory system material better and the results of student learning evaluations are also better" (Interview, April 22, 2026). Observations also showed that students were able to answer evaluation questions well after participating in the learning. Thus, *Augmented Reality* (AR) media not only functions as a visualization tool, but also as a means to help students build mental representations of the human respiratory system material so that the learning process becomes more meaningful.

In the psychomotor domain, students demonstrated improved skills in collaboration, project development, presentation, and the use of technology-based learning media. Students were able to divide tasks within groups, complete a project on the human respiratory system, and demonstrate their results to the class. These activities honed students' communication, collaboration, and practical skills.

The findings of this study are in line with the research of Iskandar et al., (2025), Komalasari & Nurhalizah (2025), Mokambu (2022), Wati et al., (2025) which showed that the implementation of *Project Based Learning* (PjBL) assisted by *Augmented Reality* (AR) media was able to increase learning motivation, creativity, learning outcomes, critical thinking skills, and active involvement of students in learning. This finding is also in accordance with John Dewey's constructivism theory which emphasizes the concept of learning by doing, namely learning obtained through direct experience, practice, discussion, and problem solving.

Based on the results of observations, interviews, and documentation, it can be concluded that the implementation of the *Project Based Learning* (PjBL) learning model based on *Augmented Reality* (AR) media in the science learning of grade V of SD Negeri 1 Cau Belayu has run well. Although there were obstacles such as internet disruptions, limited time, and the need for more intensive classroom management, various efforts made by the school, teachers, and students were able to overcome these obstacles. The implementation of this learning has a positive impact on the affective, cognitive, and psychomotor aspects of students, thus being able to create more interactive, meaningful, and student-centered learning.

4. CONCLUSION

Based on the results of research conducted in grade V of SD Negeri 1 Cau Belayu, it can be concluded that the implementation of the *Project Based Learning* (PjBL) learning model based on *Augmented Reality* (AR) media in science learning is able to create more interactive, meaningful, and student-centered learning. In its implementation, teachers and students face several obstacles, namely internet disruptions, poor time management, the need for more intensive class management, and abstract science material. Efforts made to overcome these obstacles include providing WiFi, making agreements at the beginning of learning regarding time limits and division of project tasks, establishing rules for using *Augmented Reality* (AR) media, and combining learning with the *Project Based Learning* (PjBL) model based on *Augmented Reality* (AR) media. The implementation of this model has an impact on the

affective, cognitive, and psychomotor domains of students. Students become more active and enthusiastic, understand the material more easily, are able to work together in groups, and are skilled in creating and presenting project results. *Augmented Reality* (AR) media helps students understand the material on the human respiratory system which was previously abstract to become more concrete. Through project activities, students can also develop their thinking skills, problem-solving skills, and organize information in a more focused manner. These findings suggest that integrating *Project-Based Learning* (PjBL) and *Augmented Reality* (AR) can be an effective learning alternative for improving student understanding, engagement, and skills in science and science learning.

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