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Enhancing Science Learning Outcomes On Earth and Space Concepts through Project-Based Learning Models For Sixth Grade Students of SD Negeri 5 Bedali

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Abstract : This study aims to enhance student learning outcomes in science, specifically on the topic of "Earth and Space," through the implementation of the Project-Based Learning (PjBL) model in a sixth-grade classroom at SD Negeri 5 Bedali. The research employed a Classroom Action Research (CAR) methodology conducted over two cycles. The participants included 30 students, among whom were integrated diffabled students. Data collection techniques included achievement tests, student activity observations, documentation of learning processes, and interviews. Data were analyzed qualitatively using the Miles and Huberman model to identify emerging patterns and changes throughout the intervention. The findings revealed that the application of the PjBL model significantly improved student learning outcomes. Quantitative data showed that prior to the intervention, only 50% of students met the Minimum Competency Criteria (MCC). This increased to 83.3% in the first cycle, and by the second cycle, all students (100%) achieved the MCC. These results suggest that PjBL is an effective instructional model for improving student achievement in Earth and Space science material with joyful learning. Moreover, it fosters active student engagement in the learning process, including meaningful participation from diffabled students .

Keywords: Project-Based Learning, Science Education, Earth and Space, Learning Outcomes, Classroom Action Research, Inclusive Education

INTRODUCTION

Science education at the elementary level plays a vital role in shaping students' understanding of their environment, including natural phenomena and the broader universe. One of the core topics in the sixth-grade science curriculum is *Earth and Space*, which encompasses key concepts such as the Earth's rotation and revolution, planetary motion, and their effects on human life. Despite its importance, this material is often perceived as abstract and difficult to comprehend by students. The challenge is even greater for learners with diverse educational needs, for whom traditional, lecture-based instruction may not be effective in fostering meaningful understanding.

SD Negeri 5 Bedali is an inclusive elementary school that accommodates a diverse group of 30 sixth-grade students, including diffabled children who learn alongside their peers in the same classroom. This inclusive setting presents a unique learning environment, characterized by rich diversity as well as pedagogical challenges for the classroom teacher. Such a context demands instructional strategies that are not only academically effective but also adaptive and inclusive. The overarching goal is to ensure that all students—regardless of their individual learning needs—have equitable access to meaningful educational experiences and are supported in achieving optimal learning outcomes according to their potential.

Preliminary evaluations at SD Negeri 5 Bedali revealed that students' comprehension of *Earth and Space* content was still low. Many struggled with understanding core concepts such as planetary characteristics, the occurrence of day and night, and seasonal changes. This learning gap was exacerbated by the continued reliance on conventional teaching methods, which often emphasize verbal explanations and teacher-led instruction, offering minimal opportunities for active student engagement. For many learners, especially at the elementary level, abstract scientific content becomes more accessible and meaningful when delivered through concrete, hands-on experiences.

To address these learning challenges, instructional strategies are needed that engage students cognitively, affectively, and psychomotorly. One approach considered relevant and effective is the Project-Based Learning (PjBL) model. PjBL encourages students to engage in meaningful, contextualized projects through which they actively and independently construct knowledge. As noted by Thomas (2000), PjBL involves students in real-world projects that promote collaboration, exploration, and active problem-solving. This model aligns with constructivist principles, which emphasize that knowledge is built through learners' experiences and social interaction (Trianto, 2010). In the context of inclusive classrooms, PjBL also provides flexibility for differentiated instruction, allowing teachers to tailor activities according to students' abilities and needs. This makes it possible for all learners—including those with different education needs—to participate meaningfully and achieve their full potential. Given these advantages, this study explores the application of the Project-Based Learning model as a strategy to improve science learning outcomes on the topic of *Earth and Space* among sixth-grade students at SD Negeri 5 Bedali.

Accordingly, this classroom action research aims to improve the learning outcomes of sixth-grade students at SD Negeri 5 Bedali on the topic of *Earth and Space* through the implementation of the Project-Based Learning model. The study focuses on enhancing both students' academic achievement and their active engagement in the learning process. It is expected that this approach will foster a learning environment that is enjoyable, contextual, and inclusive, ensuring that all students—regardless of their individual learning needs—can participate meaningfully and benefit from the instruction.

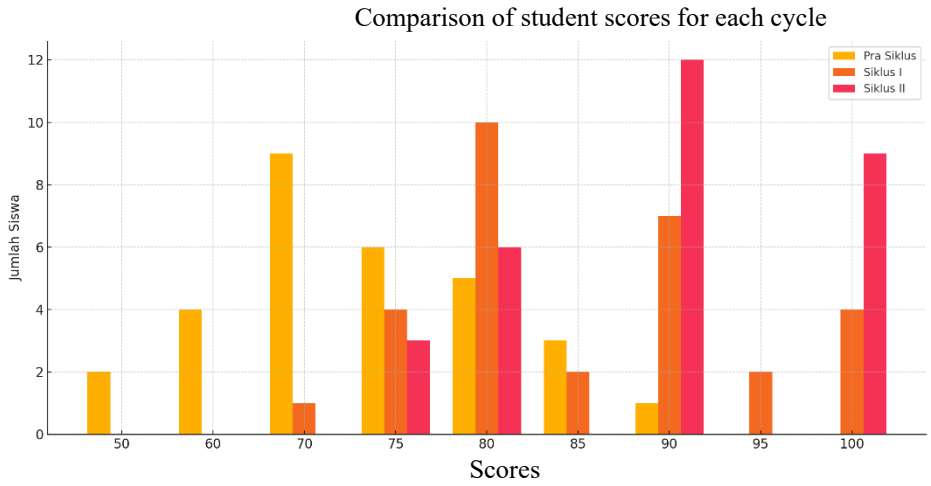
RESEARCH METHODOLOGY

This study employs a Classroom Action Research (CAR) methodology, conducted in a sixth-grade classroom at SD Negeri 5 Bedali, located in the Lawang District of Malang Regency. The research subjects consist of 30 students. According to Arends (2012), Classroom Action Research aims to directly improve and enhance teaching practices within the teacher's own classroom, facilitating the application of practical, reflective, and participatory strategies to address specific classroom challenges.

The research was conducted over two cycles, with each cycle consisting of four stages: planning, action implementation, observation, and reflection. During the planning stage, a project-based learning (PjBL) lesson plan was developed, tailored to meet the needs of the students. This included differentiating tasks for diffabled students, visualizing the content, and providing personalized support. The action implementation stage involved the application of the PjBL model, where students worked on simple yet meaningful projects, such as creating a solar system diorama and designing posters to illustrate natural phenomena. These projects were designed to engage students actively while facilitating concrete learning experiences. The observation stage focused on evaluating student involvement and engagement during the learning activities. Observations were made to assess how students participated, especially in collaborative and hands-on tasks. Finally, reflection occurred after each cycle, where the effectiveness of the teaching practices was reviewed, including successes and challenges encountered during the lessons. The reflections provided a basis for adjusting and improving teaching methods in subsequent cycles.

Data collection was carried out using several techniques: achievement tests to measure students' understanding of the material, observations of student activities to assess their level of engagement in the learning process, field notes and documentation to record the progression of the actions, and interviews with students and teachers to enrich the reflection process. The collected data were then analyzed descriptively using both quantitative and qualitative approaches. Quantitative data were derived from the test results and observation sheets, while qualitative data were analyzed using the Miles and Huberman model, which involves data reduction, data display, and conclusion drawing. The success of the intervention was evaluated by the improvement in the average test scores of the students and the increased student engagement scores from the first cycle to the second cycle. Therefore, this study aims to provide a clear picture of the effectiveness of applying the PjBL model in enhancing students' learning outcomes and engagement, particularly for diffabled students, in the context of science education.

RESULTS AND DISCUSSION



The students' learning outcomes in the pre-cycle phase indicated that a majority had not yet reached the Minimum Competency Criteria (MCC), which was set at a score of 75. Out of 30 students, only 15 reached the MCC, while the remaining 15 scored below the standard. The breakdown of scores was as follows: 2 students scored 50; 4 students scored 60; 9 students scored 70; 6 students scored 75; 5 students scored 80; 3 students scored 85; and 1 student scored 90. This suggests that students' understanding of the *Earth and Space* material was still low and needed improvement.

After the implementation of Cycle I with the PjBL model, a significant improvement in student achievement was observed. The breakdown of scores for Cycle I was as follows: 1 student scored 70; 4 students scored 75; 10 students scored 80; 2 students scored 85; 7 students scored 90; 2 students scored 95; and 4 students scored 100. A total of 25 out of 30 students (83.3%) met or exceeded the MCC. This improvement demonstrates that the PjBL model effectively encouraged greater student engagement and understanding compared to traditional teaching methods.

Significant further improvement was observed in Cycle II. The learning outcomes revealed that 3 students scored 75; 6 students scored 80; 12 students scored 90; and 9 students scored 100. In this cycle, all students met the Minimum Competency Criteria (MCC), with the class average showing a marked increase. This indicates that the Project-Based Learning (PjBL) model continued to have a positive impact on student achievement. During the learning process, observations revealed that students were more active in discussions, dividing tasks in a way that leveraged their individual strengths, problem-solving when faced with obstacles or deviations from the plan, and presenting the results of their group projects. The contextual nature of the projects enhanced students' sense of ownership over their work, leading to a deeper engagement with the material. As a result, various learning styles were effectively accommodated, and observations indicated a noticeable increase in intrinsic motivation. Moreover, diffabled students also demonstrated better engagement, particularly when provided with visual support and individualized guidance throughout the project. This highlights the PjBL model's adaptability, making it a suitable approach for inclusive classrooms where students with varying needs can actively participate and succeed.

Project-based learning provided students with concrete and enjoyable learning experiences. The implementation of PjBL offered real-world context that helped reduce the abstraction of the concepts of *rotation* and *revolution*. According to Krajcik & Blumenfeld (2006), when students engage in creating a solar system diorama, they move knowledge from a theoretical level to the manipulation of physical objects, thereby deepening and solidifying their understanding. Bell (2010) also emphasizes that "learning by doing" enables students to build stronger mental constructions compared to merely listening to the teacher's explanation. Students not only memorize concepts but also apply them in tangible forms. This approach aligns with constructivist theory, which underscores the importance of active student involvement in constructing knowledge. Through hands-on projects, students develop critical thinking skills that better prepare them for future challenges. By engaging in the PjBL model, students not only deepen their conceptual understanding but also enhance their problem-solving and collaborative skills, key competencies for their academic and personal growth.

The PjBL approach also fostered an inclusive and participatory learning environment, which is crucial in classrooms with diverse learning needs. Through collaborative projects, students not only honed their communication and teamwork skills but also developed attitudes of mutual support and empathy for differences. The formation of heterogeneous groups naturally led to peer tutoring dynamics, where students who needed support in understanding the material could be guided by peers who had a deeper understanding. Students who faced learning difficulties were more willing to ask questions and found it easier to comprehend the

material, as the language used was simple and accessible within the group. This, in turn, boosted their confidence. The differentiation of tasks and visual support for diffabled students was found to be effective in facilitating their understanding of the content and promoting active participation in group projects.

Furthermore, the success of this deep and meaningful learning process cannot be separated from the teacher's role in facilitating each stage of PjBL. This includes posing fundamental questions that ignite students' curiosity, planning collaborative projects, organizing schedules, conducting lessons, monitoring progress, and providing comprehensive and reflective evaluations. To help students understand abstract concepts such as Earth's rotation, revolution, and the movement of celestial bodies, the teacher provided a variety of visual stimuli, including images, videos, and tangible materials that students could touch and manipulate. The use of these media not only helped visualize complex ideas but also accommodated the diverse learning styles of students. Teacher guidance during the project phase was crucial, as it served as a bridge that gradually led students toward independent learning. Students' engagement increased because they felt a sense of ownership and responsibility for the projects they choose. Interviews with students revealed that they felt proud when presenting their work to the class, which served as proof of their success in creating something valuable. Many students expressed feeling "more curious" and eager to learn more about natural phenomena after completing the project. Additionally, observations indicated a reduction in disruptive behavior during lessons. This suggests that active involvement in the learning process helped alleviate boredom and frustration, particularly among diffabled students. The hands-on nature of the project helped maintain student focus and motivation throughout the learning experience.

The findings of this study align with previous research, which consistently demonstrates the effectiveness of Project-Based Learning (PjBL) in improving student learning outcomes and developing essential 21st-century skills such as collaboration, creativity, and communication (Bell, 2010; Krajcik & Blumenfeld, 2006). This research also confirms that the PjBL model can be successfully adapted for inclusive classrooms. This adaptation requires careful adjustments in the execution phases and project forms to cater to the diverse abilities of students. Thus, PjBL not only enhances students' understanding of the material but also equips them with well-developed critical thinking skills—an essential foundation for tackling the complexities and challenges of the future.

CONCLUSION

The implementation of the Project-Based Learning (PjBL) model in teaching the *Earth and Space* topic proved to be effective in enhancing the learning outcomes of sixth-grade students at SD Negeri 5 Bedali. This was demonstrated through two cycles of action, with all students successfully meeting the Minimum Competency Criteria (MCC). The model also significantly increased student engagement and active participation in the learning process, including diffabled students, who showed enthusiasm and positive contributions. Thus, PjBL can be considered a recommended alternative teaching strategy for improving the quality of science education in inclusive classrooms. The implications of these findings suggest that teachers can adapt and implement the PjBL model in various learning contexts, including heterogeneous classrooms with students of diverse characteristics, to create more meaningful, enjoyable, and student-centered learning experiences.

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