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Project-Based Learning On Solar System Materials In Grade 6 Elementary School

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Abstract

This study aims to explore the impact of Project-Based Learning (PBL) implementation on grade 6 students' understanding of solar system material at SDN Kedungsugo 1 Prambon. The research method used a descriptive qualitative approach involving grade 6 students and science teachers. The results showed that PBL was effective in increasing students' involvement and understanding of the solar system concept. The implication is that PBL can be used as a dynamic and useful teaching method in improving students' learning experience in elementary schools. Suggestions for improvement involve diversification of teaching materials, further training for teachers, and measurement of long-term impact on students' concept understanding.

INTRODUCTION

In order to help students acquire 21st century abilities like critical thinking, communication, teamwork, and problem solving, project-based learning, or PBL, places a strong emphasis on assigning projects that require them to solve real-world problems. The learning process, in which students actively solve issues and share what they discover, is another aspect of this approach that is emphasized. PBL is considered a suitable learning method to prepare students for the demands of life and career in the 21st century (Mujiburrahman et al., 2022). PBL not only enhances academic knowledge but also cultivates practical skills essential for the 21st century. Through collaborative projects, students learn to navigate complete tasks, developing adaptability and resilience. Additionally, the emphasis on real-world problem-solving promotes a deeper understanding of the subject matter, as students apply theoretical concepts to tangible situations. Moreover, PBL fosters a student's-cantered environments, encouraging autonomy and a sense of responsibility in the learning process.

Because it emphasizes problem solving, student collaboration, and creative thinking, project based learning can be considered an effective educational approach (Irnawati, 2018). This approach shifts the traditional paradigm of education by placing students in the role of active problem solvers rather than passive recipients information. Through collaborative projects, students no only acquire subject-specific knowledge but also cultivate crucial skills such as teamwork, communication, and adaptability. The emphasize on creative thinking fosters an environment where students learn to approach challenges with innovative solutions, preparing them for the demands of an ever-changing world. Moreover, PBL provides a platform for personalized learning experiences, catering to diverse learning styles and interests. As students engage in hands-on projects, they gain a deeper understanding concepts and develop a sense of ownership in their education. In essence, PBL stands as a dynamic and impactful method, aligning with evolving educational landscape end equipping students with the skills necessary for success in the complex modern world.

The outputs of the project-based framework are highly beneficial to students, particularly in terms of gaining new information and understanding (Darto & Arbi, 2022). This educational model not only facilitates the acquisition of knowledge but also encourages practical application. By actively engaging in projects, students delve into real-world problem-solving, honing critical thinking skills and creativity. Furthermore, the outputs of PBL extend beyond traditional assessments, fostering a deeper comprehension of the subject matter as students connect theoretical concepts to tangible experiences. The emphasis on experiential learning within this framework positions students to not only absorb information but also to apply and synthesize it, creating a more comprehensive educational experience.

Previous Study and Gap

Previous research, by Lidia Siswanti, Yusnaidar, and Agus Subagyo (2022) entitled "Penerapan Model Project Based Learning pada Pembelajaran IPA untuk Meningkatkan Keterampilan Proses sains Peserta Didik SMPN 30 Muaro Jambi" highlighted the low science process skills of students at SMPN 30 Muaro Jambi. They pointed out that the involvement of learners in learning activities is very important. By applying the PBL model, this study found a significant

improvement in the science process skills of learners in class VIII A. The results concluded that PBL is effective in improving the science process skills of learners at the junior high school level.

A previous study written by Cindy Melinda Putri, Ella Audianti, Neli, and Silvina Noviyanti (Putri et al., 2022) titled "Implementasi Model Project Based Learning pada Muatan IPA di SD N 34/1 Teratai." Using a phenomenological qualitative approach, this research highlights three stages of implementation: preparation, implementation, and follow-up. The results show that PBL was implemented successfully by educators, creating engaging and interactive learning for Grade V learners. The study provides insights into the effectiveness of PBL in the context of science learning at the primary level.

Two previous studies, namely "Application of Project Based Learning Model in Science Learning to Improve Science Process Skills of Students of SMPN 30 Muaro Jambi" and "Implementation of Project Based Learning Model in Science Content at SD N 34/1 Teratai" showed positive results related to the application of PBL in science learning at the secondary and primary school levels. However, there are gaps that need to be explored in this research. First, the focus of previous research is mainly on improving the science process skills of learners in junior high school and the implementation of PBL in grade V elementary schools, but no study has specifically explored the effects of PBL on students' concept understanding at the elementary level. Secondly, while previous research provides valuable insights, different geographical and cultural contexts, such as at SDN 34/1 Teratai, may introduce additional variables that need to be considered. Therefore, this study aims to fill this gap by exploring the impact of PBL on students' concept understanding in primary schools, drawing inspiration from previous successful PBL approaches.

Objectives of the Study

This study aims to explore the extent to which the implementation of project-based learning (PBL) can improve grade 6 students' understanding of solar system science materials at SDN Kedungsugo 1 Prambon. In addition, this study also aims to analyse science teacher preparation, implementation strategies, and assessment methods used in PBL related to solar system material at SDN Kedungsugo 1 Prambon.

Literature Review

Project-Based Learning

According to Klein, project-based learning is a model or technique that helps students learn new information and comprehension by leveraging on their experiences and diverse presentations (Widyantini, 2014). This educational approach emphasizes hands-on experiences, encouraging students to actively engage with the subject matter. In PBL, learners are not passive recipients of information but instead become active participants in their education. By tackling challenging tasks, students develop problem-solving skills and critical thinking abilities, preparing them for the complexities of the real world. Furthermore, PBL promotes a holistic understanding concepts as students apply theoretical knowledge to practical scenarios, fostering a deeper level of comprehension. This innovative approach aligns with the evolving educational landscape, aiming to equip students with the skills needed for success in the dynamic 21st-century environments.

The steps of project-based learning are as follows (Yulianto et al., 2017):

(1) determining basic questions;
(2) creating a project design;
(3) scheduling;
(4) monitoring project progress;
(5) assessing results;
(6) evaluating the experiences

Solar System Material

This research explores the application of project-based learning in science subjects, particularly in the context of the solar system. The solar system is a complex arrangement of celestial bodies, including planets, asteroids, comets and meteorids, all orbiting the sun (Atifah, 2019). This research is important because understanding this solar system material is crucial in science learning, and PBL offers an active and practical approach that is relevant to the future demands of education.

Understanding the complex structure of the solar system is fundamental to science education, making it a key research area in this study. Exploring the organization of the solar system in the context of project-based learning promises to enhance students' understanding and engagement in science. It integrates theoretical knowledge with real-world applications.

METHODS

Descriptive data is one of the six qualities of qualitative research, according to Donal Ary (2010). Research with the goal of accurately and factually describing the characteristics and circumstances of a certain group or region is known as descriptive research. This research uses a descriptive qualitative approach to describe the implementation of project-based learning (PBL) on Solar System science material in grade 6 of SDN Kedungsugo 1 Prambon. The research subjects involved 6th grade students of SDN Kedungsugo 1 Prambon as project-based learning participants and a science teacher who delivered the material. In this study, there are two instruments, namely structured interviews used to understand the

preparation, implementation strategy, and assessment of PBL and observation with a checklist to record student activities during learning. Data were obtained from interviews with science teachers and observations on student interactions during PBL implementation. Data sources also included notes and documentation from the project.

Data was collected through structured interviews and observations. Interviews focused on teachers' experiences and observations of students' participation and responses during learning. Data was analysed descriptively. The analysis involved limiting the findings from interviews and observations to obtain students' understanding of the Solar System. The findings were then organized into a narrative explaining the results of the study.

FINDINGS AND DISCUSSIONS

Implementation of Project Based Learning (PBL) in Solar System Science Lessons

The implementation of PBL in teaching Solar System science to grade 6 students at SDN Kedungsugo 1 Prambon revealed several key findings. Through several processes including observation and structured interviews, researchers found the following aspects:

Preparation and Design

The science teacher showed careful preparation and design in the process of implementing the PBL learning method. The initial step involved determining basic questions related to the solar system, ensuring alignment with curriculum objectives. The project design was also composed and well-structured, incorporating interesting activities to capture students' interest such as showing illustrative videos of the solar system, game activities and quizzes. The teacher provided a variety of these activities to increase students' engagement and understanding of the solar system material as a whole. The teacher also provides direction on how students can collaborate in groups to answer the basic question. By providing clear guidance, teachers create a learning environment that supports collaboration and interaction between students, enriching their learning experience. Furthermore, teachers focus on ensuring that the project design is not only interesting but also relevant to students' daily lives.

Scheduling and Progress Monitoring

Scheduling of PBL activities was effectively managed using tables. This allows for progressive exploration of solar system concepts. Educators demonstrated proficient skills in monitoring project progress. In addition, students were also very active in asking questions when experiencing difficulties in the product making process. The teacher also demonstrates proficient skills in monitoring the progress of the project. The teacher ensured that the learners stayed on track and achieved the milestones within the set time limit. In addition to effective scheduling management, teachers also guide students to plan and document project progress at regular intervals. Such steps aim to help students track their individual progress and increase accountability in achieving project goals. During the product creation process, the teacher provides additional support through question and answer sessions and focus group discussions, creating a dynamic and interactive atmosphere. This means that the teacher's role in this learning is not only as a facilitator but also as an active guide in ensuring the success of each step of the project.

Assessment Methods

The assessment methods used are diverse, encompassing both formative and summative approaches. Formative assessment is integrated throughout the project, providing students with timely feedback. Summative research at the end of the project measures overall understanding and application of solar system concepts. The formative approach gives students the opportunity to refine and develop their understanding throughout the learning process, creating an environment that supports growth. In addition, the emphasis on formative assessment allows teachers to proactively adapt their learning approach according to the individual needs of students. With summative assessment, teachers can measure students' overall achievement and evaluate the effectiveness of PBL in achieving learning objectives.

Student Participation and Engagement

Observations showed active participation and a high level of engagement among the Grade 6 students. Collaborative learning is seen when students work together to solve problems, develop teamwork and communication skills. The emphasis on hands-on projects creates an environment where students are not only recipients of information, but also active contributors to their learning process.

Impact on Concept Understanding

The PBL approach has a positive impact on students' concept understanding related to Solar System science material. The practical nature of the project allows students to apply theoretical knowledge to real-world scenarios. This has resulted in a deeper and more practical understanding of the learning material. This is supported by a study written by Kusmiati (2022), PBL is considered effective in increasing the creativity of elementary school students in science lessons, improving their ability to solve problems.

Discussion

The findings of this research have shown that the implementation of PBL in teaching solar system science materials effectively improves student engagement and understanding. The PBL approach requires students to collaborate and work together in groups to complete projects and solve real-world problems. This collaboration encourages interaction between students, develops cooperation skills, and creates an active and innovative learning environment. For example, in the Solar System project, students may be tasked with designing a scientific exhibition together, requiring coordination and contributions from each group member. In addition, the emphasis on problem solving in PBL encourages students to face real-world challenges related to Solar System material. In this case, students could be asked to design a simulated space mission, which involves solving problems related to the route of travel, resources required and scientific objectives. This activity stimulates students' critical thinking as they have to apply their theoretical knowledge to a concrete situation. PBL creates a deeper and more practical context for understanding solar system material. It means that the emphasis on collaboration and problem-solving is in line with 21st century education goals, encouraging critical thinking and adaptability (Arbi et al., 2023).

The positive impact on science process skills, as already seen in previous research, was reinforced in this context. The findings are in line with the research of Lidia Siswanti, Yusnaidar, and Agus Subagyo, showing that PBL is not only applicable to junior high school but also effective at the elementary level. Through the implementation of PBL on Solar System materials at the Kedungsugo primary school level, the findings reflect a consistent improvement in students' science process skills as students are actively involved in the scientific process, including observation, question formulation, experiment design, and interpretation of results. The importance of science processes in basic education is becoming increasingly apparent, and PBL has proven to be an adequate method for developing these aspects. During the PBL process, students at SDN Kedungsugo 1 Prambon engage in scientific steps, such as data or information collection, observation, and simple experiments related to the Solar System. This research shows that the PBL approach can be adapted and implemented successfully at the primary education level, offering additional evidence that PBL can play an important role in forming a foundation of scientific skills early on.

Although the study focused on Solar System materials, the success of PBL in elementary school, as shown by Cindy Melinda et al. demonstrates its flexibility in a wide range of science topics. This reinforces the universality of PBL in accommodating such diverse learning styles and interests. However, it needs to be recognized that geographical and cultural contexts can affect the effectiveness of PBL. The positive results observed at SDN Kedungsugo 1 Prambon may not be universally applicable, emphasizing the importance of research in various educational contexts. Overall, the implementation of PBL in teaching Solar System science materials at SDN Kedungsugo 1 Prambon demonstrated its effectiveness in enhancing students' learning experience. The findings contribute to a broader understanding of the applicability of PBL in primary schools and emphasize the importance of tailored strategies in diverse educational context.

CONCLUSION

From the results of this study, it can be concluded that the implementation of Project-Based Learning (PBL) on Solar System Science material in grade 6 SDN Kedungsugo 1 Prambon has a positive impact on student engagement and understanding. PBL demonstrated its success in stimulating student engagement through collaborative approaches, problem solving, and the application of scientific concepts in a real-world context. These results contribute to a broader understanding of the effectiveness of PBL in enhancing students' learning experiences at the primary school level.

To improve the effectiveness of Project-Based Learning (PBL) implementation in solar system science in grade 6 of SDN Kedungsugo 1 Prambon, it is recommended that teachers develop more diverse teaching materials, utilize further training for teachers in the design and implementation of PBL projects, measure the long-term impact of PBL on students' concept understanding, contextually adapt geographical and cultural contexts, and encourage collaboration between schools to exchange experiences and best practices. With these steps, it is expected that PBL can become more effective and relevant in improving students' learning experience at the primary school level.

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