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Fourth Grade Primary School Students' Conceptual Understanding in Solving IPAS Problems Through Project-Based Learning Models Reviewed from a Gender Perspective

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Abstract. This study aims to analyse the conceptual understanding of Year 4 students in solving IPAS questions through the Project Based Learning (PjBL) model and to review it from a gender perspective at UPT SD Negeri Sumberboto 5. Based on the initial observation results, it was found that IPAS learning was still dominated by conventional and memorisation methods, resulting in low conceptual understanding among students. This study used a qualitative approach with a phenomenological research type to explore students' experiences and meanings. The research subjects were 10 fourth-grade students, consisting of 4 male students and 6 female students. Data collection techniques were carried out through participant observation, in-depth interviews, and documentation. The results showed that the application of the PjBL model was able to significantly improve students' conceptual understanding. From a gender perspective, different but complementary role dynamics were found; male students tended to be more dominant in technical and physical exploration aspects, while female students were more prominent in planning, managerial, and verbal skills.

Keywords: Conceptual Understanding, Project Based Learning (PjBL), Gender, IPAS

1 Introduction

Twenty-first century education requires students to have critical thinking, creativity, collaboration, and communication skills to face global challenges. At the primary school level, mastery of conceptual understanding is an important foundation for building these higher-order thinking skills. Conceptual understanding is not merely about memorising facts, but rather the ability to construct meaning from the material being studied. Komariyah, Afifah, and Resbiantoro (2018) emphasise that strong conceptual understanding is greatly influenced by students' interest in learning and their ability to connect the material to real-world problems.

However, Science and Social Studies (IPAS) learning in primary schools still faces challenges. Based on initial observations at UPT SD Negeri Sumberboto 5, IPAS

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learning tends to be dominated by conventional methods and memorisation. This results in low conceptual understanding among students, who find it difficult to relate the material to real-world situations (contextual learning).

One solution to overcome this problem is the implementation of the Project Based Learning (PjBL) model. PjBL is an innovative approach that places students at the centre of learning through investigative activities. Innovations in learning models such as PjBL or Problem-Based Learning (PBL) have been proven effective in increasing student enthusiasm and learning outcomes in primary schools, especially in subjects related to nature and the environment (Pratiwi, Setiani, & Dirgantoro, 2025).

In addition to learning models, teacher readiness and learning strategies also play a key role. Widyawati, Asrori, and Trisnantari (2025) emphasise the importance of teacher strategies and teacher working groups in preparing for the implementation of deep learning in line with the independent curriculum. The synergy between the appropriate learning model and teacher readiness in facilitating student needs, including gender differences, is crucial. This study aims to analyse how PjBL improves conceptual understanding and how gender dynamics play a role in this process in Year 4 primary school classrooms.

2 Method

This study utilised a phenomenological research design with a qualitative approach. This approach was chosen to gain an in-depth understanding of the essence of the experiences of students and teachers in implementing the PjBL model.

The research subjects were 10 fourth-grade students from UPT SD Negeri Sumberboto 5 in the 2025/2026 academic year, consisting of 4 male students and 6 female students, as well as their class teacher. Data collection procedures were carried out through: (1) Participant observation to observe student activities during the project; (2) In-depth interviews to explore students' understanding of concepts and perspectives; and (3) Documentation in the form of photographs of activities and student work.

Data analysis techniques use the interactive model developed by Miles, Huberman, and Saldana, which includes data condensation, data display, and conclusion drawing/verification. Data validity is tested using the criteria of credibility, transferability, and dependability.

3 Results And Discussion

3.1 Research Results

The results of the study indicate that the implementation of PjBL in Grade IV at UPT SD Negeri Sumberboto 5 proceeded through six stages: determining fundamental questions, planning products, scheduling, monitoring, testing results, and evaluating experiences.

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Regarding conceptual understanding from a gender perspective, differences were found in the characteristics of participation and roles between male and female students, which contributed to their understanding. The following is a summary of the findings on gender role differences in project-based learning:

Table 1. Comparison of Participation Characteristics Based on Gender in

Learning Aspects	Male Students	Female Students
Role Dominance	Technical aspects, tool construction, physical exploration.	Planning, managerial, aesthetics, report writing.
Learning Style	Visual-Spatial (Learning by doing through physical activity).	Verbal-linguistic and interpersonal.
Project Contribution	Execution of product/prototype creation.	Time management, visual detail, and presentation.
Conceptual Understanding	Strong in mechanical concepts and how tools work.	Strong on procedural concepts and theoretical connections.

Data source: Adapted from Chapter IV of Imam Muslim's thesis

The application of PjBL has been proven to change learning patterns from passive to active. Male students showed high enthusiasm in the creating stage, while female students played a significant role in the planning and communicating stages. Despite their different roles, both complemented each other in building a comprehensive understanding of the concept.

As an illustration of success, documentation of learning activities shows the active involvement of all students.



Fig. 1. Documentation of Student Activities in PjBL

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3.2 Discussion

The application of the PjBL model can significantly improve students' conceptual understanding because it facilitates deep learning. In accordance with Vygotsky's constructivist theory, knowledge is constructed through social interaction and real collaboration. Students do not just memorise, but directly experience the process of discovering concepts through creating projects that are relevant to their village environment. This is in line with the findings of Pratiwi, Setiani, and Dirgantoro (2025), who stated that the use of media and problem/project-based models in ecosystem material in primary schools can significantly increase student engagement.

From a gender perspective, these findings enrich the discourse that male and female students' learning preferences have unique characteristics. In this study, these differences were managed through group collaboration. Teacher support in facilitating these differences is crucial, as stated by Widyawati, Asrori, and Trisnantari (2025) that thorough preparation in learning strategies is key to the successful implementation of the curriculum in the classroom.

The factors contributing to the success of this model include students' enthusiasm for new things and the relevance of the project topics to their daily lives. Meanwhile, in-depth analysis of conceptual understanding, as suggested by Komariyah, Afifah, and Resbiantoro (2018), helps teachers identify where students' difficulties lie, whether in verbal or technical aspects, so that the interventions provided (scaffolding) are more targeted.

4 Conclusion

Based on the results of the research and discussion, it can be concluded that the project-based learning (PjBL) model is effective in improving the conceptual understanding of fourth-grade students in IPAS subjects. This model transforms learning from memorisation to meaningful understanding through direct experience.

Specifically in relation to gender, there are different but complementary patterns: male students dominate in technical and visual-spatial abilities, while female students excel in planning, managerial, and verbal abilities. Collaboration between the two genders in PjBL creates an inclusive learning environment that supports equal understanding of concepts. It is recommended that teachers design gender-heterogeneous groups so that each student's potential can be accommodated and complemented.

DECLARATIONS

Author Contributions

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Artificial Intelligence (AI) Disclosure

The authors declare that no generative AI or AI-assisted technologies were used in the preparation of this manuscript.

Research Ethics

No Research ethics applied

Informed Consent Statement

Informed consent was obtained from all participants involved in the study, and from the parents or guardians of the participating students.

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