



THE EFFECT OF PROJECT-BASED LEARNING (PjBL) MODEL ON STUDENTS' LEARNING OUTCOMES IN SOCIAL ARITHMETIC MATERIALS IN GRADE VII OF SMP NEGERI 1 TOMPASOBARU

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Abstract

The mismatch of learning models with student competencies has the potential to inhibit classroom interaction and reduce learning engagement. This impact is seen in the decline of academic achievement. An effective solution is the implementation of Project Based Learning (PjBL), a student-centred approach based on creative-innovative methods. This study examined the effect of PjBL on improving learning outcomes using a quantitative experimental design. The research subjects consisted of students of class VII A (experimental) and VIII B (control) at SMP Negeri 1 Tompaso Baru.. Based on the results of research using the t-test, obtained $t_{count} = 3.605$ and t_{table} value at a significant level $\alpha = 0.05$ and $df = 38$ is 1.685, then $t_{count} > t_{table}$ ($3.605 > 1.685$). This shows that the Project Based Learning (PjBL) learning model is higher than the conventional learning model on student learning outcomes in social arithmetics class VII SMP Negeri 1 Tompaso Baru.

Keywords: Project Based Learning, Social Arithmetic

INTRODUCTION

Every human being needs education in their life. An important factor for the growth and advancement of human resources is education [1]. The learning process is a systematic orientation to achieve goals through meaningful experiences. Through learning, education aims to help people realize their full potential [2]. In the context of modern education, students' learning experiences are not only obtained through conventional

knowledge transfer, but also through project-based activities such as practicums and contextual assignments that enrich conceptual understanding while honing applicable skills [3]. This is supported by the view that learning outcomes encompass three integral domains: cognitive (concept mastery), psychomotor (practical application), and affective (attitude), especially in mathematics learning, which demands high analytical skills [4].

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Mathematics learning outcomes are not limited to mastery of formulas, but also the ability to apply concepts in real-life contexts [5]. Defines learning outcomes as indicators of educational success that include aspects of knowledge, attitude, and skills [6]. However, the achievement of these indicators includes (1) conceptual understanding, (2) contextual problem-solving skills, and (3) positive attitudes, which are hampered by teacher-centered learning practices and the lack of interactive media [7][8].

The problem encountered by SMP Negeri 1 Tompasobaru, particularly in Social Arithmetic material, is that learning is dominated by lecture and memorization methods, causing student learning outcomes to consistently fall below the minimum passing grade (70). Field observations reveal that seventh-grade students have difficulty applying basic financial concepts such as profit and loss and interest in real-life cases. This indicates that the usual learning methods have not been successful in helping students connect abstract mathematical concepts with their daily lives [9].

Responding to these challenges requires innovative learning models that integrate cognitive, affective, and psychomotor aspects through collaborative activities. Learning with innovative, effective, and appropriate learning methods can create efficient learning [10]. Project-Based Learning (PjBL) emerges as a potential solution due to its student-centered characteristics, combining scientific investigation with contextual project completion [11]. This model not only increases intrinsic motivation but also trains 21st-century skills such as

critical thinking, communication, and collaboration through systematic stages: driving questions, planning, project execution, and reflective evaluation [12].

From the problems described above, the urgency of this study is to determine whether the PjBL learning model has an effect on student learning outcomes in social arithmetic.

METHOD

A quasi-experimental study was conducted with a population of seventh-grade students at SMP Negeri 1 Tompasobaru in the 2024-2025 academic year. For the research sample, class VII A was classified as the experimental group and class VII B as the control group. The research design used a pretest-posttest control group design with academic achievement tests as the test instrument.

This study analyzes the differences between student learning outcomes using the Project Based Learning model and traditional methods in Social Arithmetic material. These learning outcomes are compared using a two-sample t-test, which was previously determined through prerequisite tests, namely the normality test (Lilliefors test) and data homogeneity test (F test).

The hypotheses in this study are:

$$H_0 : \mu_1 = \mu_2$$

$$H_1 : \mu_1 > \mu_2$$

Information:

μ_1 : Average posttest scores of students using the PjBL learning model

μ_2 : Average posttest scores of students using the conventional learning model

RESULT AND DISCUSSION

The study was conducted at SMP Negeri 1 Tomposo Baru, involving students from class VII-A (20 students) as the experimental group and VII-B (20 students) as the control group. The experimental group, which used the Project Based Learning (PjBL) model, achieved an average learning outcome of 81.02, while the control group, which used conventional learning methods, had an average learning outcome of 73.5.

Prerequisite tests, namely normality and homogeneity tests, were conducted before the hypothesis test. The normality test with the final learning score from the experimental class showed that the value of $L_{count}=1,023,667,298$ and $L_{table}=6,048,421,053$. Because $L_{count} < L_{table}$, the learning scores of students in the experimental class were normally distributed. Meanwhile, the normality test of the final test scores in the control class shows that the value of $L_{count}=4,110,320,771$ and $L_{table}=9,483,503,683$. Because $L_{count} < L_{table}$, the learning scores of students in the control class are normally distributed.

Testing the homogeneity of data from two-way testing with F-test statistics on student learning outcome data, with $S_1^2=60.4842$ and $S_2^2=24.894$, the calculated F value is 1,047,894,737, while the table F value is 6,048,421,053. This indicates that $F_{count} < F_{table}$, so the two variances are equal (homogeneous).

The analysis was performed using the t-test because both data sets

had a normal distribution and homogeneous variables. The hypothesis test results showed the following t_{count} values:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

With sample variance:

$$S = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

Explanation:

$\bar{x}_1$ = Difference between the pre-test and post-test average scores of the experimental class

$\bar{x}_2$ = Difference between the pre-test and post-test average scores of the control class

S = Standard deviation

s_1^2 = Variance of the experimental class

s_2^2 = Variance of the control class

n_1 = Sample size of the experimental class

n_2 = Sample size of the control class

With the following statistical calculations:

$$s^2 = \frac{(20-1)(60.48421053) + (20-1)(30.72631579)}{20+20-2}$$

$$s^2 = \frac{1.149,2+583.8}{38}$$

$$s = \sqrt{45.60526}$$

$$s = 6.75316$$

After obtaining the variance value, the t value is:

$$t = \frac{81.2-74.9}{6.75316 \sqrt{\frac{1}{20} + \frac{1}{20}}}$$

$$t = \frac{6.3}{6.75316 \sqrt{\frac{2}{20}}}$$

$$t = \frac{7.7}{2.13534}$$

$$t = 3.6059$$

Next, it was found that the calculated t-value was 3.6059 and the table t-value was 1.645. The pretest

and posttest results for each class are presented in Tables 1 and 2.

Table 1. Pre-test data for the experimental class and control class

Class	Number of Samples	Number of Scores	Average
VII A Experimental Class	20	770	38,5
VII B Control Class	20	668	33.4

Table 2. Posttest data for the experimental class and control class

Class	Number of Samples	Number of Scores	Average
VII A Experimental Class	20	1.624	81.2
VII B Control Class	20	1.498	74.9

Because $t_{count} > t_{tabel}$, H_0 and H_1 are accepted, which means that there is a significant difference between the Project Based Learning (PjBL) model and the Conventional learning model in terms of student learning outcomes. Both the experimental and control classes experienced an increase in scores based on the analysis of the average data in Tables 1 & 2. However, this study indicates that the Project Based Learning (PjBL) model is more effective than the conventional approach in improving the mathematics learning outcomes of seventh-grade students at SMP Negeri 1 Tompas Baru.

CONCLUSION

The Project-Based Learning (PjBL) model is more effective in improving student learning outcomes in social arithmetic in grade VII at SMP Negeri 1 Tompas Baru. The selection of appropriate learning methods to stimulate critical thinking, innovation, and activity during the

learning process has a significant impact on students' learning capacity.

Based on this, it is hoped that this study can be useful in developing learning methods that are relevant to the characteristics of the subject matter. The PjBL model is also recommended as a reference for teachers to create innovative and varied learning plans.

REFERENCES

- [1] Mohede, F. T., Domu, I., & Tumulun, N. K. (2024). PENGEMBANGAN PERANGKAT PEMBELAJARAN MODEL TEAMS GAMES TOURNAMENT PADA MATERI SPLDV. *Dharmas Education Journal (DE_Journal)*, 5(2), 1434-1444.
- [2] Makalunsenge, K. I. P., Tumulun, N. K., & Wenas, J. R. (2023). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Cerita Materi Bangun Ruang Sisi Datar Menurut Prosedur Newman Di Kelas VIII

- SMP Negeri 2 Langowan. *Dharmas Education Journal (DE_Journal)*, 4(2), 691-697.
- [3] Kurniati, R., Dahlan, T., Madubun, F. M., Afifa, R. N., Dahoklory, F. M., Dahliani, S., Bayu, E. P. S., Putra, Y., Mutmainna, D., & Yuhasriati, Y. (2025). *Pendidikan Matematika*. Sumatera Barat : Yayasan Tri Edukasi Ilmiah.
- [4] Fitria, Y., & Indra, W. (2021). *Pengembangan model pembelajaran PBL berbasis digital untuk meningkatkan karakter peduli lingkungan dan literasi sains*. Yogyakarta: Deepublish.
- [5] Indrawati, F. A., & Wardono, W. (2019). *Pengaruh Self Efficacy Terhadap Kemampuan Literasi Matematika dan Pembentukan Kemampuan 4C*. PRISMA, Prosiding Seminar Nasional Matematika, 247-267. Universitas Negeri Semarang
- [6] Nugroho, W. (2021). Pendekatan *problem based learning* model diskusi kelompok berbantuan video Youtube untuk meningkatkan aktivitas dan hasil belajar statistika. *Jurnal Pendidikan Matematika (Kudus)*, 4(2), 211–226.
- [7] Gabriela, N. D. P., & Anugraheni, I. (2022). Pengembangan Media Pembelajaran GURICA (Game Edukasi Ular Tangga Operasi Hitung Pecahan) di Sekolah Dasar. *Jurnal Ilmiah Wahana Pendidikan*, 8(8), 292–301.
- [8] Putri, F. M., Jupri, A., & Juandi, D. (2024). Analisis Penerapan Model *Problem Based Learning* dalam Pembelajaran Matematika. *Suska Journal of Mathematics Education*, 10(1), 1–8.
- [9] Dewi, S. (2023). Penerapan Model Pembelajaran Berbasis Proyek untuk Meningkatkan Hasil Belajar. *PTK: Jurnal Tindakan Kelas*, 3(2), 204–215.
- [10] Malonda, K. K., Domu, I., & Tumulun, N. K. (2023). Deskripsi Pembelajaran Daring Mata Pelajaran Matematika Pada Masa Pandemi Covid-19. *Jurnal Ilmiah Pendidikan Matematika, Matematika dan Statistika*, 4(1), 316-326.
- [11] Ramadanti, A. A. (2021). Efektivitas Model Pembelajaran Project Based Learning Terhadap Hasil Belajar Matematika Sekolah Dasar. *Primatika: Jurnal Pendidikan Matematika*, 10(2), 93-98.
- [12] Londa, K., & Domu, I. (2020). Pengaruh Model Pembelajaran *Project Based Learning* Berbasis Web Pada Kemampuan *Higher Order Thinking Skills* (HOTS). *MARISEKOLA: Jurnal Matematika Riset Edukasi Dan Kolaborasi*, 1(2), 25–2