



# The Effectiveness of the Problem-Based Learning Model and the Problem-Solving Learning Model on Student Learning Outcomes in Bali State Polytechnic

I Gusti Ayu Putu Dewi Paramita<sup>1</sup>, and Evin Yudhi Setyono<sup>2</sup>

<sup>1,2</sup> Civil Engineering Department, Politeknik Negeri Bali, Bali, Indonesia  
gustiayuputudewiparamita@pnb.ac.id

**Abstract.** To establish whether technique optimizes student learning results in the classroom, particularly for Engineering English courses, this study will compare the Problem-Based Learning (PBL) and Problem-Solving (PS) methods. The class that will act as the experimental class should be chosen first. Two courses, 4A and 4B D3 Civil Engineering, were chosen to undertake this study. Two courses, 4A and 4B D3 Civil Engineering, were chosen to undertake this study. The data collection methods include pre- and post-tests on student learning outcomes, as well as interview procedures. The respondents were two classes of fourth-semester students in the D3 study program, totaling 57 participants. The pretest-posttest nonequivalent control group design methodology is used in this quasi-experimental investigation. Data analysis tools include the Mann Whitney, Normality, and Difference tests, as well as SPSS for statistical computations on acquired data. Data analysis revealed that  $0.000 < 0.05$  was the asymp. Sig (2-tailed) value. Thus,  $H_a$  is accepted whereas  $H_o$  is refused. As a result, the two courses' English learning outcomes i.e. 4A D4 MPK using the problem-solving approach and 4B D3 using the problem-based learning method, are not the same. According to the findings, 4B learning outcomes outperform 4A learning outcomes in a descriptive sense. So, when it comes to improving student learning results, the Problem-Based Learning strategy surpasses the Problem-Solving method. This study will aid English teachers who want to try PBL and PS learning approaches so that they can use them as references in the future.

**Keywords:** Analysis, Comparison, PBL Method, PS Method, Student Learning Outcomes.

## 1 Introduction

The education system has numerous problems when it comes to teaching English, and the method of instruction selected can have a significant impact on how well pupils learn. Problem-Based Learning (PBL) and Problem Solving (PS) are two fascinating approaches to learning that can be contrasted. The effectiveness of the two learning approaches i.e. Problem-Based Learning (PBL) and Problem-Solving (PS), will be the primary focus of this study. The most effective learning strategy for improving student learning outcomes was then identified by comparing these two approaches. According to a study, problem-solving learning models and problem-based learning models that use diagram boards affect students' problem-solving skills differently. Hidayah et al.

© The Author(s) 2024

A. A. N. G. Sapteka et al. (eds.), *Proceedings of the International Conference on Sustainable Green Tourism Applied Science - Social Applied Science 2024 (ICoSTAS-SAS 2024)*,

Advances in Economics, Business and Management Research 308,

[https://doi.org/10.2991/978-94-6463-622-2\\_92](https://doi.org/10.2991/978-94-6463-622-2_92)

(2023) found a significant difference between the Problem-Solving and Problem-Based Learning groups, with p-values of 0.04, and 0.05. Some techniques, such as project-based learning, are thought to encourage students to actively participate in their education. This model is rated dependable in terms of preparing pupils for future issues. According to a study comparing inquiry-based learning to problem-based learning, these teaching styles can establish constructive paradigms that allow students to generate their own knowledge (Nasar & Kurniati, 2020). Constructivism's method emphasizes the student's experience and encourages them to develop new learning strategies. Given that PBL is student-centered, research shows that it is engaging and exciting for both teachers and students to use.

Furthermore, studies show that students who use problem-based and inquiry-based learning models learn significantly (Hadiati & Nasution, 2016). Further investigations yielded similar results. It was also found that incorporating problem-based learning into biology lessons enhanced the learning outcomes for students. An additional alternative is a research called "Efforts to improve analytical thinking skills through the Problem-Based Learning Model". The results show that the Problem-Based Learning (PBL) learning strategy significantly improves students' capacity for analytical thought. Rudimentary knowledge of online or in-person meeting scheduling (Assegaff & Sontani, 2016).

This serves as the rationale behind the research that was done. The goal is to determine which teaching strategy works best for teaching Engineering English to students enrolled at Bali State Polytechnic's D3 Civil Engineering Study Program.

## 2 Methodology

The research is being conducted in the Civil Engineering Department of Bali State Polytechnic's class IVA and B, D3 study program. The research period, meanwhile, runs from April through August of 2024. Students from classes A and B of the D3 Civil Engineering Study Program in semester IV served as the study's research subjects. Population and Sampling: The 57 students in 4A and 4B in the academic year 2023–2024 make up the population in this study. Full sampling, also known as total sampling, was used to choose the sample for this study. In class 4A, the teaching methodology is problem-solving; in class 4B, the teaching model is problem-based learning. Research Variable: In this research, there are two variables which are the independent variable and the dependent variable.

**Research Design.** The study employs a quasi-experimental research design. In Class Experiment 1 (4A d3), the teaching approach employed the problem-solving model; in Class Experiment 2, (4B class), the problem-based learning model was applied. Every student in the class received distinct treatment.

**Research approach.** A quasi-experimental research methodology was employed in this study. The teaching strategy used the problem-solving model in Class Experiment 1 (4A d3) and the problem-based learning model in Class Experiment 2 (4B class). Each student in the class was given individual attention.

### 3 Result and Discussion

#### 3.1 Result

The purpose of this study was to compare the learning outcomes of students who used the Problem-Solving and Problem-Based Learning approaches to the Engineering English learning materials in Semester IV. Two classes, designated as experimental classes 1 and 2, served as the research sample.

To compare learning outcomes across learning methods, the researcher administered a pretest first, followed by a posttest after 12 meetings. The researcher then performed the Mann-Whitney, Difference, and Normality tests.

The Problem-Solving method is given to 4A, while class 4B D4 MPK uses Problem-Based Learning. Instruments in the form of pre-tests and post-tests were given to both classes.

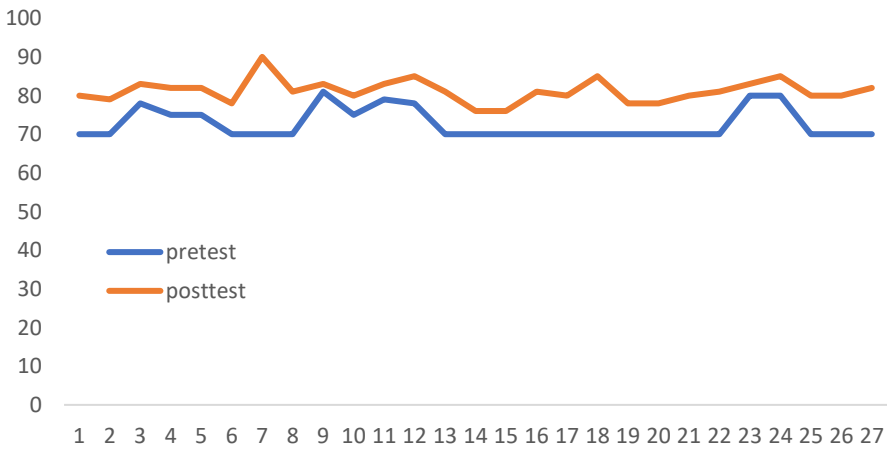
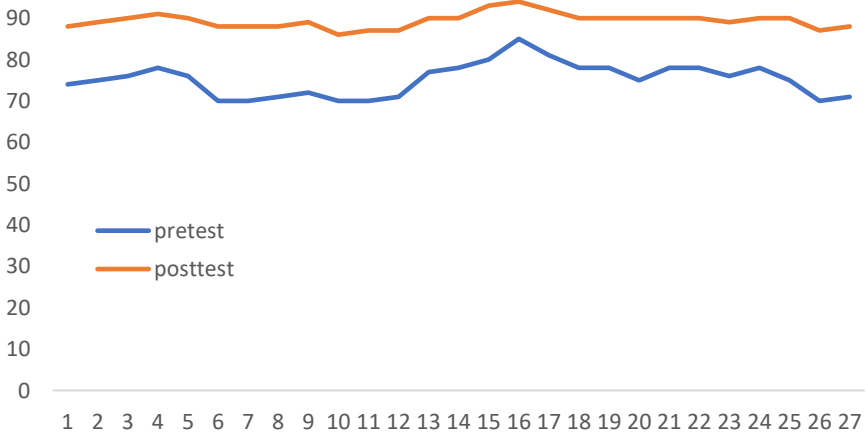


Figure 1. Class 4A MPK score test



**Figure 2.** Class 4B MPK score test

There are some tests done to help analyze the data such as the normality test and Mann-Whitney test. The N-Gain test is a method commonly used to measure the effectiveness of learning or intervention in improving student learning outcomes. This method provides a strong basis for evaluating the extent to which a learning program has contributed to students’ understanding.

Based on the results of the analysis, it was found that the N-Gain percent value for class 4A D3 TS was 30.38 which was in the “Not Effective” category, while class 4B D3 TS got an N-Gain percent value of 57.27 in the “Quite Effective” category. Category interpretation of N-Gain effectiveness can be seen in Table 1.

**Table 1.** Categories of interpretation of N-gain effectiveness

Percentage (%)	Categories
<40	Not effective
40-55	Less effective
56-75	Quite effective
>76	Effective

Based on the N-Gain percent data normality test, it was found that the data was not normally distributed using the Shapiro-Wilk test with each sig value. 0.23 and 0.30 (Table 3). The two-class difference test was carried out using a non-parametric test, namely the Mann-Whitney test.

**Table 2.** Normality test results

Class	Statistics	df	Sig.
4A D3	0.910	27	0.23
4B D3	0.915	27	0.30

The Mann – Whitney test is a test used to determine whether or not there are differences between two independent samples (Sriwidadi, 2011). The Mann-Whitney test is a non-parametric test which is an alternative to the t-test (parametric test. The alpha value used is usually 5% (0.05). The Mann-Whitney test compares the average N-Gain percent score for classes 4A D4 MPK and 4B D4 MPK with the formulation of this research hypothesis as follows:

Ho: There is no difference in learning outcomes between the two classes

Ha: There is differences in learning outcomes between the two classes

The basis for decision-making in the Mann-Whitney test is, that Ho is rejected if sig<0.05 and Ho is accepted if sig>0.05. The test output can be seen in Table 4.

**Table 4.** Mann-Whitney test results

Mann-Whitney U	27.000
Wilcoxon W	405.000
Z	-5.850
Asymp. Sig. (2-tailed)	.000

Based on the output of the test results above, it is obtained that the a-symp. Sig (2-tailed) is 0.000<0.05. Therefore, it can be concluded that Ho is rejected and Ha is accepted. Thus, it can be concluded that there are differences in English learning outcomes between the two classes, namely 4A D4 MPK which uses the Problem-Solving method, and 4B D4 MPK which uses the Problem Based Learning method. Descriptively, as seen in Table 1 above, the learning outcomes for class 4B D4 MPK are higher than 4A D4 MPK.

Based on the research done in 2023 it is mentioned that the use of teaching methods is significant to maximize the result of the studying process (Oishi, 2020). This refers to the conclusion that in the learning that will be carried out, students should use good, creative, and fun learning methods to enable students to understand learning easily and increase student activity in learning. The achievement of learning objectives or teaching outcomes is greatly influenced by student’s activities in learning (A.M. Sadirman, 2011). This is also in line with the idea of Purnama and Syaparudin. According to them, A good learning method is a method that can improve learning outcomes in the cognitive realm of students and can improve critical thinking skills, student interaction, and student motivation in learning (Purnama et al., 2021).

### 3.2 Discussion

The purpose of this study was to compare the learning outcomes of students utilizing the Problem-Solving technique and the Problem-Based Learning method in Engineering English learning materials during the fourth semester of the D3 Civil Engineering study program at Bali State Polytechnic. Comparing the learning outcomes involves looking at the outcomes of a set of tests that were given (posttest) after the learning method was utilized. Each class uses learning methods (therapy) for a total of 12 meetings, or approximately 6 weeks. The computations yielded the conclusion that the employment of learning methods can improve students' learning outcomes prior to using the strategy (pretest). When the learning outcomes of students who utilized the Problem-Based Learning and Problem-Solving techniques were compared, significant disparities emerged.

Initially, the two classes—class 4A D3 and class 4B D3—were identical, with essentially equal pretest results. Following this, various treatments were offered. Class 4A is taught using the problem-solving method, while class 4B learns using the problem-based learning method. An assessment was performed six weeks later, or after twelve sessions. Based on several testing, class 4A's N gain is 30.38, and class 4B's N gain is 57.27; class 4A is unsuccessful, while class 4B is extremely effective. The N Gain value suggests that the Problem-Based Learning strategy performs better than the Problem-Solving technique in terms of improving student learning outcomes. Understanding and implementing unique teaching tactics is critical for improving student learning results. This pertains to the discovery that in order to allow simple comprehension of the subject and increase student participation in the learning process, educators should use effective, engaging, and entertaining teaching tactics. How students participate in learning has a significant impact on how effectively learning objectives or teaching outcomes are met. Other studies provide support for this research. According to the offered debate, the Problem-Based Learning (PBL) learning paradigm influences critical thinking abilities in the general administration topic of class X OTKP at SMK Negeri 10 Surabaya. After using the problem-based learning paradigm, the experimental class outperformed the control group, which had an average of 81.56. The experimental class averaged 86.89. These findings suggest that there is a significant impact on the learning outcomes of students in OTKP SMK Negeri 10 Surabaya's general administration topic class X (Rachmawati and Rosy, 2020). Using the problem-based learning methodology in instructional materials, this study attempts to improve student's critical thinking abilities in the classroom through PC repair and resets. In this study, PC repair and reset can improve student learning outcomes by incorporating the problem-based learning approach into instructional materials. After implementing problem-based learning, students' critical thinking abilities improved by 24.2%. At the end of cycle II, 27 students (93.1%) demonstrated good critical thinking skills (Nafiah and Suyanto, 2014).

A variety of inferences can be derived from the study's findings and the discussion's outcomes. This includes the following: Using the Problem-Based Learning method improves student learning outcomes in environmental pollution material; it can help students recall the material easier since it directly addresses the problem; and it can produce activity, motivation, and creativity, involving students in the learning process

and making the classroom atmosphere enjoyable; and using the method in biology to improve student learning outcomes in environmental pollution material was deemed successful because each cycle saw an increase in learning outcomes, particularly Cycle I 40% and Cycle II (Rahmadani, 2019). There are differences in the learning outcomes of students who are taught using the problem-based learning and inquiry model on the main cell material at SMA Negeri 16 Medan in the 2015/2016 academic year (Hadiati & Nasution, 2016). It is also strengthened by other researchers, like these researchers. Lintang (2017) stated that by applying problem-based learning method, the student can be more independent and confident. It means that this method of learning is a positive way to study since it enhances a better characteristic of the students (Lintang et al., 2017).

## Conclusion

The research findings lead to the conclusion that the Problem-Based Learning method is more effective in enhancing student learning outcomes, with an N Gain value of 57.27, placing it in the quite effective group. Meanwhile, the Problem Solving method stands at 30.38. As a result, the Problem-Based Learning learning approach outperforms others in terms of enhancing student learning outcomes.

## Acknowledgment

The Author intended to pay gratitude to dana DIPA Politeknik Negeri Bali, as fund bearers, and also some person, and other parties that play pivotal roles in the study. The author also ask for permission from persons or institutions for mentioning them in the acknowledgment. Last but not least, sincere gratitude also offered to the Editor team, for the time given.

## References

- Sadirman, A.M. (2011). *Interaksi dan motivasi belajar mengajar*. Jakarta: Raja Grafindo, 2007. [http://repository.uin-suska.ac.id/4682/3/BAB II.pdf](http://repository.uin-suska.ac.id/4682/3/BAB%20II.pdf).
- Assegaff, A., & Sontani, U. T. (2016). Upaya meningkatkan kemampuan berfikir analitis melalui model problem based learning (PBL). *Jurnal Pendidikan Manajemen Perkantoran*, 1(1), 38. <https://doi.org/10.17509/jpm.v1i1.3263>.
- Hidayah, Y. B. N., & Putra, L. V.(2023). Perbedaan model pembelajaran problem solving dan problem based learning berbantuan papan diagram terhadap kemampuan Pemecahan masalah siswa Sekolah Dasar. *Journal on Education*, 06(01), 1390–1396.
- Hadiati, D., & Nasution, M. Y. (2016). The differences student's learning outcomes by using problem based learning (PBL) and inquiry model on cell topic in SMA Negeri 16 Medan Academic Year 2015/2016. *Jurnal Pelita Pendidikan*, 4(1), 82–90.

- Lintang, A. C., Masrukan, & Wardani, S. (2017). PBL dengan APM untuk meningkatkan kemampuan pemecahan masalah dan sikap percaya diri. *Jpe*, 6(1), 27–34. <http://journal.unnes.ac.id/sju/index.php/jpe/>
- Nafiah, Y. N., & Suyanto, W. (2014). Penerapan model problem-based learning untuk meningkatkan keterampilan berpikir kritis dan hasil belajar siswa. *Jurnal Pendidikan Vokasi*, 4(1), 125–143. <https://doi.org/10.21831/jpv.v4i1.2540>.
- Nasar, A., & Kurniati, K. (2020). Comparing students' learning outcomes using problem based learning model and inquiry based learning model. *Jurnal Pendidikan Fisika*, 8(1), 43–55. <https://doi.org/10.26618/jpf.v8i1.2127>.
- Oishi, I. R. V. (2020). Pentingnya belajar mandiri bagi peserta didik di perguruan tinggi. *Jurnal IKRA-ITH Humaniora*, 4(2), 50–55.
- Purnama, J., Nehru, N., Pujaningsih, F. B., & Riantoni, C. (2021). Studi literatur model problem based learning terhadap kemampuan pemecahan masalah siswa. *Edumaspul: Jurnal Pendidikan*, 5(2), 272–277. <https://doi.org/10.33487/edumaspul.v5i2.1687>.
- Rachmawati, N. Y., & Rosy, B. (2020). Pengaruh model pembelajaran problem based learning (PBL) terhadap kemampuan berpikir kritis dan pemecahan masalah pada mata pelajaran administrasi umum Kelas X OTKP di SMK Negeri 10 Surabaya. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, 9(2), 246–259. <https://doi.org/10.26740/jpap.v9n2.p246-259>.
- Rahmadani, R. (2019). Metode penerapan model pembelajaran problem based learning (PBL). *Lantanida Journal*, 7(1), 75. <https://doi.org/10.22373/lj.v7i1.4440>.
- Sriwidadi, T. (2011). Pengujian mann whitney u pada analisis pengaruh pelatihan wiraniaga dalam penjualan produk baru [Testing kann whitney u on the analysis of the Influence of sales force training in selling new products]. *Binus Business Review*, 2(2), 751–762. <https://journal.binus.ac.id/index.php/BBR/article/view/1221>.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

