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The effectiveness of the PBL learning model on students' problem-solving abilities in the subject of jama qasar prayers

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Abstract: Students' problem-solving abilities still need to be considered higher. Therefore, variations are needed in learning models that can increase critical thinking and independence in learning. This research aims to test the effectiveness of the PBL learning model in improving students' problem-solving abilities in the subject of Jama Qasar prayers. This study uses a quasi-experiment to compare the pretest and posttest scores of two data groups. The N-Gain test was carried out to analyze the increase in the effectiveness of the treatment given, especially in comparing pretest and posttest data between two groups. Apart from that, hypothesis testing uses the Coefficients test from inferential analysis of linear regression tests. Meanwhile, the subjects of this research were class VII students at Yunior High School Darul Falah, West Bandung. This study did not use randomization, and the subjects were selected based on class availability. The research results show that the PBL learning model can significantly improve students' problem-solving abilities.
***Keywords**:* PBL learning model, problem-solving abilities, fikih learning.

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Introduction

Problem-solving abilities have become an important topic in education over the last few decades. This skill is one of the fundamental abilities needed in the 21st century. The ability to solve problems is included in higher-order thinking skills (HOTS). This competency is essential for students to face future challenges. Problem-solving abilities in students refer to their ability to identify, analyze, and find practical solutions to various challenges or complex situations. This ability is also closely related to critical thinking skills, creativity, and the ability to work together. In an educational context, problem-solving skills help students understand the subject matter and prepare them to face challenges in the complex and dynamic natural world. In addition, this ability encourages students to be more independent and proactive in facing learning challenges, improves their critical and analytical thinking skills, and prepares them to overcome various problems in the learning process.

The research results of Kurniawati et al. (2019) explained that improving students' ability to solve problems requires an appropriate learning approach. It is hoped that integrating problems into real-life contexts during the learning process can help students more effectively overcome challenges often associated with mathematics in everyday life. In line with previous research, Nuzulia et al. (2023) and Septiani et al. (2023) explained that the education system must be focused on providing and developing skills in this century, which is characterized by rapid technological and scientific development and one of the skills that students must master is solving ability. Problems that require collaboration between teachers, students, and the educational environment to carry out learning that supports the development

of these skills. Therefore, teacher preparation before the learning process dramatically determines student learning success (Purnomo & Rachmani, 2022).

However, students' problem-solving abilities still have not reached the expected level. They are still relatively low (Mariani & Susanti, 2019). This can be seen from the results of the Trend in International Mathematics and Science Study (TIMSS), a study conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 2007. This research placed Indonesian class VIII students in 36th out of 49 countries. Who participated with an average student score of 397, while the international average score was 500 (Mullis, Ina V.S. et al., 2008). On the other hand, we need to realize that improving the quality of education is also determined by the quality of teacher education because teacher quality is one of the essential pillars of educational quality (Mingka, 2022).

Using various learning models can significantly improve students' problem-solving abilities in the learning process and make learning more enjoyable and focused (Asyhari & Sifa'i, 2021). One model that can be applied is Problem-Based Learning (PBL). In PBL, students face real situations or problems that they must solve through research, discussion, and collaboration. The following are several previous studies that apply the PBL model.

The results of previous research conducted by Sari et al. (2021) explain that the problem-based learning model significantly influences students' problem-solving and scientific writing skills. Overall, problem-based learning and problem-solving skills together have a significant impact on students' scientific writing abilities. Furthermore, the research results of Suci & Riki (2020) explained that the low student learning outcomes were caused by the use of less varied learning models, which resulted in a lack of enthusiasm for learning and active student participation. The application of the PBL learning model has proven effective in improving student learning outcomes. In 2021, Sari et al. (2021), in their qualitative research, explained that based on expert assessments regarding the application of the PBL model in interactive learning media, it was discovered that the stages in PBL could be adopted and applied in this media. In this way, learning can take place in two directions without needing to meet face to face, especially during the COVID-19 pandemic (Dita et al., 2021). Pratama & Ramadhan (2021) conducted research to test the effectiveness of PBL using smartphone media, looking at students' cognitive abilities. The results of their research show that this new variation of the PBL method is more effective than the conventional PBL method.

Chaidam & Poonputta (2022) explained that the average score of grade 1 students on the topic "Weight and Measurement" in Mathematics showed a significant increase after implementing PBL in the TPACK MODEL compared to before using the PBL model. Furthermore, the research results of Hermuttaqien et al. (2023) state that the application of the PBL learning model can improve student learning outcomes in Mathematics subjects in elementary schools. Ndiung & Menggo (2024), their research aims to analyze the integration of the PBL model in improving students' interpersonal communication skills, as well as evaluating the level of proficiency in these skills and the obstacles faced in achieving them. The research results show that PBL is an effective alternative because its principles, syntax, implementation stages, orientation, and benefits can help students overcome challenges in interpersonal communication. The PBL model is designed to equip students with the skills necessary for problem-solving and improving logical thinking, collaboration, and communication. Then, Andini & Siregar (2024), research is based on various problems that often arise in classroom learning, especially in Mathematics subjects. The research results show that PBL can be used as a basis for designing more innovative and student-centered learning units.

The low problem-solving abilities among students occur not only in mathematics or science subjects but also in other learning, including subjects in Islamic Religious Education. Therefore, this research aims to analyze how the effect of the PBL learning model can improve students' problem-solving abilities in fiqh subjects, especially class VII students, on the topic of the Jama Qosar prayer.

Based on the literature study conducted, the PBL model has been widely used in mathematics and other science subjects. However, its application in Islamic religious subjects remains very limited. In Islamic Religious Lessons, there are topics that require students' problem-solving skills, such as the Jama Qosor prayer topic. Therefore, the aim of this research is to test the effectiveness of the PBL learning model in improving students' problem-solving abilities in the context of the Jama Qosor prayer.

Method

This research uses a quantitative design using quasi-experimental methods. This experiment aims to compare the problem-solving abilities of the experimental group and the control group before and after implementing the learning process using the PBL model to those of the conventional model. In a quasi-experimental design, the determination of research subjects does not use strict randomization but can be based on the availability of existing classes. In addition, quasi-experimental research uses pretest and posttest data to compare and evaluate the effects of interventions on each data group (Sugiyono, 2019). The subjects of this research were class VII students at SMP Darul Falah Cihampelas, consisting of 23 students in the experimental class who received treatment with the PBL model, and 21 students in the control class who received treatment with the conventional model.

The data collection technique in this research was carried out by giving the experimental and control groups a pretest and posttest. Tests were carried out to measure each group's initial and final abilities, and then the differences in results from the two groups were compared. The number of questions given was 23 items. The instrument of the test is first given to two expert judges to review the instrument grid, especially the suitability between the research objectives and the question items. Next, a limited test was carried out to instrument on samples outside the research sample with criteria that had the same characteristics. This was done to test the validity and reliability of the research instrument. Validity and reliability tests are essential to determine the instrument's suitability for collecting research data.

In this research, apart from a descriptive analysis of pretest and posttest results, the N-gain (g) test was also used to analyze the increase in the effectiveness of the intervention provided, especially when comparing pretest and posttest data. The N-gain test allows a clearer comparison between the experimental and control groups regarding performance improvement. This helps determine whether the tested method is more effective than conventional methods. Using the N-gain test, researchers can provide a more detailed and accurate analysis of the impact of intervention on increasing students' abilities or knowledge using the following formula.

$$\text{N-Gain (g)} = \frac{\text{Posttest Score-Pretest Score}}{\text{Ideal Score-Pretest Score}}$$

Figure 1. Normalized N-Gain Formula (Supriadi, 2021) (Supriadi, 2021)

Table 1. Interpretation of gain scores

No	Score	Classification
1	N-Gain ≥0,7	High
2	0,30-0,70	Moderate
3	0,00-0,29	Low

Results and Discussion

The following are the results of the descriptive analysis of the pretest and posttest scores in the two data groups.

Table 2. Descriptive analysis of pretest and posttest for experimental and control groups

Type of test	Data Group	N	Median	Std. Deviation
Pretest	Experiment-PBL	23	65.83	17.559
	Control-Conventional	21	57.38	17.803
Posttest	Experiment-PBL	23	76.52	16.039
	Control-Conventional	21	74.43	11.522

From Table 2, it can be interpreted that the number of samples in the experimental group was 23. The pretest score in the experimental group had a median score of 65.83 and a standard deviation of 17.56. Meanwhile, the post-test score has a median of 76.52 and a standard deviation 16.04. Furthermore, the sample in the control group numbered 21. The pretest score had a median of 57.38 and a standard deviation 17.803. Then, the post-test score has a median of 74.43 and a standard deviation of 11.52.

Furthermore, here is an analysis of the N-Gain score. The pretest and posttest scores in the two groups, namely the experimental group and the control group, were calculated for the N-Gain score using the N-Gain formula. So, the following is a recapitulation of the N-Gain results for two data groups.

Table 3. Recapitulation of N-Gain scores for experimental and control groups

No	Criteria	Experiment		Control	
		n	Percentage	n	Percentage
1	High	1	4%	1	5%
2	Moderate	11	48%	12	57%
3	Low	11	48%	8	38%
	Total	23	100%	21	100%

Table 3 shows that the N-Gain for the experimental group is 4% for high criteria, 48% for medium criteria, and 48% for low criteria. Meanwhile, in the control group, 5% were in the high criteria, 57% were in the medium, and 38% were in the low criteria. To measure the significance of differences in pretest and posttest scores in each group, hypothesis testing using inferential statistical analysis is required. The analysis used is the Coefficients test, produced from linear regression analysis, and the coefficient of determination test to determine the magnitude of the influence on each data group. The application used is SPSS Version 22. So, the data processing results are presented below.

Inferential statistical analysis of the experimental group

Table 4. Experimental group coefficient

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	69.095	4.674		14.783	.000
NGain_Exper	25.009	11.764	.421	2.126	.046

a. Dependent Variable: group_ Experiment

From Table 4, we can interpret that the significance score for the experimental group is 0.046, with the alpha (α) score used as 0.05. This research has the provision of using a confidence level of 5%, so if the significance score is <0.05, it can be concluded that there has been a significant increase in learning outcomes in the experimental group. In other words, the PBL learning model significantly affects students' problem-solving abilities. Then, to find out the magnitude of the influence, the following is a table of the coefficient of determination test results.

Table 5. Coefficient of determination

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.421[a]	.177	.138	14.89242

a. Predictors: (Constant), group_ Experiment

Table 5 illustrates the R-square score of 0.177 or 17.7%. So, it can be concluded that the magnitude of the effect in the experimental data group is 17.7%. This means that the magnitude of the effect of the PBL learning model on the experimental class group of class VII students at Yunior High School Darul Falah is 17.7%. Meanwhile, the rest is affected by other factors not studied in this research. To see the linearity of the relationship between the two variables above, apart from being seen in Table 4 Coefficients, his research is equipped with linear regression equation test analysis using MS. Excel.

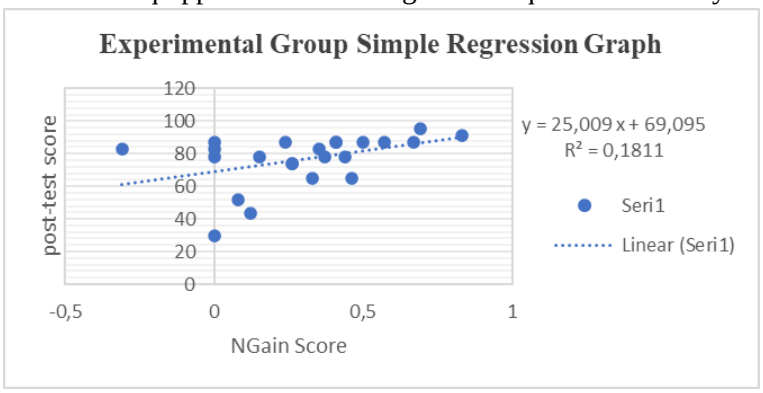

Figure 2. Simple regression equation

Figure 2 shows a linear and positive relationship between the two variables: the PBL learning model and students' problem-solving abilities. This can be seen from the resulting regression equation, namely Y=25.009x+69.095. The linear regression equation can be interpreted as the constant score of the Unstandardized Coefficient, in this case being 69,095, meaning that if there were no PBL learning model variables (X=0), the problem-solving ability of class VII students at Yunior High School Darul Falah (Y) would be 25,009. The PBL model regression coefficient score of 25,009 means that if the PBL model variable (X) increases by 1% and the constant (a) is 0 (zero), then students' problem-solving abilities will increase by 25,009.

This shows that the PBL model variables positively contribute to or influence students' problem-solving abilities. Hence, the better the teacher uses or implements this PBL model, the higher the students' problem-solving abilities. Therefore, it can be concluded that the PBL learning model significantly affects students' problem-solving abilities, especially in fiqh subjects.

Inferential statistical analysis of the control group

Table 6. Control group coefficient

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	67.065	5.334		12.572	.000
NGain control	19.819	12.780	.335	1.551	.137

a. Dependent Variable: group_ control

Table 6 shows that the significance score for the control group is 0.137, with an alpha (α) score of 0.05. Because the significance score for the control group is 0.137, meaning it is greater than the

alpha score of 0.05, it can be concluded that there was no significant increase in learning outcomes in the control group. In other words, conventional learning models do not significantly impact students' problem-solving abilities. To determine the extent of the influence, the following is a table of the coefficient of determination test results for the control group.

Table 7. Coefficient of determination

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.335a	.112	.066	11.13752

a. Predictors: (Constant), group control

Table 7 shows the R-square score of 0.112 or 11.2%. So, it can be concluded that the magnitude of the effect in the control class group is 11.2%. This means that the magnitude of the effect of the conventional learning model on the control class group of class VII students at Yunior High School Darul Falah is 11.2%. Meanwhile, the rest is affected by other factors not studied in this research. Besides being seen in Table 6 Coefficients, the following is a linear regression equation test analysis using MS Excel to see the linearity of the relationship between these two variables.

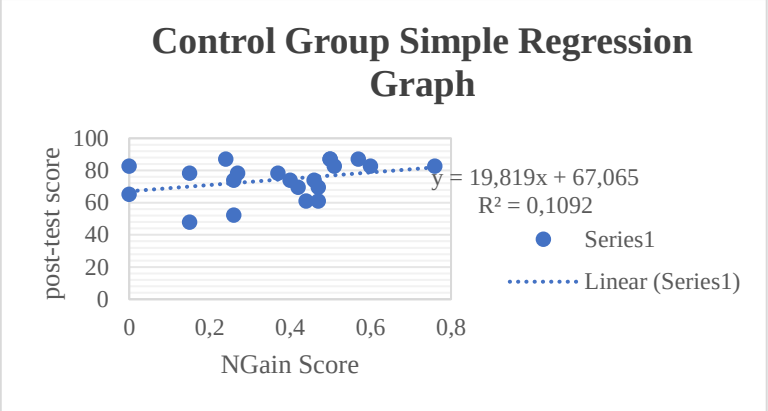

Figure 3. Simple regression equation

As seen in Figure 3, it has an almost straight line. Even though it does not have a significant effect, it still has a linear relationship between the two variables, namely the conventional learning model and students' problem-solving abilities. This can be seen from the resulting regression equation, namely Y=19,819x+67.065. This group has a constant Unstandardized Coefficient score of 67,065 and a coefficient score of 19,819.

Discussion

Based on the descriptive data analysis results in this study, the experimental group showed significant improvement. This means that the PBL learning model is highly effective in improving students' problem-solving abilities in learning jurisprudence. Problem-Based Learning (PBL) is a learning model that places problems as the starting point for learning. PBL encourages students to learn through investigation and solving real problems, promoting and enhancing students' critical and analytical thinking skills essential for the 21st century (Efendi & Wardani, 2021).

PBL can significantly improve students' problem-solving skills (Asyhari & Sifa'i, 2021; Putri et al., 2024). In PBL, students face complex problems without clear solutions, so they must analyze the situation, identify the main problem, and search for solutions systematically. This process forces students to consider multiple perspectives and make decisions based on logic and evidence. The PBL model demands active involvement from students and encourages collaborative work. Students work in small groups to solve problems, share ideas, and learn from each other. These interactions develop

essential communication and collaboration skills and increase the individual's sense of responsibility for group learning.

The results of the pretest-posttest hypothesis test in this study showed a significant increase in the problem-solving abilities of students who used the PBL learning model compared to those who used the conventional model. The better the teacher implements this learning model, the more significant the increase in students' problem-solving abilities. This is because PBL tends to be more exciting and relevant for students than conventional learning methods (Simanjuntak et al., 2021). Facing problems that are relevant to their lives can increase students' motivation to learn. They feel more involved because they can see the practical application of their knowledge, increasing their interest and active participation in the learning process.

Therefore, it can be concluded that the results of this research strengthen the findings of previous studies indicating that the PBL learning model can also be applied in Islamic religious subjects. This is because in the stages of implementing the PBL learning model, learning is student-centered, where students are encouraged to be critical and creative when confronted with problems that require problem-solving skills. The application of various other learning models needs testing and implementation in religious studies to ensure students find this subject as engaging as others. Thus, students' attendance in this subject should not solely fulfill mandatory requirements but also reflect genuine interest in learning.

PBL places more emphasis on applying knowledge rather than simply memorizing facts. Students use the concepts they learn to solve problems, deepening their understanding and increasing their ability to remember and apply information in various contexts. Through the PBL learning model, students can analyze problems critically, logically, broadly, and deeply by understanding facts and reality. In PBL, students are involved in a series of scientific activities, such as identifying, investigating, and solving real problems presented in learning (Ulhaq et al., 2024).

PBL learning encourages students to become independent learners. They are responsible for searching for relevant information, evaluating those sources, and determining the best way to resolve the problem. This develops students' independence, initiative in learning, and critical self-management skills. Apart from that, this learning model can be a solution to developing students' critical thinking skills. Students become more active, dare to express opinions, and discuss and present their results in front of the class (Pamungkas & Wantoro, 2024).

Conclusion

The conclusion that can be drawn from this study is that the PBL learning model has proven to be effective in improving students' problem-solving abilities in the subject of jama qasar prayers by developing critical thinking skills, encouraging active and collaborative learning, increasing motivation and involvement, and encouraging the application of knowledge and learning independence. Based on the analysis of statistical test results from the coefficient table, a significant value smaller than the alpha value of 5% was obtained. This indicates that the independent variable, the PBL learning model, significantly influences the dependent variable, students' problem-solving abilities.

On the other hand, it is important to note that a student's problem-solving abilities are influenced by various factors, both internal and external. Internal factors encompass physiological and psychological aspects. Psychological aspects such as intelligence level, motivation, self-confidence, and learning persistence. Meanwhile, external factors originate outside the student and include the teacher's role, classroom environment, and school climate, all of which can enhance students' learning potential. Additionally, the learning approach, specifically the strategy or method used in conveying learning messages, plays a crucial role. In the context of this research, findings demonstrate that the PBL learning model effectively enhances students' problem-solving abilities, particularly in understanding the fundamental principles of jama qasar prayers.

Therefore, it can be concluded that the PBL learning model has proven to be effective in improving students' problem-solving abilities in the subject of jama qasar prayers by developing critical thinking skills, encouraging active and collaborative learning, increasing motivation and involvement, and encouraging the application of knowledge and learning independence. Even though it faces several challenges, such as increasing teacher competence in managing classes, the benefits of learning using the PBL model can help students face challenges in the real world, making it a precious approach in education. Applying knowledge and meaningful learning, PBL prepares students to address future challenges better.

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