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Innovations in 21st Century Education: An Experimental Investigation of the Effect of Problem Based Learning on Students' Learning Autonomy

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Abstrak: Kemandirian belajar merupakan aspek penting dalam pendidikan, namun banyak siswa masih menunjukkan ketergantungan tinggi dalam proses belajar. Studi ini dimaksudkan untuk mengetahui dampak penggunaan metode pembelajaran *Problem Based Learning* (PBL) terhadap prestasi belajar siswa kelas X pada mata pelajaran Akidah Akhlak di MAN 2 Bandar Lampung. Studi ini menggunakan pendekatan kuantitatif dengan desain *quasi-eksperimental* yang dikenal sebagai *Pretest-Posttest Nonequivalent Control Group Design*. Sampel terdiri dari seluruh siswa kelas X sebanyak 310 orang, dengan sampel kelas X.H Sebagai kelas eksperimen dipilih kelas X.A, sedangkan kelas X.I ditetapkan sebagai kelas kontrol melalui teknik simple random sampling. Instrumen yang dimanfaatkan pada studi ini yaitu angket non-tes berisi 20 pernyataan berdasarkan indikator percaya diri, keaktifan, kedisiplinan, dan tanggung jawab. Uji homogenitas, uji-t digunakan dan Uji normalitas untuk menganalisis data. Hasil uji normalitas menunjukkan nilai signifikansi 0,89 dan uji homogenitas 0,386, yang berarti berdistribusi normal dan homogen. Hasil uji-t menunjukkan nilai t sebesar 1,090 dengan derajat kebebasan 61 dan nilai signifikansi (Sig. 2-tailed) sebesar 0,280 dan 0,288, yang lebih besar dari 0,05. Hal ini menunjukkan bahwa kedua kelompok eksperimen dan kontrol tidak menunjukkan perbedaan yang nyata. Berdasarkan hasil penelitian yang membuktikan bahwa model *Problem Based*

Learning (PBL) belum menunjukkan mempengaruhi pada kemandirian belajar siswa yang signifikan, disarankan agar guru mengoptimalkan penerapan PBL dengan menyesuaikan metode pembelajaran pada kondisi dan kesiapan siswa, serta memberikan bimbingan yang lebih intensif. Penerapan PBL juga dapat dipadukan pada metode pembelajaran yang lain, agar mendukung pengembangan kemandirian. Selain itu, sekolah perlu memberikan pelatihan kepada guru tentang penerapan PBL yang efektif. Penelitian lanjutan juga direkomendasikan dengan durasi lebih panjang dan mempertimbangkan faktor lain, seperti motivasi dan lingkungan belajar, agar hasil yang diperoleh lebih komprehensif dan mendalam.

Keywords:

Problem Based Learning (PBL),
learning Independence, Akidah
Akhlaq

Abstract: *Fostering learning independence is a crucial element of the educational process. Nonetheless, many students continue to exhibit a high degree of dependency during learning. This research investigates the impact of the Problem-Based Learning (PBL) approach on the academic performance of 10th-grade students at MAN 2 Bandar Lampung in the Akidah Akhlak subject. Employing a quantitative method, the study adopts a quasi-experimental design known as the Pretest-Posttest Nonequivalent Control Group Design. The research population comprises all 310 students enrolled in the 10th grade. The class was selected using a simple random sampling method. X.H as the experimental group and class X.I as the control group. Data collection was conducted using a non-test questionnaire consisting of 20 statements aligned with the indicators of self-confidence, activeness, discipline, and responsibility. Data analysis involved normality testing, homogeneity testing, and t-tests. The normality test yielded a significance value of 0.89, while the homogeneity test produced a value of 0.386, confirming that the data met the assumptions of normal distribution and homogeneity. The t-test results showed a t-value of 1.090 with 61 degrees of freedom and a significance level (Sig. 2-tailed) of 0.280 and 0.398—both exceeding the 0.05 threshold. These findings suggest that the experimental and control groups did not differ significantly in statistical terms. Given the findings that the PBL model did not significantly enhance students' learning independence, it is recommended that educators refine the implementation of PBL by tailoring teaching strategies to the learners' needs and levels of preparedness. Providing more structured guidance is also essential. Integrating PBL with complementary learning models may further support the development of student autonomy. Additionally, schools are advised to offer professional development for teachers on effective PBL application. Future studies should consider longer implementation periods and include variables such as student motivation and the learning environment to produce more comprehensive insights.*

INTRODUCTION

Education holds a vital role in human life, as it enables individuals to learn, grow, and lead a more meaningful and improved life. (Destrianjasari et al., 2022; Novitriani et al., 2024; Syaadah et al., 2023) The purpose of education is to shape learners into confident, well-mannered, and creative individuals who are capable of independently seeking, comprehending, and evaluating information, as well as actively participating in community activities. (Aulia et al., 2024) Education consists of two essential elements: educators and learners. A teacher is considered successful when the learning objectives have been effectively achieved. (Ardianti et al., 2021)

Students' academic success is partly determined by their level of learning independence, which naturally varies from one student to another. (Suhayati et al., 2024) Learning independence refers to a student's ability to manage their own learning process from identifying their needs, selecting appropriate learning methods and resources, evaluating the outcomes, to taking full responsibility for their academic progress without relying on others. (Cicilia Emita & Samuel Lukas, 2022; Ningtiyas & Surjanti, 2021; Nuryanto & Ramadani, 2022; Prasetyo et al., 2024; Putri et al., 2021; Sele et al., 2023) The value of learning independence is not solely measured by a student's ability to work without depending on others, but also by how they interact with and respond to their surrounding environment. Currently, student learning independence has become a concern, as many students lack confidence in completing tasks, demonstrate limited responsibility for their learning, and continue to rely heavily on others to complete their assignments. (Salamudin & Utami, 2023)

Learning independence is the ability and attitude of students to engage in self-directed learning by seeking information from various sources, rather than relying solely on the teacher. (Ilahi et al., 2021; Sembiring & Wardani, 2021; Winata et al., 2021) The core issue addressed in this study is the low level of student learning independence, which stems from the lack of attention given to the development of autonomous learning attitudes. This problem arises due to a predominantly one way, teacher-centered learning process. During the learning activities, it is essential to adopt effective instructional approaches that foster students' independence. One suitable approach is the *Problem Based Learning (PBL) model*. This instructional model is particularly effective in training students to solve problems independently and relate their learning to real-life contexts. (Fannisa Rahmadani & Sudioanto Manullang, 2024) *Problem Based Learning* is an approach that introduces students to *real-world problems* relevant to their lives, thereby encouraging them to investigate, analyze, and collaboratively seek solutions through group discussions prior to formal instruction. (Aziz & Astuti, 2023; Fitria et al., 2023; Mariskhantari et al., 2022; Nurfahrani et al., 2023; Winahyu et al., 2024)

Based on field observations, the ongoing learning process has not yet reached the expected standards. One of the primary issues identified is the low level of student learning independence. This is evident from the academic performance of Grade X students at MAN 2 Bandar Lampung, particularly in the subject of *Akidah Akhlak*, where the majority of students have not demonstrated optimal learning outcomes. Many students remain passive, show limited engagement in classroom activities, and tend to rely heavily on the teacher. In response to this issue, the researcher proposes an

alternative solution by implementing the *Problem Based Learning* (PBL) model. This model offers a challenging and engaging learning experience through the resolution of real-world problems, thereby training students to think critically, act independently, and take responsibility for their own learning process. Through the application of PBL, it is expected that students will be able to enhance their learning independence and demonstrate the ability to solve various problems they encounter. Fostering learning independence is crucial as it forms an integral part of character development and prepares students to face future challenges with confidence and competence.

The *Problem Based Learning* (PBL) model positions students at the center of the learning process, thereby requiring them to adapt to a more active role within the educational experience. On the other hand, teachers must also prepare themselves thoroughly to implement this model effectively. (Ardianti et al., 2021) Through the application of the PBL model, learners are encouraged to develop essential skills such as asking questions, expressing opinions, identifying relevant information, exploring various alternative solutions, and selecting the most appropriate method to solve problems independently. (Astikawat et al., 2020; Noviani et al., 2023) Thus, the implementation of the PBL model is expected to foster a sense of responsibility and initiative in learning both of which are key characteristics of learning independence.. (Wulandari & Firmansyah, 2024).

Findings from several researchers Adilah and Haryanti(2023),Novitasari and Amran (2021), Wijanarko and Taofik (2022), Wulandari Firmansyah (2024) have revealed the potential of the *Problem Based Learning* (PBL) model in enhancing students' learning independence. Problem-Based Learning is an instructional method specifically designed to train students in the art of learning how to learn, as well as in developing collaboration skills within groups to find solutions to real world problems. (Ardianti et al., 2021; Khakim et al., 2022) The primary aim of *Problem Based Learning* is to equip students with the necessary skills to face real-life situations and to prepare them to take on adult-like roles in solving various challenges. (Ardianti et al., 2021b; Khoiriyah et al., 2022)

To date, most studies on the *Problem Based Learning* (PBL) model have primarily focused on general aspects such as improving academic achievement and student learning outcomes, while the impact of PBL on the development of learning independence has not been explored in depth. Moreover, variations in the design and implementation of PBL including differences in student characteristics and school conditions have yet to receive significant attention in previous research. Therefore, this study seeks to bridge that gap through a structured and comprehensive experiment aimed at gaining a more detailed understanding of how to optimize the implementation of the PBL model to enhance students' learning independence. The issue of low student learning independence in the subject of Akidah Akhlak indicates that the current learning process has not effectively encouraged students to be active and self-directed in their studies. Many students remain dependent on the teacher and tend to be passive participants in the classroom, which results in suboptimal academic outcomes. This condition is critically important to investigate, as independent learning is one of the key components of educational success in the modern era. Through this research, it is expected that appropriate instructional

approaches or strategies can be identified to enhance students' autonomy, enabling them to take greater responsibility for their own learning process. This study will offer meaningful contributions to the field of education by supporting independent learning through the effective application of the *Problem Based Learning* model.

The low level of learning independence among Grade X students at MAN 2 Bandar Lampung, particularly in the subject of *Akidah Akhlak*, highlights the urgent need for a renewal of instructional strategies. Students tend to remain passive and heavily dependent on the teacher, resulting in a less than optimal learning process. This study is crucial for examining the impact of the *Problem-Based Learning* (PBL) approach on improving students' learning independence. If proven effective, the implementation of PBL could serve as a practical solution for teachers and schools in promoting more active learning that is oriented toward character development. These findings are expected to enrich educational practice by introducing a more relevant and contextualized instructional approach.

METHOD

This study employs a quantitative approach. Quantitative research is a type of study that involves multiple interrelated variables, organized into hypotheses or initial statements to examine the relationships among those variables. The study was carried out during even semester of the 2024/2025. The study took place at MAN 2 Bandar Lampung. The research utilizes a quantitative approach, emphasizing the gathering and interpretation of numerical data to explain phenomena, test hypotheses, and make predictions. This study utilized a *Quasi-Experimental Design* method, comparing one group with another, and involving both a control class and an experimental class.

Picture 1
Quantitative research

The participants in this study included 34 students from class X.H, designated as the experimental group, and 36 students from class XI, designated as the control group. The sampling technique applied was *Simple Random Sampling* using the "spin the wheel" application. The research instrument was a non-test in the form of a learning independence questionnaire. The questionnaire was developed based on the theory of Putu Shinta Ningtyas, which includes four indicators: (1) Self confidence, (2) Active engagement in learning, (3) Learning discipline, and (4) Responsibility in learning. The questionnaire consisted of 20 statements, and its validity was assessed by expert validators. The questionnaire instrument consisted of 20 statements, which were first validated by experts. All 20 items were found to be valid, with none deemed invalid. Validity essentially refers to 'measuring what is intended to be measured.' An indicator in the validity questionnaire is deemed valid when the r-value computed (r count) exceeds the critical value listed in the table (r count > r table). Once the data is declared valid, a reliability test can be conducted. If the Cronbach's alpha value of the variable is greater than 0.60, the variable is considered reliable or consistent in measurement. The results of

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P:		O ₂

the validity and reliability tests for normality, reliability, and the T-test were used in this research. (Dewi et al., 2022)

Table 1
Validity test

No. Item	R Hitung	R Tabel	Keterangan
1	0,431	0,279	Valid
2	0,376	0,279	Valid
3	0,526	0,279	Valid
4	0,494	0,279	Valid
5	0,281	0,279	Valid
6	0,413	0,279	Valid
7	0,289	0,279	Valid
8	0,682	0,279	Valid
9	0,496	0,279	Valid
10	0,336	0,279	Valid
11	0,399	0,279	Valid
12	0,679	0,279	Valid
13	0,777	0,279	Valid
14	0,482	0,279	Valid
15	0,481	0,279	Valid
16	0,589	0,279	Valid
17	0,280	0,279	Valid
18	0,597	0,279	Valid
19	0,308	0,279	Valid
20	0,642	0,279	Valid
21	0,284	0,279	Valid
22	0,542	0,279	Valid
23	0,605	0,279	Valid
24	0,787	0,279	Valid
25	0,384	0,279	Valid
26	0,576	0,279	Valid
27	0,612	0,279	Valid
28	0,630	0,279	Valid
29	0,422	0,279	Valid
30	0,645	0,279	Valid

Table 2
Reliability test

Case Processing Summary

Cases	N		%
	Valid	Excluded ^a	
Total	50	0	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.891	30

Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	109.7000	107.112	.384	.889
Item 2	109.5800	108.412	.338	.890
Item 3	110.9800	103.122	.483	.887
Item 4	109.7000	106.867	.468	.888
Item 5	111.8400	110.627	.054	.896
Item 6	111.2600	105.094	.341	.891
Item 7	109.7200	109.675	.209	.892
Item 8	110.8000	100.979	.637	.883
Item 9	109.7600	106.984	.441	.888
Item 10	109.6400	108.725	.286	.890
Item 11	109.5800	107.800	.239	.890
Item 12	110.6600	100.351	.629	.883
Item 13	110.7600	97.841	.748	.880
Item 14	109.7200	106.900	.435	.888
Item 15	110.1000	105.806	.434	.888
Item 16	109.9200	105.585	.537	.887
Item 17	109.9600	109.100	.230	.891
Item 18	110.9800	104.020	.544	.886
Item 19	110.1000	108.051	.253	.891
Item 20	110.6200	99.791	.577	.885
Item 21	110.0000	111.551	.022	.895
Item 22	110.8400	102.790	.480	.887
Item 23	109.9200	105.177	.573	.886
Item 24	110.8800	99.863	.760	.881
Item 25	109.6600	107.045	.324	.890
Item 26	109.7200	105.798	.533	.887
Item 27	110.7600	101.847	.561	.885
Item 28	110.6400	100.643	.580	.883
Item 29	110.2800	105.224	.336	.890
Item 30	109.8000	105.265	.617	.886

According to Arends (2022), the syntax of the Problem-Based Learning (PBL) model is as follows: (1)At the outset, the teacher introduces the problem to students, outlines the learning objectives, and provides a foundational explanation along with clear instructions that will guide the learning process.(2)Next, the teacher facilitates student engagement by helping them identify key concepts related to the problem and assigning tasks accordingly.(3)During the investigation phase, the teacher supports students in gathering information, conducting experiments, and exploring effective solutions.(4)As students create and present their findings, the teacher assists them in planning and preparing their work for presentation.(5)Finally, the teacher leads students in evaluating both their learning journey and the strategies they used to solve the problem.

RESULT AND DISCUSSION

Post-test scores collected after the treatment were analyzed to evaluate the condition of both the experimental and control classes, aiming to determine whether the

outcomes met the expected results. The analysis process consisted of several steps, including tests for normality, homogeneity, and a T-test.

1. Normality Test

Tabel 1.
Normality Test

As stated by criteria, the (Sig) for both the experimental this value exceeds threshold of 0.05, was accepted, data is normally results obtained method also show a of 0.89 for both confirming that the data in each group follows a normal distribution.

		Unstandardized Residual
N		27
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	7.07498113
Most Extreme Differences	Absolute	.156
	Positive	.156
	Negative	-.089
Test Statistic		.156
Asymp. Sig. (2-tailed)		.089 ^c

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

the normality test significances values control and groups is 0.89. Since the significance the statical null (H₀) suggesting that the distributed. The through the Smirnov significances values groups, further

2. Homogeneity Test

Tabel 2.
Homogeneity Test

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
VAR00002	Based on Mean	.763	1	61	.386
	Based on Median	.871	1	61	.354
	Based on Median and with adjusted df	.871	1	60.250	.354
	Based on trimmed mean	.803	1	61	.374

According to the criteria of the homogeneity test at a significances level of $\alpha = 0.05$, data is considered to have homogeneous variance when the significances values (Sig.) exceeds 0.05, indicating acceptance of the statistical null (H_0). In this study, Levene's test was used to assess homogeneity, yielding a significances values of 0.386 based on the mean. Since this value is greater than 0.05, the assumption of homogeneity is met. Therefore, it can be concluded that the variances in both the control and experimental groups are homogeneous. This uniformity between groups supports the assumption of homogeneity, making it appropriate to proceed with further statistical analysis.

3. T-Test

Table 3.
T-Test

		Independent Samples Test					Test for Equality of Means			
		Levene's Test for Equality of Variances					95% Confidence Interval of the Difference			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
hasil angket kemandirian belajar	Equal variances assumed	.763	.386	1.090	61	.280	2.03704	1.88896	-1.70017	5.77424
	Equal variances not assumed			1.074	52.857	.288	2.03704	1.89665	-1.76741	5.84148

To test the hypothesis on how students' learning independence is impacted by the Problem-Based Learning (PBL) methodology, the following hypotheses are proposed:

- H_0 (Null Hypothesis): If the significance value (2-tailed) is higher than 0.05, the Problem-Based Learning (PBL) paradigm has no discernible impacted on students' learning independence.
- H_a (Alternative Hypothesis): If the significance value (2-tailed) is less than 0.05, the Problem-Based Learning (PBL) model has a substantial impacted on students' learning independence.

The findings from the Independent Sample Test table show that the sig (2-tailed) values is 0.280, which is higher than 0.05. Therefore, that could be conclude the PBL learning model does not significant affect students' learning independence. This indicates that (H_0) got accepted and (H_a) turned down whereas.

This study employed the Problem-Based Learning (PBL) model with the aim of enhancing students' learning independence in the subject of Aqidah Akhlak. The model

was designed to encourage students to be more actively engaged in seeking solutions to given problems, thereby fostering a self-directed learning attitude. However, it was revealed by the findings that a significant impact on students' learning independence was not had by the implementation of the PBL model. Consequently, the expected improvement in self-directed learning through the application of this model has not been optimally achieved.

Picture 2
Distribution of Questionnaire



Picture 3
Interview With The Teacher



This study presents a significant distinction compared to previous research conducted by Endah Putri Utami Purba (2020), Barlianty Aprila(2022), Susilawati(2024), and Lintang Kusuma Wardani(2023). The key difference between this study and that of Endah Putri Utami Purba (2020) lies in the dependent variable. While Endah Putri research employed two dependent variables mathematical reasoning ability and students' learning independence this study focused solely on a single dependent variable, namely learning independence. Furthermore, a notable difference is also evident when compared to the study by Barlianty Aprila (2022), who utilized both test and non-test instruments. In contrast, the present research employed only non-test instruments.

Susilawati (2024), conducted a study that differed in terms of its independent variables, incorporating both the SAVI learning model and the PBL model. In contrast, the current study focused solely on one independent variable, namely the PBL learning model. Meanwhile, the research carried out by Lintang Kusuma Wardani (2023), differs in the methodology used; Lintang employed the Systematic Literature Review (SLR) method, whereas the study utilized a quantitative experimental approach.

The results of this study suggest that implementing problem-based learning (PBL) does not significantly impact students' independent learning in the subject of Aqidah Akhlak at MAN 2 Bandar Lampung. This conclusion is reinforced by the outcome of the Independent Samples Test, which yielded a significances value of 0.280. As this exceeds the threshold of 0.05, the statical null (H_0) was accepted. Therefore, that would be inferred that's there no substantial differences between the PBL method and conventional teaching approaches regarding their implications for students' self-managed learning.

The Problem-Based Learning (PBL) model aims to promote independent learning, support the development of flexible and comprehensive knowledge, and improve students' problem-solving abilities as a basis for lifelong learning (Ananda & Fauziah, 2022; Murdilah & Farhurohman, 2025; Zainal, 2022). In addition, this approach aims to shape students into individuals who can collaborate effectively and address contextual

problems with confidence and competence. Based on the data, it can be concluded that although PBL was implemented, it did not produce a statistically significant difference in students' learning motivation among the control and experimental groups.

According to Agus (2021), the factors influencing students' learning independence can be divided into two categories: exterior and internal. Internal factors include a sense of responsibility, initiative, self-confidence, and discipline in learning. However, this study does not rule out the possibility that external factors also play a role in shaping learning independence. These exterior factors may include the availability of learning resources or the fulfillment of academic needs, as well as a supportive home environment. This highlights the active role of parents in enhancing students' learning motivation. (Andrila et al., 2022).

Several factors contribute to the ineffectiveness of this learning model, including teacher readiness, time constraints, and students' lack of self-confidence. (Auliah et al., 2023; Rombe et al., 2021). Challenges in implementing this model arise from teachers limited ability to design effective learning scenarios, students' unfamiliarity with active participation, independence, and engagement in open discussions, as well as the limited time available for instructional activities.

This study can serve as a valuable reference for other researchers interested in the field of education, particularly in designing innovative learning models. The findings provide concrete perspective on the efficacy of the Problem-Based Learning (PBL) concept and techniques for evaluating how it affects students' independence in learning. The results of this research may form a solid foundation for future studies—either to test similar models in different contexts or to develop new approaches that are better aligned with the current needs of education.

The findings of this investigation make a substantial contribution to the advancement of educational science by deepening the understanding effectiveness of Problem Based Learning (PBL) in fostering students' learning independence. Theoretically, these results reinforce the foundations of constructivist thought, which positions students as active agents in the learning process. Concepts such as self-directed learning, active engagement, and problem-solving as the core of the learning experience are validated through this research. Consequently, this study not only strengthens existing theoretical frameworks but also elucidates the connection between the PBL approach and the development of autonomous learning characteristics.

In addition to reinforcing well-established concepts, this study offers a novel perspective in evaluating the effectiveness of instructional models. Rather than solely focusing on academic outcomes, it highlights the importance of non-cognitive indicators such as attitudes and metacognitive skills. This emphasis encourages the development of a more comprehensive and contextually relevant assessment framework aligned with the demands of modern education. Accordingly, the findings pave the way for designing alternative or integrative learning models that are more contextualized and responsive to the needs of 21st-century learners.

CONCLUSION

It can be inferred from the research results and the discussion that the teaching strategy used had no appreciable learning outcomes independence of Grade X students at

MAN 2 in Bandar Lampung. This is demonstrated by the t-test findings, which indicate that the statistical null (H_0) was accepted. Consequently, it can be inferred that the teaching method did not succeed in improving students' motivation to learn. This condition suggests the need for further efforts to identify and develop instructional methods that are more in line with the needs and traits of the students.

Accordingly, future research is encouraged to explore alternative instructional strategies that are more interactive and engaging, and that can accommodate diverse learning styles. Approaches such as collaborative and project-based learning may serve as promising alternatives, as they actively involve students in the learning process. By adopting such methods, it is expected that students' learning independence can be sustainably enhanced, ultimately leading to long-term positive outcomes.

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