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The Effect of the Project-Based Learning (PjBL) Model on Students' Critical Reasoning and Learning Achievement in Islamic Education Based on the SDGs

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Abstract

Objective: This research aims to: (1) examine the effect of the PjBL model on improving critical reasoning skills at SDN Masaran 5; (2) analyze the impact of PjBL on enhancing students' learning achievement; and (3) assess the overall effectiveness of PjBL in improving critical thinking and learning outcomes in the context of Islamic Education (PAI) and Character Building (BP), aligned with the Sustainable Development Goals (SDGs), particularly Goal 4: Quality Education. **Theoretical framework:** In the era of 21st-century education, the development of students' 4C skills—Communication, Collaboration, Critical Thinking, and Creativity—is a fundamental necessity. Within this framework, Project-Based Learning (PjBL) emerges as a powerful pedagogical model that fosters student engagement, innovation, and critical reasoning through meaningful projects. **Literature Review:** Project-based learning fosters critical thinking and academic achievement, especially in Islamic education, by promoting active learning aligned with SDGs to support holistic, student-centred, and values-based education. **Methods:** Grounded in constructivist learning theory, this study adopts a mixed-methods approach, combining qualitative and quantitative methods. The research design consists of Classroom Action Research (CAR) and Pre-Experimental Research using the One Group Pre-Test and post-test Design. The sample includes 18 fourth-grade students, selected through total sampling. Data collection techniques include observation for the qualitative phase and pre-test/post-test instruments for the quantitative phase. **Results:** The results reveal that the PjBL model significantly improves students' critical reasoning skills. Furthermore, it effectively enhances learning achievement in PAI and BP subjects. The integration of Islamic values within student-centred projects not only enriches content understanding but also aligns the educational process with the values of the SDGs, promoting holistic, inclusive, and transformative learning. **Implications:** This study has important implications for educators and policymakers, highlighting the need for innovative instructional models that blend faith-based education with global education goals. **Novelty:** The novelty of this research lies in its focus on implementing PjBL within Islamic Education, framed through the lens of sustainable development. It offers a replicable model for primary-level instruction that supports both cognitive and character development in line with SDG aspirations.

Keywords: project-based learning, critical reasoning, islamic education, sdgs, learning achievement.

INTRODUCTION

In the face of rapid global change, education must adapt to equip students with essential 21st-century skills, including critical thinking, creativity, collaboration, and communication. Project-Based Learning (PjBL) is widely recognized as a student-centred approach that empowers learners to actively explore real-world problems and develop deeper understanding through inquiry and innovation. Within the context of Islamic Education, integrating PjBL not only enhances cognitive skills but also fosters spiritual and moral development, making learning more meaningful and relevant [1].

This theme is particularly important as it aligns with the Sustainable Development Goals (SDGs), especially Goal 4: Quality Education, which emphasizes inclusive, equitable, and transformative learning. By applying PjBL in Islamic Education, educators can bridge traditional religious teachings with modern pedagogical strategies, supporting both academic achievement and character building. This study aims to demonstrate the effectiveness of PjBL in developing critical reasoning and improving learning outcomes in Islamic learning environments [2].

Education is currently an important entity in society, characterized by significant changes in teaching systems and methods to improve the effectiveness and efficiency of learning. In addition to functioning as a means of knowledge transfer, education also plays a role in realizing a learning vision that focuses on students, by involving families and the community. In this case, teachers play the role of trusted partners of parents in supporting learning success. One of the important subjects is Islamic Religious Education (PAI) and Ethics (BP), which aims to form students who excel in behaviour and its application in daily life. PAI and BP, as Islamic-based educational tools, are taught in public institutions and function as moral bulwarks through interaction between teachers and students to achieve the desired learning vision [3]–[5].

Good learning quality can be measured through the process and results, with the expectation that 75% of students actively participate in learning mentally, physically, and socially, resulting in optimal quality. Students are expected to show a high enthusiasm for learning, and learning success can be indicated by an increase in grades of around 75% among the majority of students [6]. An effective learning process must consider a variety of teaching methods, as this affects learning outcomes. The quality of learning must be comprehensive, not only focusing on cognitive improvement but also the development of behavior in an integrated manner, so that changes can be observed and measured. Effective learning will produce good achievements for students and teachers [7]–[9].

Currently, the world of education faces challenges in developing 21st-century skill competencies in students, which include the 4Cs: Communication (communication), Collaboration (collaboration), Critical Thinking and Problem-Solving (critical reasoning and problem-solving), and Creativity and Innovation (creativity and innovation). 4C skills, as part of "soft skills", have a higher value in daily life than mastery of "hard skills" [10]. Therefore, students need to be equipped not only with materials but also with skills to face future competition. However, the problems faced by schools in Indonesia, such as the unequal quality of education at the primary and secondary levels, hinder this development [11]. The government's efforts to improve the quality of education through teacher competency training and improvement of education quality management have been carried out, but there are still indicators that show unequal quality, so the condition of schools, especially in the learning process, is still concerning in many places [12]–[15].

The critical reasoning skills of students in Indonesia still face significant challenges. Data from Trends in International Mathematics and Science Study (TIMSS) 2015 shows that the mathematics scores of Indonesian students are ranked 45 out of 50 countries, with low ability to solve problems that require critical reasoning [16]. The habit of doing routine problems and simple computing leads to a lack of practice in dealing with problems that require information integration, concluding, and applying in complex contexts. Therefore,

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it is necessary to improve learning approaches to encourage the development of critical reasoning skills and deep thinking [17]–[19].

Observation of PAI and BP learning in various schools shows that adjustments to the conditions of students have been made. However, the methods used still tend to be monotonous and teacher-centric (teacher-centered), which results in boredom and lack of enthusiasm among students [20]. The lack of variety in learning methods also hinders the development of critical reasoning skills. At SDN Masaran 5, PAI and BP teachers generally still use the lecture and demonstration method, focusing on practice questions in the LKS. The results of the evaluation show that the learning achievement of PAI and BP is still average with a Mid-Semester Summative (STS) score of grade IV for the 2023/2024 school year of 50, the highest score of 77, and the lowest score of 28, while the Minimum Completeness Criterion (KKM) is 65. This low achievement is caused by the inconsistency of learning strategies applied by teachers [21]–[23].

Given the low achievement achieved, PAI and BP teachers at SDN Masaran 5 need to evaluate teaching strategies so that learning is not boring and decreases students' critical reasoning skills and learning achievements. Often, only a few learners achieve a complete score on the daily test, STS, or SAS (End of end-of-semester summative) [24]. The large value gap indicates the need for teachers to develop more varied learning models. One of the models that can be applied is PjBL, which emphasizes project work to improve creativity, innovation, and critical reasoning skills in producing work [25]. Through this approach, students will be faced with challenges in designing projects, so that they can act independently, expected to encourage cognitive development and problem-solving skills in PAI and BP subjects [26], [27].

The application of the PjBL model can develop the character of students in conveying ideas and ideas and creating the products they produce [28]. Thus, PjBL contributes both directly and indirectly to the development of high-level reasoning skills (HOTS/Higher Order Thinking Skills). This model is in line with the needs of 21st-century education, including mastery of 4C skills, as well as offering interesting learning methods to apply. In addition, PjBL is expected to increase student involvement during the learning process, thus potentially improving their learning achievement [29].

Considering the experiment carried out by Siti Fatimah, et al. stated that there was an increase in the average percentage of completeness of student learning outcomes. In the pre-cycle, before being given treatment, the value of students' learning outcomes has not reached completeness. In the first cycle, the percentage of completeness reached 50%, while in the second cycle, it increased to 100%. From the findings of this study, it can be concluded that the use of project-based learning models in science learning in the material Characteristics of Objects is effective in improving student learning outcomes [30]. Next S. Syukriah et al concluded that there was a significant difference between the control group and the experimental group α =0.05, Asymp value. Sig. (2-tail) 0.00<0.05. In conclusion, the PjBL model combined with PDEODE (predict-discuss-explain-observe-discuss-explain) has significantly improved the cognitive learning outcomes of students [31], [32].

Sandy Vantika, et al. concluded that The implementation of project-based learning has a positive influence on student learning achievement, which is measured through a t-statistical value of -2.0541 with a p-value of 0.04421. In particular, the average mid-semester assessment score of students who participated in project-based learning was higher than those who participated in conventional learning [33]. Furthermore, Jonte C. Taylor et al., concluded that PjBL is a pedagogical methodology that is rarely used by EBD teachers (Emotional and Behavioral Disorders). Recent studies examine the use of PBL teaching to support student behavior and its impact on the stress and job satisfaction of EBD teachers. PBL has been proven to improve students' behavior in the classroom and in the private as well as increase job satisfaction for EBD teachers [34], [35].

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A subsequent experiment from Roza Febrianti, et al., concluded that the PjBL model had a positive impact on the creative reasoning ability of grade 11 mechanical engineering students in the creative product and entrepreneurship course [36]. Finally, the findings from Siti Nurhamidah and Kun Nurachadijat concluded that the learning independence of students who obtained learning with PjBL was better than those who obtained learning with the expository method, students had a good view of learning with PjBL [37]. The experiments that have been carried out are identical to this research than those that have been carried out, namely in the combination of variable search, namely looking for the influence of PjBL on critical reasoning and learning achievement to students, then from the article has not discussed in the third PAI and BP subject, namely the use of this research method using mixed methods What makes this study unique [38], [39].

Based on the various problems identified, the objectives of this paper are: (1) to find out the influence of PjBL on improving students' critical reasoning skills, (2) to find out the influence of PjBL on improving students' learning achievement, and (3) to assess the effectiveness of the use of the PjBL model at SDN Masaran 5, especially in learning PAI and BP subjects.

LITERATURE REVIEW

The Project-Based Learning (PjBL) model has gained increasing recognition in educational settings due to its emphasis on active learning and real-world application. Within the context of Islamic education, PjBL presents an innovative approach to fostering critical reasoning and improving student learning outcomes. By engaging students in meaningful projects that align with real-life challenges, particularly those connected to the Sustainable Development Goals (SDGs), the PjBL model encourages learners to think critically, collaborate, and apply their knowledge in practical ways [38], [39].

Critical reasoning, as a key component of 21st-century skills, is essential in Islamic education to help students interpret religious teachings thoughtfully and apply them in diverse contemporary contexts. The PjBL model creates opportunities for students to analyze issues such as poverty, environmental stewardship, and social justice through the lens of Islamic values and teachings, promoting deeper understanding and relevance. This not only enhances cognitive engagement but also nurtures moral and ethical awareness aligned with the goals of Islamic education [38], [39].

Moreover, research has shown that the PjBL approach positively impacts learning achievement by encouraging student autonomy, problem-solving, and sustained inquiry. When students are actively involved in constructing knowledge through project-based tasks, they tend to retain information more effectively and demonstrate improved academic performance. Integrating the SDGs into project themes further strengthens students' motivation and global awareness, fostering a holistic educational experience. In conclusion, the implementation of PjBL in Islamic education offers a promising pedagogical strategy to cultivate critical reasoning and elevate learning achievement while reinforcing the values and objectives of both Islam and sustainable development [38], [39].

METHODOLOGY

The paradigm of this research is Mixed Methods namely research by combining qualitative and quantitative research [40]. The type of research uses PTK and Experiments in the form of Pre-Experimental Design, using research design One Group Pre-test – Post-test Design. The PTK research subjects themselves consist of class IV with a total of 18 students, then the total population is 36 students with a total of 18 experimental classes and a control class with a total of 18 students. Furthermore, the sample of this study is class IV students with a total sample of 18 samples Total Sampling. The data collection technique for PTK research is Observation, while for Experimental research with Pre-Test and Post-

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Test. In qualitative data processing techniques, percentages are used, while quantitative tests are used.

This study employs a mixed-methods approach, combining qualitative and quantitative research to gain a comprehensive understanding of the impact of the Project-Based Learning (PjBL) model. The qualitative aspect involves Classroom Action Research (CAR) to observe and reflect on students' critical reasoning development, while the quantitative part uses a Pre-Experimental Design, specifically the One Group Pre-Test–Post-Test model, to measure changes in students' learning achievement. Data collection techniques include observation, interviews, pre-tests, and post-tests.

The novelty of this study lies in integrating the PjBL model within Islamic Education while aligning it with the Sustainable Development Goals (SDGs) framework—particularly SDG 4 on Quality Education. Unlike conventional methods, this research introduces an innovative strategy that combines faith-based learning with global competencies. It provides fresh insights into how Islamic Education can evolve through interactive, project-oriented methods that promote critical thinking, academic success, and character development simultaneously [40].

RESULTS AND DISCUSSION

PTK Research Results Cycle I

The results of the research in the first cycle obtained an average score of 1.80, including the criterion of "lacking" critical reasoning. Further details can be seen in the following table.

Table 1. Results of Observation of Critical Reasoning of Students in Cycle 1

No.	Observers	Score
1.	Observer 1	1,78
2.	Observer 2	1,83
Total average score		3,61
Average		1,80
Criterion		Less

Observations are carried out simultaneously with the implementation of the teaching and learning process. At the end of the process, students are given a test to find out their level of success in learning by applying the PjBL model that has been implemented. The data of the results of the research on actions in class IV can be seen in the table below.

Table 2. Recapitulation of Students' Learning Achievement in Cycle 1

No.	Description	*Pre-Test*	Frequency	*Post-Test*	Frequency
1.	Total Students	18		18	
2.	Highest Scores	70	3 people	80	3 people
3.	Lowest Rate	30	8 people	30	1 Person
4.	Average Score	40,56		56,11	
5.	The number of students who have not completed	3		8	
6.	Number of completed students	15		10	
7.	Completion percentage	16,66%		44,44%	

In Table 3.2 above, it can be seen that the application of the PjBL learning model in cycle I resulted in an average Post-Test score of 56.11 students with a learning completion rate

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of 44.44%. Of these, 10 students managed to achieve a score above the KKM, so their Post-Test was considered complete. However, these results show that overall, in Cycle I, students have not reached the classically complete category, because only 44.44% of students obtained a score of ≥ 65, while the expected percentage of completion is 80%.

The researcher carried out a follow-up on the assessment results at the end after the implementation of learning to analyze the evaluation program to improve the results. In this activity, students experienced a little difficulty in understanding the material with the PjBL learning model because it was still new and they were not used to it, so it took time to adapt. Nevertheless, the classroom conditions remained orderly, smooth, and conducive.

PTK Research Results Cycle 2

In this 2nd cycle, the application of the PjBL model obtained an average score of 2.63 with the criterion of "Good" with critical reasoning. Further details can be seen in the following table.

Table 3. Results of Observation of Critical Reasoning of Students in Cycle 2

No.	Observers	Score
1.	Observer 1	2,61
2.	Observer 2	2,65
Total average score		5,26
Average		2,63
Criterion		Good

Observations are carried out simultaneously with the implementation of the teaching and learning process. At the end of the process, students are given a test to find out their level of success in learning by applying the PjBL model that has been implemented. The data of the results of the research on actions in class IV can be seen in the table below.

Table 4. Recapitulation of Students' Learning Achievement in Cycle 2

No.	Description	*Pre-Test*	Frequency	*Post-Test*	Frequency
1.	Total Students	18		18	
2.	Highest Scores	70	6 people	80	5 people
3.	Lowest Rate	40	7 people	50	3 people
4.	Average Score	52,78		68,33	
5.	The number of students who have not completed	12		5	
6.	Number of completed students	6		13	
7.	Completion percentage	33,33%		72,22%	

In Table 3.4 above, it can be seen that applying the PjBL learning model in cycle II resulted in an average post-test score of 68.33 students, with a learning completion rate of 72.22%. Of these, 13 students managed to achieve a score above the KKM, so that their Post-Test was considered complete. However, these results show that overall, in Cycle II, students have not achieved classical learning completeness because only 72.22% of students obtained a score ≥ 65, while the target of completeness should be 80%.

The researcher conducts a follow-up analysis after the implementation of learning to evaluate and improve the program. In this analysis, it was found that students had little difficulty in understanding the material with the PjBL learning model because it was the first time it was applied and they were not used to it. This indicates the need for further

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adaptation time for students. Nevertheless, the classroom conditions are well-maintained and conducive.

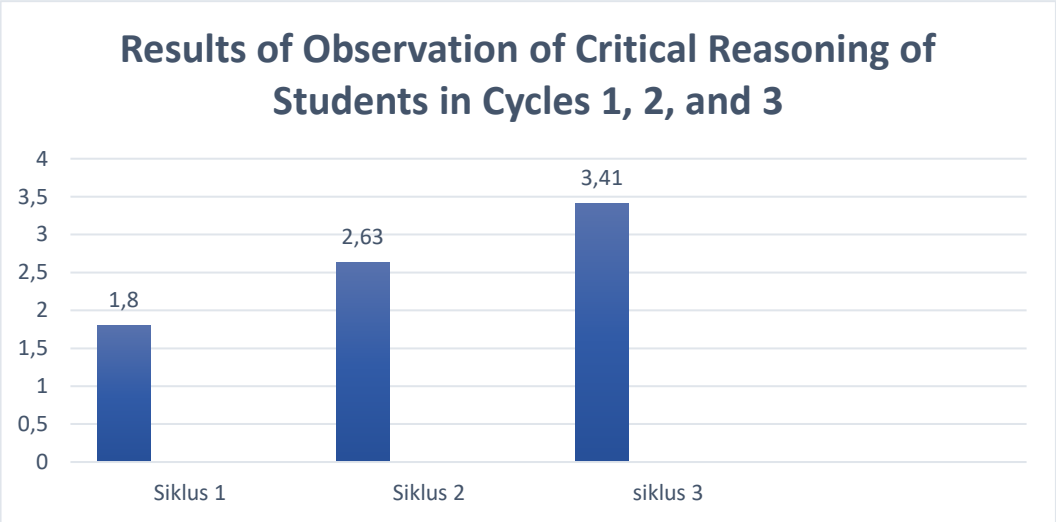
PTK Research Results Cycle 3

In this third cycle, an average score of 3.41 was included in the "Very Good" criterion for critical reasoning. Further details can be seen in the following table.

Table 5. Results of Observation of Critical Reasoning of Students in Cycle 3

No.	Observers	Score
1.	Observer 1	3,35
2.	Observer 2	3,47
Total average score		6,82
Average		3,41
Criterion		Excellent

The increase in the results of students' critical reasoning observation in cycles I, II, and III can be seen from the increase in the average results of cycles I, II, and III, which are 1.80 in the poor criterion, 2.63 in the good criterion and 3.41 in the Very good criterion. Furthermore, the improvement of students' critical reasoning from cycles 1, 2, and 3 can be seen in the graph below.



Graph 1. Results of Observation of Critical Reasoning of Students in Cycles 1, 2, and 3

Observation is carried out simultaneously with the teaching and learning process. At the end of the learning session, students were given a test to evaluate their level of success in learning using the PjBL Model.

Table 6. Recapitulation of Students' Learning Achievement in Cycle 3

No.	List	*Pre-Test*	*Post-Test*
1.	Total Students	18	18
2.	Highest Scores	70	90
3.	Lowest Rate	50	60
4.	Average Score	61,11	80,56
5.	The number of students who have not completed	10	2
6.	Number of completed students	8	16

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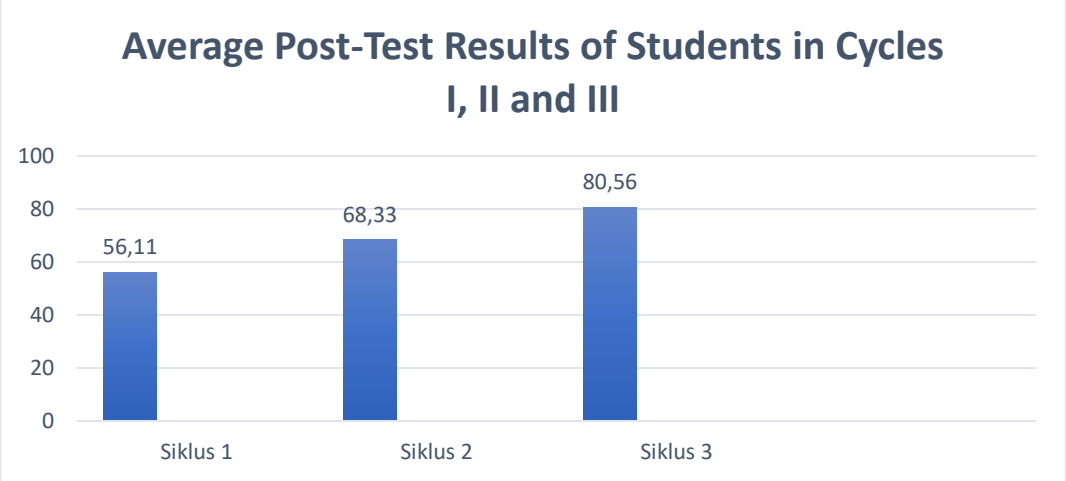
7.	Completion percentage	44,44%	88,88%

Based on the data shown in Table 3.6, the application of the PjBL learning model in cycle III shows positive results. The average score of students for the Pre-Test was 61.11, while the average score for the Post-Test increased to 80.56. In addition, the level of learning completeness also increased, with the completion of the Pre-Test by 44.44% and the completion of the Post-Test increased to 88.88%. This means that out of 18 students, 10 have achieved completeness in the Pre-Test, and 16 students have completed the Post-Test, with a score above the KKM.

These results show that in this cycle, the majority of students have reached the expected level of completeness. The percentage of students who obtained a score of ≥ 65 reached 88.88%, exceeding the set completion target of 80%. The final assessment is carried out after the learning process to analyze the results and improve the evaluation program if necessary. During this action, students showed progress in understanding the material through the PjBL model, with orderly, smooth, and conducive classroom conditions. Students appear serious and attentive in various learning activities, such as formulating problems, formulating hypotheses, analyzing data, and providing conclusions.

From the results of the Post-Test, it can be seen that the increase in the learning achievement score of students from cycles 1, 2, and 3 is as shown in the graph below.



Graph 2. Average Post-Test Results of Students in Cycles 1, 2 and 3

Research Results in Experimental Classes

A very important first step in this PjBL research is to ensure that the two classes to be compared, namely the PjBL/PTK class and the control class, have equal initial abilities. This is done to eliminate other variables that can affect the results of the research so that the comparisons made become more valid and reliable. To ensure this equality, initial measurements were made using the Pre-Test test in both classes. The average results of the Pre-Test score showed that the experimental class had an average score of 53.89, while the control class had an average score of 51.67. This difference is quite small, so it can be concluded that the initial abilities of both classes are relatively the same.

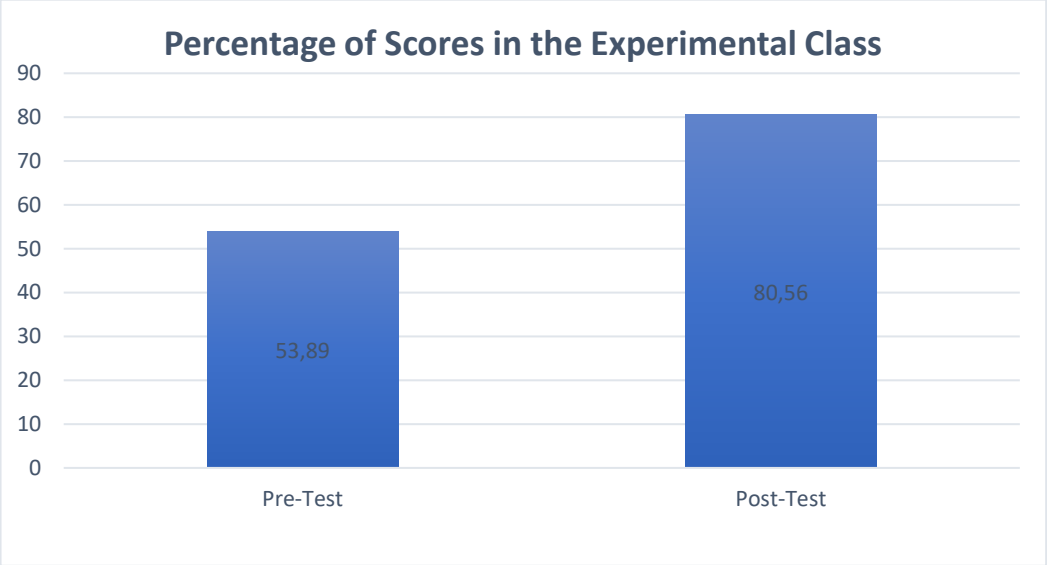
The data from the research results from the Post-Test scores of students in the experimental class can be seen in the following table:

Table 7. Recapitulation of The Completeness of Students' Learning Achievement in the Experimental Class

No.	List	*Pre-Test*	*Post-Test*
1.	Total Students	18	18

2.	Highest Scores	80	100
3.	Lowest Rate	40	60
4.	Average Score	53,89	80,56
5.	The number of students who have not completed	13	2
6.	Number of completed students	5	16
7.	Completion percentage	27,77%	88,88%

It can also be seen in the graph below.



Graph 3. Average Learning Achievement Scores in the Experimental Class

In this experimental class, before the teacher carried out the learning action, the teacher first gave a Pre-Test to 18 students. The results showed that only 5 students reached completion, while the other 13 people had not completed it. This completeness is measured based on the KKM that has been set.

After the learning process takes place using the PjBL approach, the teacher provides a Post-Test to re-measure students' understanding of the material that has been taught. The results of the Post-Test showed a significant increase: out of 18 students, 16 people obtained a score above 65, while only 2 people still received a score below 65.

The average learning achievement of students in the Pre-Test was 53.89. After the learning intervention, classical learning completeness increased significantly to reach 88.88% with an average score of 80.56. This figure shows that the majority of students in the experimental class managed to achieve the minimum expected standard, with many of them getting a score above the KKM set by the teacher, which is 65. This also shows the effectiveness of the PjBL approach in improving students' understanding and learning achievement compared to the results of the Pre-Test before the learning action is carried out.

This increase in learning achievement can be attributed to the PjBL approach applied in the experimental class. PjBL encourages learners to be more active in the learning process, increasing their engagement through projects relevant to the subject matter. This process not only makes learning more interesting and meaningful but also helps students to understand the concepts taught more deeply. Learners not only memorize information but also apply their knowledge in real-world contexts, which in turn improves critical reasoning and problem-solving skills.

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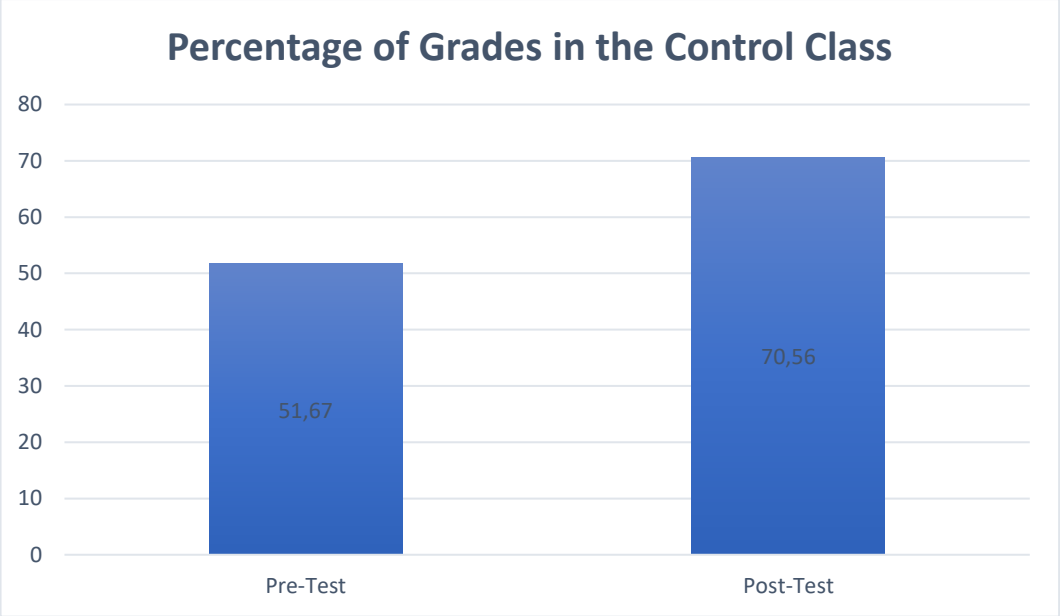
Research Results in the Control Classroom

Based on the analysis of student learning achievements, the results show that some students still do not reach the expected standards. The Post-Test scores obtained are still some students who have not met the KKM set by the teacher, which is ≥ 65. Details of the Post-Test scores of students in the control class can be seen in the following table:

Table 8. Recapitulation of The Completeness of Students' Learning Achievement In The Control Class

No.	List	*Pre-Test*	*Post-Test*
1.	Total Students	18	18
2.	Highest Scores	80	100
3.	Lowest Rate	40	50
4.	Average grade	51,67	70,56
5.	The number of students who have not completed	14	5
6.	Number of completed students	4	13
7.	Graduation percentage	22,22%	72,22%

It can also be seen in the graph below.



Graph 4. Average Learning Achievement Scores in the Control Class

In the control class, before starting the learning action, the teacher gave a Pre-Test to 18 students. The results of the Pre-Test showed that only 4 students achieved completeness, while 14 others had not reached the standards set based on the KKM.

After the learning process takes place using a conventional approach, the teacher provides a Post-test to re-measure students' understanding of the material that has been taught. The results of the Post-Test showed a significant improvement: out of 18 students, 13 people obtained a score above 65, while the other 5 people still received a score below 65.

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The average learning achievement of students in the Pre-Test was 51.67. After the learning intervention, the classical learning completeness increased to 72.22% with an average Post-Test score of 70.56. This shows an increase in understanding and learning achievement compared to the results of the Pre-Test before learning is carried out.

However, when compared to the experimental class that achieved a classical completeness of 88.88% using PjBL learning, the results of the control class were still less effective. The experimental class showed better results in improving students' learning achievement.

Test The Effectiveness of The Implementation of The Pjbl Model

Pre-Test and Post-Test Cycle I T-Test

To analyze whether the results of the study have experienced a significant improvement, the t-test test is used. In analyzing this t-test test, the researcher utilizes data from the results of the Pre-Test of students in cycle I and Post-Test cycle I. Using the SPSS program, the interpretation of the data can be seen in the following table.

Table 9. Pre-Test and Post-Test Data of Cycle 1

Cycle 1	*Pre-Test*	*Post-Test*
Average	40,56	56,11
Calculation	-6,710	
t-table	1,740	

Based on table 4.1, the tcal>ttable (6,710 > 1,740) with P value (0.000 < 0.05), so the hypothesis was accepted, which means that there was a significant difference in students' learning achievement after the application of the PjBL approach model in the first cycle in the PTK class.

The results of the t-test above prove that there is a significant difference in learning achievement after the application of the PjBL learning model in cycle I in the PTK class.

Pre-Test and Post-Test Cycle II t-test

To analyze whether the results of the study have experienced a significant improvement, the t-test test is used. In analyzing this t-test, the researcher used data from the results of the Pre-Test of students in cycle II and Post-Test cycle II. With the help of the SPSS program, the interpretation of t-test data for Pre-Test and Post-Test scores of cycles II can be seen in the table.

Table 10. Pre-Test and Post-Test Data Cycle 2

Cycle	*Pre-Test*	*Post-Test*
Average	52,78	68,33
Calculation	-7,714	
t-table	1,740	

Based on table 4.2, the calculation > t-table (7.714 > 1.740) with P value (0.000 < 0.05), so that the hypothesis is accepted. This shows that there is a significant difference between student learning achievement and the application of the PjBL model in PAI and BP subjects in cycle II in the PTK class.

Thus, the application of the PjBL model in cycle II in PTK classes shows that students' Pre-Test and Post-Test scores increase in PAI and BP subjects in Class IV of SDN Masaran 5.

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Post-Test Cycle I and Cycle II t-Score Test

To analyze the results of the study whether there is a significant increase or not, the t-test test is used. In analyzing this t-test, the researcher used data obtained from the results of Post-Test Cycle I and Post-Test Cycle ll. By using the SPSS program, the interpretation of t-test data for Post-Test scores in cycle I and cycle II is obtained. The data can be seen in the table.

Table 11. Data of Post-Test t-Test Cycle 1 and Post-Test Cycle 2

Cycle	*Post-Test* Cycle I	*Post-Test* Cycle II
Average	56,11	68,33
Calculation	-4,267	
t-table	1,740	

Based on table 4.3, calculate > ttable (4.267 > 1.740) with P value (0.001 < 0.05), then the hypothesis is accepted. Based on Table 4.3, the tcal value (4.267) is greater than the t-table (1.740), and the P value (0.001) is smaller than 0.05. This shows that the research hypothesis is accepted, which means that there is a significant difference in the learning achievement of students after the application of the PjBL model in PAI and BP subjects in cycle II in the PTK class.

The results of this t-test prove that there is a difference in student learning achievement between the application of the PjBL model in cycle I and cycle II in PTK classes, especially in PAI and BP subjects for Class IV at SDN Masaran 5. In other words, the PjBL method shows a significant increase in students' learning achievement from cycle I to cycle II in the subject.

Pre-Test and Post-Test Cycle III t-test

To analyze whether the results of the study have experienced a significant improvement, the t-test test is used. In analyzing this t-test, the researcher used data from the results of the Pre-Test of students in cycle III and Post-Test cycle III. With the help of the SPSS program, the interpretation of t-test data for Pre-Test and Post-Test scores of cycle III can be seen in the table.

Table 12. Data of Pre-Test and Post-Test Cycle 3

Cycle	*Pre-Test*	Post-Test
Average	61,11	80,56
Calculation	-15,297	
t-table	1,740	

Based on table 4.4, the calculation > t-table (15.297 > 1.740) with P value (0.000 < 0.05), so the hypothesis is accepted. This shows that there is a significant difference between student learning achievement and the application of the PjBL model in PAI and BP subjects in cycle III in the PTK class.

Thus, the application of the PjBL model in cycle III in PTK classes shows that students' Pre-Test and Post-Test scores increase in PAI and BP subjects in Class IV of SDN Masaran 5.

Post-Test Cycle II and Cycle III t-Score Test

To analyze the results of the study whether there is a significant increase or not, the t-test test is used. In analyzing this t-test test, the researcher used data obtained from the results of the Post-Test Cycle II and Cycle III. By using the SPSS program, the interpretation of t-test data for Post-Test scores of cycle II and cycle III is obtained. The data can be seen in the table.

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Table 13. Post-Test Cycle 2 and Post-Test Cycle 3 Data

Cycle	*Post-Test* Cycle II	*Post-Test* Cycle III
Average	68,33	80,56
Calculation	-5,500	
t-table	1,740	

Based on Table 4.5, tcal> t-table (5,500 > 1,740) with a P value (0.000 < 0.05) then the hypothesis is accepted. This means that there is a significant difference between student learning achievement and the application of the PjBL model in PAI and BP cycle III subjects in the PTK class.

The results of the t-test above prove that there is a difference in students' learning achievement with the application of the PjBL model in Cycle II and Cycle III in PTK class, in PAI and BP Class IV subjects in SDN Masaran 5.

Test t Score Pre-Test Experimental Class and Control Class

To analyze the results of the study whether there is a difference in learning achievement or a significant increase in learning achievement in the experimental and control classes, the t-test test is used. In analyzing this t-test, the researcher used data obtained from the results of the pre-test of students in the experimental class and the control class.

Table 14. Data of Pre-test t-test of Experimental Class and Control Class

Pre-test	Experimental Classes	Control Classes
Average	53,89	51,67
Calculation	0,462	
t-table	1,691	

From the results of the calculation of the t-test test of 95% significance level of the degree of freedom (db) = n1 + n2 = 18 + 18 = 36-2 = 34 seen in the table, which is 1.691, a calculation of 0.462 was obtained. Since the t-count < t-table, the null hypothesis (H0) is accepted and the alternative hypothesis (Ha) is accepted. This means that there is no difference in student learning achievement between students in the experimental class and the control class. The results of the Pre-Test of the PjBL model class and the control class were then tested using SPSS. Based on the calculation results, the significance result was 0.647. If the value of Sig. (2-tailed) < 0.05 The value obtained is 0.647 < 0.05, then it can be concluded that there is no difference between the learning achievement of students in the experimental class and the control class before the application of the PjBL model.

Test t Score Post-Test Experimental Class and Control Class

To analyze the results of the study whether there is a difference in learning achievement or a significant increase in learning achievement in the experimental and control classes, the t-test test is used. In analyzing this t-test, the researcher used data obtained from the results of the Post-Test of students in the experimental class and the control class.

Table 15. Data of pre-test t-test of Experimental Class and Control Class

Post-test	Experimental Classes	Control Classes
Average	80,56	70,56
Calculation	2,168	
t-table	1,691	

From the results of the calculation of the t-test of the significance level of 95% of the degree of freedom (db) = n1 + n2 = 18 + 18 = 36 - 2 = 34 seen in the t-table, which is 1.691,

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it is obtained t-count = 2.168. Because the t-count > t-table, the null hypothesis (H0) was rejected and the alternative hypothesis (Ha) was accepted.

This means that there is a difference in students' learning achievement with the application of the PjBL learning model in improving critical reasoning and students' learning achievement in PAI and BP subjects in the experimental and control classes.

The results of the Post-Test of the experimental class and the control class were then tested using SPSS. Based on the calculation results, the significance result was 0.037. If the value of Sig. (2-tailed) < 0.05 The value obtained is 0.037 < 0.05, then it can be concluded that there is a difference between the learning achievement in the experimental class and the control class.

The results of the t-test above prove that there is a difference in learning achievement with the application of the PjBL model in PAI and BP subjects in the experimental class, namely class IV, and the application of conventional learning in the control class of PAI and BP subjects in grade IV of SDN Masaran 5.

So, it can be concluded that the application of the PjBL model is more effective in improving critical reasoning and students' learning achievement in PAI and BP subjects.

The Influence of the PjBL Model on Critical Reasoning at SDN Masaran 5

Based on the results of the study, the application of the PjBL model showed a significant increase in students' critical reasoning attitudes from the first cycle to the third cycle. In the first cycle, students' critical reasoning skills were still less than optimal with an average class score of 1.80, which was included in the less critical category. This is due to the implementation of PjBL which has not been maximized because teachers are still in the adaptation stage to this model. However, in the second cycle, the average class score increased to 2.63, indicating that students began to be more actively involved in learning, asking questions, and developing their analytical skills. In the third cycle, the average class score reached 3.41, which is in the very good category, where students can identify problems, formulate hypotheses, and conclude results better.

In addition to improving critical reasoning skills, the application of the PjBL model also has a positive impact on students' responsibilities. This model encourages students to experience the learning process independently, find solutions, and learn from their own experiences. Learners learn to manage time, work together in groups, and take responsibility for the outcomes of their projects. Classroom activities became more dynamic and conducive, with students being more enthusiastic and active in listening to the material, observing problems, and expressing ideas in the form of projects.

The measurement of PjBL effectiveness was carried out through Pre-Test and Post-Test in each cycle, which showed a significant increase in student scores. In the third cycle, most of the students managed to achieve a score above the KKM, with learning completeness reaching 88.88%, far above the set target of 80%. In conclusion, the PjBL model significantly improves students' critical reasoning attitudes and responsibilities, making it an effective model for improving the quality of education, especially in PAI and BP subjects.

The effect of the PjBL model on improving learning achievement at SDN Masaran 5

Based on the results of observation of the application of the PjBL model in PAI and BP learning, it can be seen that teachers have followed the learning plan contained in the teaching module well. Although in the first meeting, there were shortcomings in teacher guidance, especially in helping students observe and reflect on their experiences, in the second and third meetings, all stages of PjBL were well implemented. This has a positive impact on the activities of the learners observed during the learning process, where their engagement increases significantly.

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The observation procedure carried out every five to seven minutes shows that at the first meeting, students are still less actively involved, and learning tends to be dominated by teachers. However, in the second and third meetings, students began to be more actively involved, reducing the dominance of teachers, and their participation was within the ideal period. The student's response to the application of the PjBL model was also very positive, with high enthusiasm for listening to the material, observing problems, and expressing ideas through projects formulated with their group.

The application of the PjBL model not only improves students' understanding of the material, but also develops other important skills such as teamwork, communication skills, and critical reasoning. Students can apply new concepts in their projects, which is proven by excellent results in pre-test and post-test. In addition to supporting academic achievement, PjBL also prepares students with important life skills, making it an effective learning strategy to be applied in PAI and BP learning.

The Effectiveness of The Influence Of The Pjbl Model In Improving Critical Reasoning And Learning Achievement At SDN Masaran 5

Based on data from cycles 1, 2, and 3 as well as learning achievement tests, the PjBL model has proven to be effective in improving students' critical reasoning skills and learning achievement. PjBL encourages learners to be active in the learning process through real projects that are relevant to the subject matter, so that they can identify problems, find solutions, and communicate the results of their work, ultimately honing their critical reasoning skills. In addition, PjBL also has a positive impact on student learning achievement. In contrast to conventional teacher-centred learning, PjBL puts students at the centre of learning, allowing them to apply knowledge in real contexts. This helps students understand the subject matter more deeply and not only memorize the information but also be able to apply it.

Active involvement in PjBL increases learners' motivation to learn, as projects that are relevant to real life make them more enthusiastic about learning. This motivation contributes to an increase in academic achievement, as students are more motivated to achieve good results and show the best performance. Overall, PjBL offers a more interactive and effective learning approach compared to conventional models, preparing learners with strong critical skills and superior academic achievement.

Analysis and Discussion

The implementation of the Project-Based Learning (PjBL) model in Islamic education provides a transformative approach to enhance students' critical reasoning and academic achievement. Unlike traditional learning methods that often emphasize memorization and passive reception of knowledge, PjBL places students at the center of the learning process through active exploration, collaboration, and problem-solving. This student-centred approach aligns well with the goals of the Sustainable Development Goals (SDGs), particularly in fostering quality education, peace, and strong institutions.

The analysis of PjBL's application in the context of Islamic education reveals a significant improvement in students' ability to think critically. By engaging with real-world problems and connecting them to Islamic teachings, students are challenged to analyze, evaluate, and synthesize information from both religious and contemporary perspectives. This cultivates higher-order thinking skills, which are essential in developing a generation that can navigate complex social and moral issues with an Islamic worldview.

Moreover, the discussion shows that PjBL contributes positively to learning achievement. Students become more motivated and responsible for their learning, leading to a deeper understanding of the subject matter and improved academic performance. When projects are designed to reflect the values and objectives of Islam in addressing global challenges outlined in the SDGs—such as environmental care, social justice, and poverty alleviation—learning becomes more meaningful and relevant to students' lives.

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In conclusion, the integration of PjBL in Islamic education enhances both cognitive and affective learning outcomes. It not only strengthens students' academic abilities but also supports the development of character and global awareness, thereby aligning Islamic education with the broader mission of the SDGs.

CONCLUSION

Based on the findings from the implementation of the Project-Based Learning (PjBL) model at SDN Masaran 5, it can be concluded that PjBL significantly enhances both students' critical reasoning skills and learning achievement, particularly in the subjects of Islamic Education (PAI) and Ethics. The structured and well-managed application of the PjBL model not only fosters deeper student engagement but also encourages meaningful learning experiences that go beyond conventional classroom methods. In the context of Islamic education, PjBL empowers students to actively explore and internalize Islamic values through real-life problem-solving, promoting moral development alongside cognitive growth. Moreover, by integrating themes aligned with the Sustainable Development Goals (SDGs), students are guided to connect Islamic teachings with global issues such as social justice, environmental care, and responsible consumption. This approach cultivates a generation of learners who are not only academically competent but also socially conscious and spiritually grounded. Therefore, the PjBL model stands out as an effective and relevant strategy to support the goals of education that harmonize with both Islam and the SDGs. Its implementation should be supported by improved teacher competencies, adequate school facilities, and continuous curriculum evaluation. Future studies are encouraged to further investigate the impact of PjBL across different subjects and educational levels to strengthen its role in advancing sustainable, value-based education.

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Author Contribution

The authors contributed equally to this paper, some are the chairman, member, financier, article translator, and final editor. The authors read and approved the final paper.

Conflicts of Interest

The author declares no conflict of interest.

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