



# Project-Based Learning as a Transformative Pedagogical Strategy for Enhancing Students' Skills and Problem-Solving Competence in Educational Institutions

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## Abstract:

To respond to the challenges of 21st-century education and the Industrial Revolution 4.0, students are required to master higher-order thinking skills, including creativity, collaboration, communication, and problem-solving. This study aims to analyze the implementation of Project-Based Learning (PjBL) in improving students' problem-solving skills within educational institutions. Employing a qualitative approach with a case study design, the research was conducted in two educational institutions with different characteristics. Data were collected through classroom observations, in-depth interviews, documentation, and analysis of students' project work. The validity of the data was ensured through triangulation techniques and informant verification. The findings reveal that the implementation of PjBL significantly enhances student engagement, learning motivation, and collaborative competencies. Furthermore, it fosters a solution-oriented mindset and reflective thinking among students. The integration of Islamic values within project activities makes learning more contextual and meaningful, positively influencing students' attitudes and daily behavior. In addition, teachers demonstrate increased creativity and adaptability in managing student-centered learning environments. Overall, PjBL proves to be an effective pedagogical strategy in improving students' problem-solving skills and aligns well with the principles of the Independent Curriculum. This study contributes practical insights for educators, institutions, and policymakers in designing more relevant, engaging, and value-oriented learning experiences.

## INTRODUCTION

Education is a key pillar in developing high-quality human resources capable of competing in the global era. In the context of Islamic education, improving the quality of learning is not only oriented towards mastering knowledge, but also towards developing students' character and skills. In an increasingly complex world, 21st-century skills such as critical thinking, creativity,

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communication, collaboration, and problem-solving are becoming an urgent need for students to face future challenges.

In Indonesia, efforts to improve the quality of education are ongoing, one of which is through the implementation of the Independent Curriculum, which emphasizes active, student-centered learning. One approach relevant to this curriculum is project-based learning (PjBL). This model provides students with the opportunity to engage directly in the learning process by completing real-world, contextual projects, thereby improving conceptual understanding and problem-solving skills.(Fuadiy, 2023),(Yuliani, 2024).

However, in practice, Islamic Religious Education (PAI) instruction at the Islamic high school (madrasah aliyah) and high school levels still tends to use a traditional, teacher-centered approach. The dominant lecture method results in students being less active and less engaged in the learning process. Yet, PAI plays a strategic role in developing students who are not only intellectually superior but also capable of solving various life problems in accordance with Islamic values.

The implementation of Project-Based Learning (PjBL) is an alternative solution to address these issues. This model places students at the center of learning by engaging them in exploration, collaboration, and the application of knowledge in real-world contexts. In Islamic Religious Education (PAI) learning, Project-Based Learning (PjBL) enables students to internalize Islamic values through projects relevant to everyday life. Furthermore, this approach has been proven to enhance higher-order thinking skills, creativity, and student learning motivation.(Effendi, 2020),(Santoso, 2020).

The need for PjBL implementation is increasingly relevant in the era of the Industrial Revolution 4.0, marked by rapid technological developments. In this era, problem-solving skills are becoming a key competency for graduates. Therefore, innovative and contextual learning is crucial to prepare students to adapt to these changes. (Darwis, 2020).

At MAN 1 Probolinggo and SMA Muhammad Shodiq Maron, the implementation of project-based learning has demonstrated potential in improving students' problem-solving skills. Through contextually designed projects, students not only understand the material theoretically but also gain practical experience that increases engagement and motivation to learn.(Musfiroh, nd).In addition, PjBL also encourages students to be more active, creative, and able to relate knowledge to real situations.

Although various studies have shown that PjBL has a positive impact on student learning outcomes and skills, studies on its application in Islamic Religious Education (PAI) learning at the Islamic high school (madrasah aliyah) and high school levels are still relatively limited. Therefore, this research is crucial to fill this gap.

## RESEARCH METHOD

This research uses qualitative approach by integrating quantitative elements to measure the effectiveness of implementing project-based learning (PjBL) strategies. This approach was chosen to gain an in-depth understanding of the PjBL implementation process, changes in student skills, and their impact on problem-solving abilities. This research was conducted in two or more cycles, each of which consisted of planning, action, observation, reflection, and each cycle aimed to test

the effectiveness of the PjBL strategy and correct deficiencies found in the previous cycle.

This research was conducted at MAN 1 Probolinggo and SMA Muhammad Shodiq Maron, both of which are under the auspices of Islamic boarding schools, but have different environmental characteristics; MAN 1 Probolinggo is outside the Islamic boarding school environment (associated with the Nurul Jadid Islamic Boarding School) so it combines modern formal education with religious values, while SMA Muhammad Shodiq Maron is within the Islamic boarding school environment with a more intense integration of formal and religious education. This difference provides a unique comparison in the application of project-based learning to improve students' problem-solving skills and the integration of Islamic values in different contexts. This research uses a qualitative approach with the researcher as the main instrument (human instrument) whose task is to determine the focus, select informants, collect, analyze, and conclude data, supported by additional instruments such as mobile phones for documentation. Data sources include primary data (interviews with teachers and students) and secondary data (documents, books, journals, and related archives).

Data collection techniques were conducted through naturalistic observation to obtain a real picture of school conditions and learning implementation, mixed interviews (structured and unstructured) to dig for in-depth data, and documentation as a complement in the form of archives, photos, and important notes. Data analysis used the Miles and Huberman model which includes data reduction (sorting and focusing), data presentation in the form of systematic narratives, and verification or drawing conclusions that are continuously tested until the data is saturated. Data validity is maintained through triangulation of sources and methods, member checks with informants, audit trails in the form of complete documentation of the research process, and extension of research time to ensure the data obtained is valid, consistent, and representative.

## RESULTS AND DISCUSSION

### RESULTS

#### Project-Based Learning (PjBL) at MAN 1 Probolinggo and SMA Muhammad Shodiq Maron

The implementation of the Project-Based Learning (PjBL) strategy at MAN 1 Probolinggo and SMA Muhammad Shodiq Maron demonstrates a systematic implementation pattern through six main stages, namely determining essential questions, project planning, investigation and exploration, product creation, presentation, and reflection. At MAN 1 Probolinggo, project-based learning focused on the problem of well water quality in the student dormitory environment. Students actively designed a solution in the form of a simple filtration device based on local materials such as sand, charcoal, and coconut fiber. This process involved repeated experiments, measuring water turbidity levels, and revising the prototype until optimal results were achieved. Meanwhile, at SMA Muhammad Shodiq Maron, the implementation of PjBL was oriented towards environmental issues in the form of reducing plastic waste through a zero-plastic movement based on Islamic values and digital technology. Students conducted waste audits, interviewed canteen managers, and developed various

products such as educational applications, Islamic preaching videos, and digital campaign media.

Student engagement in both contexts demonstrates increased active participation in the learning process. Students not only receive material but are also directly involved in the process of identifying problems, designing solutions, and evaluating results. At MAN 1 Probolinggo, the water filtration experiment demonstrated students' ability to think scientifically and make data-driven decisions. Meanwhile, at SMA Muhammad Shodiq Maron, the use of digital technology in the project demonstrated increased digital literacy and students' communication skills in conveying messages to the public. Thus, the implementation of PjBL not only improves conceptual understanding but also develops collaborative and problem-solving skills in a real-world setting.

Based on data analysis through the stages of open coding, axial coding, and selective coding, three main themes were obtained which describe the research results as follows:

**Table. Thematic Analysis Results**

Selective Theme	Axial Category		Code Example
Environmental problems	Islamic boarding school sanitation; school waste	plastic	Cloudy water causes health problems; Plastic is a source of pollution
Strengthening student skills	Collaboration; Digital Literacy	Iteration;	Changing strategy when failure occurs; Using digital media in projects
Integration of religious values	Cleanliness in Islam; Environmental Ethics		The sanctity of water in worship; Protecting the earth as part of faith

In addition, differences were found in the character of PjBL implementation in the two schools which were influenced by the context of the learning environment.

**Table. Comparison of PjBL Implementation**

Aspect	MAN 1 Probolinggo	Muhammad Shodiq Maron High School
Project type	Water filtration	Zero-plastic campaign
Product	Physical prototype	Digital applications and media
Iteration	± 3 times	≥ 4 times
Approach	Live experiment	Technology and communication
Context	Islamic boarding school	Semi-urban
PAI Integration	Purity of water	Environmental ethics

The research results show that the Project-Based Learning (PjBL) strategy is effective in improving students' problem-solving skills in Islamic Religious Education (ISE). This is evident in the shift in students' learning patterns, from passive to more active, independent, and reflective. Students no longer act merely as recipients of information but become subjects involved in the process of constructing knowledge through direct experience. The process of identifying real-world problems, exploring solutions, experimenting, and reflecting forms a series that continuously develops critical thinking skills.

Furthermore, PjBL has also been shown to develop 21st-century skills such as collaboration, communication, creativity, and digital literacy. In the context of

MAN 1 Probolinggo, students integrated science concepts with religious values related to the sanctity of water in worship, making learning more meaningful and contextual. Meanwhile, at SMA Muhammad Shodiq Maron, students developed communication skills through a digital campaign that combined Islamic values with global environmental issues. This demonstrates that PjBL is able to bridge theoretical knowledge and real-life practice.

### Challenges in Implementing Project-Based Learning

Project-Based Learning (PjBL) is an innovative approach designed to improve students' problem-solving skills through active engagement in authentic tasks. The implementation of PjBL at MAN 1 Probolinggo and SMA Muhammad Shodiq Maron demonstrates a strong commitment from both institutions and teachers to delivering meaningful learning. However, in practice, several structural and cultural challenges affect its effectiveness.

One of the main challenges faced is limited learning time. In the context of Islamic Religious Education (PAI), the relatively limited time allocation (2 x 40 minutes per week) is not fully adequate to support all stages of PjBL, which include problem exploration, data collection, solution development, and product evaluation. At MAN 1 Probolinggo, teachers negotiate with the Islamic boarding school to provide additional time for students, although this often clashes with religious activity schedules. Meanwhile, at SMA Muhammad Shodiq Maron, time optimization is carried out by utilizing Saturdays, although student participation is not yet optimal.

Beyond time constraints, the digital literacy gap also poses a significant challenge. At MAN 1, some students are unfamiliar with collaborative technologies like Google Docs or digital design platforms, requiring intensive teacher support. Conversely, at SMA Muhammad Shodiq Maron, the challenge lies more in information verification skills, with students tending to rely on less credible sources. This prompted teachers to provide Islamic-based digital literacy reinforcement through mini-training on source validity.

Limited local resources and materials also impacted the project's progress. In the water filtration project at MAN 1, students experienced difficulties obtaining materials such as activated charcoal and water quality measuring instruments, necessitating creativity in utilizing alternative sources and cross-laboratory support. Meanwhile, a technology-based project at SMA Muhammad Shodiq faced technical challenges, such as damaged electronic components, which were resolved through cross-subject collaboration with other teachers.

In terms of evaluation, teachers face challenges in implementing comprehensive, authentic assessment. PjBL assessment encompasses not only the final outcome but also the process, collaboration, creativity, and student reflection. This increases teachers' workload, as they must assess various forms of evidence such as reports, products, presentations, and logbooks. Efforts to simplify this process have been made through the development of an assessment rubric, although it remains subjective and requires continuous improvement.

Heterogeneous class dynamics also pose challenges. Differences in student academic abilities, motivations, and character lead to unequal roles within groups. At MAN 1, more dominant students tend to dominate projects, while others become passive. To address this, teachers implement a role rotation strategy.

Meanwhile, at SMA Muhammad Shodiq, the integration of students across majors is leveraged to create complementary collaborations.

Finally, limited policy support also impacts the implementation of PjBL. In Islamic boarding schools like MAN 1, strict administrative procedures often delay project implementation. Meanwhile, at Muhammad Shodiq High School, a policy prohibiting students from using digital devices hindered project documentation, which was addressed through teacher flexibility through the loan of personal devices.

To provide a more systematic overview, the following is a summary of the main challenges in implementing PjBL:

#### **Challenges of Implementing PjBL at MAN 1 Probolinggo and SMA Muhammad Shodiq Maron**

No	Challenge	Description	Solution Strategy
1	Time Limitation	Learning time is not enough for all stages of the project	Additional time outside of class hours, use of holidays
2	Digital Literacy	Technology capability gap and information validation	Technical assistance and digital literacy training
3	Resource	Limited project tools and materials	Cross-stakeholder collaboration and utilization of local resources
4	Authentic Assessment	The complexity of process and product evaluation	Development of a phased assessment rubric
5	Heterogeneous Class	Inequality of student participation in groups	Role rotation and formation of heterogeneous groups
6	Policy Support	School/Islamic boarding school regulations that limit flexibility	Policy negotiation and adaptation of learning strategies

#### **Impact of Project-Based Learning on Student Motivation and Engagement**

The research results show that the implementation of Project-Based Learning has a significant impact on increasing student motivation and engagement holistically, encompassing behavioral, emotional, and cognitive dimensions. This process occurs gradually through student engagement in projects that are contextual and relevant to their lives.

At MAN 1 Probolinggo, a project to create ablution water filters using local materials fostered both religious awareness and environmental awareness. Meanwhile, at SMA Muhammad Shodiq Maron, a digital campaign project focused on the environment encouraged students to integrate Islamic values into creative media. Both projects have been shown to increase students' intrinsic motivation because they have real meaning in their daily lives.

Student engagement is evident in their active participation in project activities, enthusiasm during the learning process, and critical thinking skills in problem-solving. Students are not merely recipients of material but also key actors in the knowledge construction process.

### The Impact of PjBL on Student Motivation and Engagement

Dimensions	MAN 1 Probolinggo	Muhammad Shodiq Maron High School	Field Evidence
Intrinsic Motivation	The need for clean water for ablution	Digital preaching has an impact	Students found the project to be of real benefit
Extrinsic Motivation	“Santri Innovator” Award	Public appreciation through media	Social support increases morale
Behavioral Engagement	Actively participate in additional sessions	Manage your own project schedule	High initiative in group work
Emotional Involvement	Proud of the filtration results	Enthusiastic about media production	Expression of happiness and satisfaction
Cognitive Engagement	Water law analysis	Integration of arguments in content	Improving critical thinking skills

These findings were reinforced by thematic analysis, which revealed the emergence of several key patterns: a sense of project ownership, pride in the work, resilience in the face of failure, and the application of Islamic values in concrete actions. This confirms that PjBL not only improves academic competence but also shapes students' character and reflective awareness. Thus, it can be concluded that project-based learning is an effective and transformative approach to Islamic Religious Education (PAI). When students are confronted with real-world problems and given the space to explore solutions independently, the learning process becomes more meaningful, contextual, and sustainable.

### CONCLUSION

Based on the results of research that has been conducted through a process of data collection, analysis, and in-depth interpretation, it can be concluded that the implementation of the Project-Based Learning (PjBL) strategy at MAN 1 Probolinggo and SMA Muhammad Shodiq Maron was carried out systematically through structured stages, starting from determining essential questions, project planning, implementation, presentation of results, to reflective evaluation. The implementation of this strategy has been proven to be able to encourage active student involvement in Islamic Religious Education (PAI) learning, while developing critical, collaborative, and solution-oriented thinking skills that are an important part of 21st-century competencies. Although in its implementation teachers face various challenges, such as limited learning time, students' digital literacy gaps, limited local resources and materials, complexity in authentic assessment, heterogeneous class dynamics, and limited institutional policy support, research findings show that teachers are able to carry out various forms of adaptation and contextual innovation so that the implementation of PjBL continues to run effectively. Furthermore, project-based learning also has a significant positive impact on increasing students' motivation and involvement in the problem-solving process, which is demonstrated through increased enthusiasm, active participation, and responsibility of students towards the projects they work on, not only in an academic context, but also in the formation

of spiritual and social characters that are more mature and applicable in everyday life.

The implications of this research indicate that the successful implementation of PjBL requires a transformation of the teacher's role from merely delivering material to being an innovative, adaptive learning facilitator capable of guiding students comprehensively through every stage of the project, including designing an authentic evaluation system relevant to real-life contexts. For students, the implementation of PjBL provides a more contextual, applicable, and meaningful learning experience, enabling them not only to understand religious concepts theoretically but also to internalize and implement them in solving various real-world problems based on Islamic values. Meanwhile, for educational institutions, the success of this strategy can serve as a model for developing an independent curriculum oriented towards strengthening character and 21st-century skills, which ultimately contributes to improving the quality of graduates and the competitiveness of educational institutions amidst the challenges of globalization and the ever-growing digital transformation.

As a follow-up to the findings of this study, it is recommended that Islamic Religious Education teachers continue to improve their competencies in designing and implementing project-based learning creatively, innovatively, and collaboratively, through ongoing training and professional discussion forums as a means of sharing good practices. Furthermore, school principals and education policy makers are expected to provide more optimal support, both in the form of flexible policies, the provision of learning facilities and resources, and teacher capacity building programs, so that the implementation of PjBL can run optimally and sustainably. For future researchers, it is recommended to develop further research with a quantitative or mixed-method approach, in order to obtain a more comprehensive picture of the influence of PjBL on student academic achievement and the development of 21st-century skills at various levels of education and a wider range of subjects.

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