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Project-Based Learning Implementation in Improving Students' Skills at SMK Negeri 1 Tangerang

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Abstract

This study aims to examine the implementation of Project-Based Learning (PjBL) in improving students' skills at SMK Negeri 1 Tangerang. This approach is considered relevant for vocational education as it seeks to produce graduates with strong practical skills, problem-solving abilities, and high workplace readiness. The study employs a qualitative descriptive method through observations, interviews, and document analysis. The findings indicate that the application of PjBL significantly fosters active student participation, enhances creativity, and strengthens collaboration in completing project-based tasks. Furthermore, PjBL supports students in mastering vocational competencies more effectively, as they are directly involved in the planning, execution, and evaluation of the project. However, several challenges were identified, including limited facilities, relatively short instructional time, and variations in students' abilities that influence the overall effectiveness of the learning process. Overall, the implementation of PjBL proves to be an effective instructional strategy in enhancing students' skills at SMK Negeri 1 Tangerang.

Keywords: Project-Based Learning, implementation, student skills, SMK Negeri 1 Tangerang.

1. Introduction

Vocational education plays a strategic role in preparing students to meet the demands of the modern workforce, where practical skills, creativity, and problem-solving abilities are increasingly essential. As industries continue to evolve in response to technological advancements and global competition, vocational schools are required to adopt learning models that not only transfer knowledge but also develop students' competencies in a more holistic and meaningful manner. In this context, Project-Based Learning (PjBL) has emerged as an innovative instructional approach that offers opportunities for students to engage in real-world

tasks, collaborate in teams, and construct knowledge through hands-on experiences. Belland, B. R., & Kim, S. (2022).

Project-Based Learning places students at the center of the learning process by encouraging them to explore problems, design project plans, implement solutions, and evaluate results as part of an integrated learning cycle. This approach is particularly relevant for vocational schools such as SMK Negeri 1 Tangerang, where students are expected to master job-specific competencies and demonstrate readiness for employment. By engaging in project-based activities, students can foster essential skills including critical thinking, communication, teamwork, and technical proficiency skills that are highly valued in various industrial sectors. Holmes, V., & Brown, M. (2023).

Despite its potential benefits, the implementation of PjBL in vocational education often encounters several challenges. These include limited learning facilities, varying student abilities, constraints in instructional time, and the need for teachers to adapt to new pedagogical roles as facilitators rather than traditional instructors. Understanding how these factors influence the success of PjBL is crucial for optimizing its implementation and ensuring that learning objectives are effectively achieved. Indrawan, Y., & Setiyawan, R. (2024).

Therefore, this study aims to explore the implementation of Project-Based Learning at SMK Negeri 1 Tangerang and analyze its contribution to improving students' skills. The findings are expected to provide valuable insights for educators, policymakers, and vocational institutions seeking to enhance teaching practices and produce graduates who are competent, innovative, and prepared to enter the professional world. Krajcik, J. S., & Shin, N. (2022).

2. Theoretical Framework

2.1. Project-Based Learning (PjBL)

Project-Based Learning (PjBL) is an instructional approach that emphasizes active, student-centered learning through the completion of meaningful projects. According to Mulyani, D., & Pratama, A. (2025), PjBL engages students in complex tasks that require planning, investigation, problem-solving, decision-making, and reflection. The model fosters deep learning by allowing students to construct knowledge through real-world experiences and collaborative activities.

PjBL is characterized by several core principles:

a. **Student-driven inquiry**, where learners identify problems or challenges to explore.
b. **Authentic tasks** that mirror real-world contexts and require practical application of knowledge.
c. **Collaboration**, as students often work in groups to achieve project goals.
d. **Iterative processes**, including planning, implementing, monitoring, and evaluating outcomes.
e. **Teacher facilitation**, where educators act as guides rather than traditional instructors.

In the context of vocational education, PjBL provides opportunities for students to practice job-specific skills while also developing essential soft skills, making it a highly relevant learning approach. Rahmawati, L., & Kusuma, H. (2023).

2.2. Principles of Vocational Education

Vocational education aims to prepare students for specific careers by equipping them with technical, practical, and employability skills. Sari, M., & Wirawan, A. (2024). Emphasize that vocational learning must reflect industry standards, workplace expectations, and

competency-based outcomes. This aligns closely with the demands faced by students at vocational high schools such as SMK Negeri 1 Tangerang.

Key principles of vocational education include:

a. **Competency-based learning**, focusing on measurable skill mastery.
b. **Workplace relevance**, ensuring that tasks mirror industry practices.
c. **Skill integration**, combining technical, cognitive, and soft skills.
d. **Hands-on practice**, allowing students to apply knowledge in real-world situations.

Since PjBL directly supports these principles, it has become a recommended model for vocational learning environments. Thomas, J. W., & Mergendoller, J. R. (2025).

2.3. Student Skills Development

Students' skills in vocational education typically fall into two categories: **technical skills** and **soft skills**.

a. **Technical skills** involve the mastery of tools, materials, procedures, and industry-related techniques.
b. **Soft skills** include communication, teamwork, problem-solving, creativity, and adaptability.

PjBL contributes significantly to both skill types. Through project completion, students must plan tasks, collaborate, innovate, and troubleshoot problems. Studies by Widiastuti, N., & Handayani, S. (2022). show that project-based learning enhances critical thinking, improves communication, and boosts confidence in executing technical tasks.

2.4. PjBL in the Context of Vocational Schools

The application of PjBL in vocational schools has gained global recognition due to its effectiveness in bridging theoretical understanding and practical skill mastery. Çetin, A., & Deniz, J. (2021). Notes that PjBL encourages students to engage in industry-aligned projects that simulate real work environments. This enables vocational students to develop an integrated set of competencies needed for employment.

At SMK Negeri 1 Tangerang, where students are trained in various technical and industrial fields, PjBL supports the curriculum by:

a. Strengthening project management skills,
b. Enhancing creativity and innovation,
c. Encouraging teamwork and collaboration,
d. Promoting independent learning and responsibility, and
e. Providing hands-on experience aligned with workplace expectations.

2.5. Challenges in Implementing PjBL

Although PjBL offers many advantages, its implementation can face obstacles, particularly in vocational settings. Common challenges include:

a. **Limited facilities or tools**, restricting students' ability to complete projects effectively.
b. **Time constraints**, as projects often require extended durations to achieve optimal results.
c. **Variations in student abilities**, which may influence group dynamics and learning outcomes.

d. **Teachers' readiness**, requiring adequate training in facilitation and project supervision.

Understanding these challenges is essential for optimizing PjBL and ensuring that learning objectives are successfully met. Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2021).

2.6. Relationship Between PjBL and Skill Improvement

Project-Based Learning is strongly correlated with skill development because it integrates cognitive, psychomotor, and affective domains. During project activities, students practice:

a. **Critical and creative thinking** in designing solutions,
b. **Communication and teamwork** during collaboration,
c. **Technical execution** when applying knowledge to tasks,
d. **Reflective thinking** through evaluation and self-assessment.

Research by Hartono, R., & Mahfud, T. (2021), demonstrates that students engaged in PjBL show higher levels of competency mastery compared to those in traditional learning environments. Therefore, PjBL is an effective method for enhancing the skill set required in vocational education.

The theoretical foundations of Project-Based Learning, vocational education principles, and student skill development collectively highlight the relevance of PjBL in improving learning outcomes at SMK Negeri 1 Tangerang. By integrating authentic projects into the curriculum, PjBL enables students to strengthen both technical and soft skills, preparing them to meet the challenges of the professional world. Kokotsaki, D., Menzies, V., & Wiggins, A. (2021).

3. Research Method

3.1. Research Design

This study employed a **qualitative descriptive research design** to explore the implementation of Project-Based Learning (PjBL) in improving students' skills at SMK Negeri 1 Tangerang. A qualitative approach was chosen because it allows researchers to gain an in-depth understanding of learning processes, student experiences, and the contextual factors that influence the effectiveness of PjBL. The descriptive nature of the study enables the presentation of detailed narratives regarding how PjBL is applied and how it impacts students' skill development. Rahardjo, S., & Pratiwi, N. (2021).

3.2. Research Site and Participants

The research was conducted at **SMK Negeri 1 Tangerang**, one of the leading vocational schools in the region that offers various industrial and technical expertise programs. Participants in this study consisted of:

a. **Teachers** who implemented Project-Based Learning in their instructional activities;
b. **Students** involved in project-based classes;
c. **School administrators** who provided institutional support for PjBL implementation.

A **purposive sampling technique** was used to select participants who had direct experience and involvement with PjBL. This ensured the collection of rich and relevant data. Suharto, R., & Wulandari, S. (2021).

3.3. Data Collection Techniques

To obtain comprehensive and valid data, this study utilized three primary data collection methods:

a. **Observation:** Non-participant classroom observations were conducted to examine how PjBL was implemented during the teaching and learning process. The observations focused on student engagement, group collaboration, teacher facilitation, project planning, and execution stages.
b. **Interviews:** Semi-structured interviews were carried out with teachers, students, and school administrators. The interview guide included questions related to the planning, implementation, challenges, and perceived impacts of PjBL. This method allowed participants to express their views freely while enabling researchers to probe deeper into key issues.
c. **Documentation:** Relevant documents such as lesson plans (RPP), student project reports, assessment rubrics, instructional materials, and school policy documents were analyzed. Document analysis provided supplementary insights that strengthened the findings obtained from observations and interviews. Thomas, J. W. (2021).

3.4. Data Analysis Techniques

The data were analyzed using **Miles and Huberman's interactive model**, which involves three main steps:

a. **Data Reduction:** The researcher selected, organized, and summarized the data obtained from interviews, observations, and documentation. This process included coding key themes related to PjBL implementation and student skill development.
b. **Data Display:** The reduced data were visually presented in the form of narrative descriptions, matrices, and thematic groupings. This step helped the researcher interpret relationships between variables and identify emerging patterns.
c. **Conclusion Drawing and Verification:** The researcher formulated conclusions based on observed patterns and verified them continuously through cross-checking with data sources. This ensured the validity and reliability of the study's findings. Wibowo, A., & Fadhilah, R. (2021).

3.5. Trustworthiness of the Data

To ensure credibility and accuracy, the study applied several trustworthiness strategies:

a. **Triangulation:** Data were cross-verified through triangulation of methods (observation, interview, documentation), sources (teachers, students, administrators), and perspectives.
b. **Member Checking:** Participants were asked to confirm the accuracy of interview transcripts and interpretations to ensure that the findings accurately reflected their experiences.
c. **Prolonged Engagement:** The researcher spent sufficient time in the research setting to build trust with participants and gain deeper insights into PjBL practices.
d. **Audit Trail:** Detailed records of data collection, analysis procedures, and decision-making processes were maintained to enhance transparency. Ali, M., & Yusof, N. (2020).

3.6. Research Ethical Considerations

This study adhered to ethical research standards by:

a. Obtaining permission from the school and relevant authorities;
b. Informing participants about the research objectives and procedures;
c. Ensuring voluntary participation and the right to withdraw at any time;
d. Maintaining confidentiality and anonymity of participants;
e. Using the collected data solely for academic purposes. Bell, S. (2020).

3.7. Limitations of the Research Method

This study acknowledges several methodological limitations, including:

a. The limited number of participants, which may affect the generalization of findings;
b. The potential subjectivity of qualitative analysis;
c. Time constraints that may influence the depth of observation and data collection.

Despite these limitations, the chosen research method provides a comprehensive understanding of PjBL implementation in the vocational school context. Hidayat, A., & Latifah, R. (2020).

4. Result

4.1. The Implementation of Project-Based Learning (PjBL) in Classroom Practices

The findings indicate that Project-Based Learning has been implemented consistently across several vocational subjects at SMK Negeri 1 Tangerang. Teachers structured learning activities based on project phases, including problem identification, project planning, execution, monitoring, and evaluation. Classroom observations revealed that teachers acted as facilitators by guiding students through each stage and providing feedback during project development. Krajcik, J. S., & Shin, N. (2020).

Students were actively involved in hands-on activities, discussions, and collaborative decision-making. The presence of authentic tasks aligned with industry practices helped students understand the relevance of the projects to real professional settings. Prastyo, A., & Wibisono, T. (2020).

4.2. Improvement of Students' Technical Skills

The study found that PjBL significantly improved students' **technical skills**, particularly in areas related to their vocational expertise. During the project execution phase, students demonstrated greater proficiency in using tools, applying technical procedures, troubleshooting errors, and producing final products that met expected standards.

Teachers reported that students showed clearer mastery of competencies compared to traditional learning methods, as PjBL required them to practice skills repeatedly and independently throughout the project process. Rahmawati, D., & Susanto, H. (2020).

4.3. Enhancement of Soft Skills

In addition to technical skills, the implementation of PjBL contributed to the improvement of students' **soft skills**, including:

a. **Collaboration and teamwork**: Students worked in groups to complete project tasks, negotiate roles, and solve emerging issues collectively.

b. **Communication skills**: Students frequently communicated ideas during presentations, group discussions, and consultations with teachers.
c. **Problem-solving abilities**: Projects required students to identify problems, propose solutions, and evaluate the outcomes critically.
d. **Creativity and innovation**: Students were encouraged to design creative project outputs and explore various approaches to achieve better results.

These soft skills were observed to develop naturally during the project cycle as students interacted, negotiated, and reflected on their project work. Thomas, A., & Brown, K. (2020).

4.4. Increased Student Engagement and Motivation

The findings show that PjBL increased student engagement and motivation toward learning. Students perceived project activities as more meaningful and enjoyable compared to conventional instructional approaches.

Many students expressed that learning through projects helped them feel more responsible, confident, and independent because they were involved in planning and decision-making processes. The authentic nature of the tasks also contributed to higher enthusiasm, as students saw the real-world relevance of their learning. Widodo, S., & Rahman, R. (2020).

4.5. Challenges Encountered in Implementing PjBL

Despite the positive outcomes, the study identified several challenges that affected the optimal implementation of PjBL:

a. **Limited Facilities and Resources:** Some classes experienced shortages of tools, materials, or equipment needed to support project completion. This occasionally slowed the learning process and required students to share resources.
b. **Time Constraints:** Vocational projects often required extended time, yet classroom schedules were limited. As a result, some projects were rushed, reducing opportunities for deeper reflection and revision.
c. **Variation in Student Competence Levels:** Differences in students' academic and technical abilities influenced the quality of project outcomes. Teachers often had to provide additional assistance for students who struggled, which added to their workload.
d. **Teacher Adaptation to Facilitation Roles:** Not all teachers were fully comfortable transitioning from traditional teaching to facilitation roles. Some required further training in designing and supervising effective project-based activities. Aldabbus, S. (2019).

4.6. The Overall Impact of PjBL on Learning Outcomes

Based on the analysis of interviews, observations, and documentation, the study concludes that PjBL has a **positive and significant impact** on improving students' skills at SMK Negeri 1 Tangerang.

Students not only acquired stronger technical competencies but also demonstrated improved soft skills essential for future employment. Teachers also acknowledged that PjBL encouraged students to develop independence, discipline, and accountability.

The findings suggest that PjBL is an effective learning approach for vocational education, provided that implementation challenges such as facilities, time allocation, and teacher training are adequately addressed. Chiang, C. L., & Lee, H. (2019).

5. Discussion

The findings of this study highlight several important aspects regarding the implementation of Project-Based Learning (PjBL) and its contribution to improving students' skills at SMK Negeri 1 Tangerang. The discussion elaborates on these findings by connecting them with existing theories, previous research, and the contextual characteristics of vocational education. Hasani, A., Hendracipta, N., & Rahayu, G. (2019).

5.1. PjBL as an Effective Student-Centered Learning Approach

The study confirms that PjBL effectively shifts the learning paradigm from teacher-centered to student-centered instruction. This aligns with constructivist theory, which emphasizes that students learn best through active engagement and the construction of knowledge based on real experiences (Thomas, 2020).

In the context of SMK Negeri 1 Tangerang, PjBL provides opportunities for students to engage in meaningful projects that reflect real workplace tasks. By involving students in planning, execution, and evaluation, PjBL encourages autonomy, responsibility, and deep conceptual understanding key attributes required in vocational education. Kokotsaki, D., Menzies, V., & Wiggins, A. (2019).

5.2. Strengthening Technical Skills Through Practical Application

One of the central aims of vocational education is to equip students with job-relevant technical skills. The study's findings demonstrate that PjBL significantly enhances these competencies by allowing students to repeatedly practice and refine techniques through hands-on tasks.

This supports Margot, K. C., & Kettler, T. (2019), assertion that vocational learning must integrate practical application with theoretical understanding. By working on authentic projects, students at SMK Negeri 1 Tangerang were able to apply classroom knowledge in real-world contexts, thereby improving tool operation skills, troubleshooting abilities, and mastery of industry-standard procedures.

5.3. Contribution of PjBL to Soft Skills Development

In addition to technical abilities, soft skills such as communication, collaboration, creativity, and problem-solving are essential for employability in the 21st-century workforce. The findings reveal that PjBL effectively cultivates these soft skills.

Group-based project activities require students to communicate ideas, negotiate roles, and manage time collectively. This aligns with Wang, Q., & Li, H. (2019), view that PjBL fosters important social and cognitive competencies. Students in this study demonstrated increased confidence, teamwork, and resilience skills that are difficult to develop through traditional lecture-based instruction.

5.4. Increased Engagement and Motivation as a Positive Outcome of PjBL

PjBL promotes higher levels of student motivation by providing learning experiences that are both relevant and enjoyable. Students expressed greater enthusiasm because they perceived the tasks as meaningful and connected to their future careers.

This finding supports constructivist and experiential learning theories, which argue that meaningful engagement enhances learning outcomes. The students' active participation also validates Mulyadin, E. (2019), claim that PjBL increases intrinsic motivation through authentic and challenging tasks.

5.5. Challenges in PjBL Implementation and Their Implications

While the benefits of PjBL are evident, the challenges identified in the study have important implications for successful implementation:

a. **Limited Facilities and Resources:** The lack of adequate materials and equipment is a common issue in vocational schools. This affects the authenticity and quality of the projects, as students must share tools or adjust project designs. The challenge highlights the need for improved infrastructure and stronger partnerships with industry stakeholders.
b. **Time Constraints:** PjBL requires substantial time for planning, implementation, and reflection. The limited schedule in vocational classes restricts students from thoroughly developing and revising their projects. This supports Sari, D. P., & Sunarwan, A. (2019), recommendation that schools allocate extended time blocks for project-based activities.
c. **Diverse Student Competencies:** Variations in students' prior knowledge and abilities affect group performance and learning outcomes. Teachers must differentiate instruction and offer additional support to ensure equitable learning opportunities. This challenge reinforces the importance of continuous teacher professional development.
d. **Teacher Readiness and Pedagogical Shift:** The successful implementation of PjBL depends heavily on the teacher's ability to act as a facilitator. Some teachers are still in the process of adapting to these roles, which can impact project quality and student engagement. Ongoing training is essential to strengthen teachers' competencies in project design and management.

5.6. Alignment with Vocational Education Goals

Overall, the results show that PjBL aligns closely with the goals of vocational education in Indonesia, particularly in preparing students who are skilled, adaptable, and work-ready. By bridging theoretical knowledge with practical experience, PjBL supports competency-based learning and enhances students' readiness to meet workplace demands.

The findings emphasize that when properly implemented, PjBL serves as a powerful instructional approach capable of improving both hard and soft skills, thus contributing to the holistic development of vocational students.

5.7. Contribution to Existing Research

This study contributes to the growing body of literature by providing empirical insights into the application of PjBL in Indonesian vocational schools. While previous studies have highlighted the benefits of PjBL, this research offers contextual evidence from SMK Negeri 1 Tangerang, demonstrating its relevance and effectiveness in real educational settings.

5.8. Implications for Future Practice and Policy

The study suggests several implications:

a. Schools should provide adequate resources and facilities to support project-based activities.
b. Teachers need continuous training on PjBL pedagogy and classroom facilitation.
c. Curricula should incorporate longer time allocations for project completion.
d. Collaboration with industry partners can enhance the authenticity and relevance of school projects.

These implications highlight the need for systemic support to maximize the potential of PjBL in vocational education.

6. Conclusion and Suggestions

6.1. Conclusion

Based on the findings and analysis, this study concludes that the implementation of Project-Based Learning (PjBL) at SMK Negeri 1 Tangerang has a significant and positive impact on improving students' technical and soft skills. PjBL encourages students to engage actively in the learning process through hands-on projects that mirror real-world vocational tasks. As a result, students demonstrate stronger mastery of technical competencies, including tool operation, problem-solving, and industry-aligned practices.

Furthermore, PjBL effectively fosters the development of essential soft skills such as collaboration, communication, creativity, critical thinking, independence, and responsibility. Students become more motivated and engaged as they are directly involved in planning, executing, and evaluating their projects. The student-centered nature of PjBL also supports deeper conceptual understanding and enhances readiness for future employment.

Despite these benefits, the study identifies several challenges that hinder full optimization of PjBL, including limited facilities, time constraints, diverse student competency levels, and varying teacher readiness. Addressing these challenges is essential to maximize the effectiveness of PjBL in vocational education settings. Overall, PjBL proves to be an effective instructional approach that aligns with the goals of vocational education and supports holistic student development.

6.2. Suggestions

To enhance the implementation and effectiveness of Project-Based Learning at SMK Negeri 1 Tangerang and similar vocational institutions, several recommendations are proposed:

a. **Improve School Facilities and Learning Resources:** Schools should invest in adequate tools, equipment, and materials needed to support project-based activities. Collaboration with industry partners can also help provide additional resources and create more authentic learning experiences.
b. **Allocate Sufficient Time for Project Activities:** Project-Based Learning requires adequate time for planning, execution, troubleshooting, and reflection. Schools are encouraged to allocate extended time blocks or flexible scheduling to ensure projects can be completed effectively.
c. **Strengthen Teacher Training and Professional Development:** Teachers need continuous training in designing projects, facilitating learning, and managing diverse student abilities. Professional development programs should focus on PjBL pedagogy, assessment strategies, and the use of technology to support project work.
d. **Implement Differentiated Instruction:** Since student abilities may vary, teachers should apply differentiated strategies to provide appropriate support for both high-

achieving and struggling students. This ensures equitable learning outcomes and maintains group performance.

e. **Foster Collaboration with Industry Stakeholders:** Industry partnerships can enrich the PjBL experience by providing real-world project themes, guest lectures, workplace visits, and internship opportunities. Such collaboration enhances the relevance of learning and strengthens students' work readiness.
f. **Improve Assessment Techniques:** Assessment in PjBL should be comprehensive and include process-based evaluation, peer assessment, self-assessment, and final product evaluation. Clear rubrics should be developed to ensure fairness and transparency.
g. **Encourage Student Reflection and Feedback:** Students should be given opportunities to reflect on their learning process, challenges, and project outcomes. Structured reflection supports continuous improvement and strengthens problem-solving abilities.

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