IMPLEMENTATION OF PROJECT-BASED LEARNING TO IMPROVE STUDENT COMPETENCE AT VOCATIONAL HIGH SCHOOL

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Field Code Changed

Abstract. *Quality education is essential to create a generation that can compete on a global level. Vocational education, in particular, plays a role in preparing a ready-made workforce. Vocational education in Indonesia still faces challenges, one of which is the inadequate quality of graduates according to the industry. Innovation in learning methods is needed, and project-based learning (PJBL) is considered effective in improving student competence. This study aims to provide an empirical or picture that PJBL can be implemented well and can improve the quality of student competence in every vocational education institution, with a focus on SMK Muhammadiyah 7 Gondanglegi. The location selection is based on information that the institution has successfully implemented the industrial PPA program. This research uses qualitative methodology with case study technique combined with positivistic paradigm. Inductive data analysis was conducted through data reduction, data visualization, conclusion drawing, and verification.The results showed that PJBL at SMK Muhammadiyah 7 Gondanglegi was effective in improving students' competencies and skills. The implementation of a curriculum that is aligned with industry through cooperation with PT Astra Daihatsu Motor ensures the relevance of education to industry needs. PJBL emphasizes productive education that includes improving hard skills and soft skills, and involves students in real projects that combine theory and practice.*
Keywords. *Implementation; Curriculum; Project Based Learning; PK Vocational School*

Abstract.
Pendidikan berkualitas sangat penting untuk menciptakan generasi yang mampu bersaing di tingkat global. Pendidikan vokasional atau kejuruan, khususnya, berperan dalam menyiapkan tenaga kerja siap pakai. Pendidikan SMK di Indonesia masih menghadapi tantangan, salah satunya adalah kualitas lulusan yang kurang memadai menurut industri. Inovasi dalam metode pembelajaran diperlukan, dan pembelajaran berbasis proyek (*Project-Based Learning*/PJBL) dianggap efektif dalam meningkatkan kompetensi siswa. Penelitian ini bertujuan untuk memberikan empiris atau Gambaran bahwa PJBL dapat diimplementasikan dengan baik serta dapat meningkatkan kualitas kompetensi siswa di setiap lembaga pendidikan kejuruan, dengan fokus pada SMK Muhammadiyah 7 Gondanglegi. Pemilihan lokasi didasarkan pada informasi bahwa lembaga tersebut telah berhasil menjalankan program PJBL industri. Penelitian ini menggunakan metodologi kualitatif dengan teknik studi kasus yang dipadukan dengan paradigma positivistic. Analisis data induktif dilakukan melalui reduksi data, visualisasi data, pengambilan kesimpulan, dan verifikasi. Hasil penelitian menunjukkan bahwa PJBL di SMK Muhammadiyah 7 Gondanglegi efektif dalam meningkatkan kompetensi dan keterampilan siswa. Implementasi kurikulum yang diselaraskan dengan industri melalui kerja sama dengan PT Astra Daihatsu Motor memastikan relevansi pendidikan dengan kebutuhan industri. PJBL menekankan pendidikan produktif yang mencakup

peningkatan h*ard skill* dan *soft skill*, serta melibatkan siswa dalam proyek nyata yang memadukan teori dan praktik.
Kata Kunci. *Implementasi; Kurikulum; Pembelajaran Berbasis Project; SMK PK*

A. INTRODUCTION

Vocational High Schools (SMK), has a strategic role in generating competent human resources for professional sphere (Irianto, 2017). The competence of SMK students is the main indicator of the success of vocational education, as they are expected to be able to integrate theoretical knowledge with relevant practical skills (Arifin et al., 2022; Maki et al., 2022). According to the data from the Central Bureau of Statistics (BPS) in 2023, the unemployment rate of SMK graduates is still quite high, reaching 8.49%, greater than graduates of other education levels (Badan Pusat Statistik, 2023). These statistics has shown that there is a gap between the competencies mastered by SMK students and the needs of the industrial world. Previous research, such as that conducted by Suwandi, (2020); Widodo et al., (2023); Yani et al., (2020), confirms that developing the competencies of vocational students requires an innovative and contextual learning approach to bridge this gap. In addition, Abdillah & Puspitasari, (2025); Islamiah et al., (2022) also highlighted the importance of collaboration between education and industry in designing a relevant curriculum.

One learning approach that is considered effective in improving student competencies is Project-Based Learning (PjBL) (Almulla, 2020). This method focuses on providing real projects that are relevant to the professional sphere, allowing students to develop technical and soft skills and simultaneously. According to Islawati & Samsuddin, (2024), PjBL has the potential to increase student engagement, problem-solving skills, and critical thinking ability. In addition, this method also encourages students to learn independently and collaboratively, which are essential skills in the modern professional sphere. In the context of vocational education, PjBL provides learning experiences that are relevant to real time situations in the professional world, so that students can be well prepared to face the existing challenges (Mardiyanti & Mantra, 2022).

Research conducted by Susanti, (2023) shows that the application of Project-Based Learning (PjBL) at SMK PK (Pusat Keunggulan) has a significant effect on improving student competence, especially in the aspect of working skills. This study was conducted at SMK PK in the field of engineering, with the results that revealed that PjBL was not only able to improve students' technical abilities but also soft skills such as communication, teamwork, and problem solving. This idea is in line with the objectives of SMK PK as an institution designed to generate work-ready graduates with competencies that are in line with industry needs.

Another study by Sunardi et al., (2024) has highlighted that the implementation of PjBL in expertise programs at SMK PK can integrate curriculum materials with real-world challenges. This study was conducted through

collaboration between teachers, students, and industry partners in relevant projects, such as product design and business simulation. As a result, students can produce innovative products that are economically valuable and relevant to market needs. In addition, the study underlined the importance of the teacher's role as a facilitator in the project-based learning process, which directly influences the success of PjBL implementation in the SMK PK.

Project-based learning emphasizes the active involvement of students in completing real projects that are relevant to the industrial world. Through PJBL, students are expected to learn through hands-on experience, develop practical skills, and improve problem solving abilities Hsiao et al., (2022). This approach also fosters critical thinking, teamwork, and effective project management among students Wiyono, (2014). Therefore, PjBL may be a useful way to address some of the problems currently faced by the vocational school system in Indonesia. The implementation of PjBL in SMK PK (Pusat Keunggulan) is a strategic step in an effort to improve student competencies (Minan & Ekohariadi, 2022; Nurhidayati, 2024). SMK PK (Pusat Keunggulan) is a school that has been designated by the government as a center of excellence with the output of becoming a model for other schools. SMK PK is expected to be able to implement PJBL and other cutting-edge teaching strategies through this program, thus improving student achievement and generating competent and well- ready graduates for the professional world (Telaumbanua et al., 2024). The implementation of PJBL at SMK PK not only aims to improve students' technical skills, but also to develop non-technical skills that are highly needed in the professional spheres, such as communication skills, cooperation, and time management (Sardi et al., 2024; Sulistyani & Rustyningsih, 2024).

Although many studies support the effectiveness of PjBL in improving student competence, there are results that show variations on its success. Research conducted by Arifa et al., (2018) showed that the implementation of PjBL in SMK increased students' technical competence by 25%. This is in line with Ahwan et al., (2023) which found that students who learned using PjBL showed significant improvements in analytical and collaboration skills. However, research by Dewi Anggraini & Sri Wulandari, (2021); Sugiyanto et al., (2020) found that the implementation of PjBL did not have a significant impact on student competence in some vocational schools that lacked supporting facilities. This variation in results suggests that there are certain factors that influence the effectiveness of PjBL, such as teacher readiness, school facilities, and student characteristics. Therefore, further research is needed to explore the conditions and strategies that can optimize the implementation of PjBL in vocational schools.

This study chose SMK Muhammadiyah 7 Gondanglegi as the research object. This school is unique because it has implemented an industry-based curriculum by involving cooperation partners from various sectors, such as automotive, information technology, and hospitality. The school's strategic geographical location is also an advantage, as it provides easy access for students to engage directly with the industrial world. However, despite these advantages, SMK Muhammadiyah 7 Gondanglegi still faces challenges in improving student competencies evenly. Based on initial interviews with several teachers at SMK Muhammadiyah 7 Gondanglegi, the PjBL method has begun to be implemented, but it is not maximized because it is

still around 75% but overall, it has had a positive impact on student competence. In addition, Mr. Ahmad revealed that the challenges faced by SMKs in implementing PjBL are major. One of the main challenges is the limited facilities and resources and it is experienced by all vocational schools. Many vocational schools still lack adequate infrastructure to facilitate efficient teaching, such as industry.

This research, hence, contributes to provide an in-depth analysis of the effectiveness of PjBL in improving student competencies at SMK Muhammadiyah 7 Gondanglegi, and also identifying supporting and inhibiting factors. This research is expected to provide practical recommendations for schools and stakeholders in developing more effective learning strategies. In addition, this research can also be a reference for other schools that want to implement PjBL in improving student competencies. Thus, this research not only contributes to improving the quality of education at SMK Muhammadiyah 7 Gondanglegi, but also to the development of vocational education more broadly.

The novelty of this research lies in the study location at SMK Muhammadiyah 7 Gondanglegi, which has a unique advantage because it focuses on developing student competencies in the Light Vehicle Engineering (TKR) department. Another advantage is the strategic partnership with Astra Daihatsu, a leading automotive company that provides practical support in the form of training, industry-based curriculum development, and practical facilities relevant to the recent technology. This research also offers a new contribution by analyzing how collaboration between vocational education institutions and large companies such as Astra Daihatsu can optimize the quality of competent graduates in the professional world.

This research explores the implementation of industry-based learning strategies at SMK Muhammadiyah 7 Gondanglegi, including its impact on improving students' skills, curriculum relevance, and work readiness. Thus, the results of this study are expected to be a reference for other schools in developing similar cooperation patterns to create graduates who are competent and in accordance with the needs of the manpower. This novelty reinforces the importance of collaboration between education and industry in supporting the strengthening of vocational education. This research also emphasizes on the adaptation of PjBL according to local needs, which is often ignored in previous research. Thus, this research offers a new perspective on how adaptable PjBL according to the characteristics and specific needs of schools.

Based on this background, the research question posed in this study is How is the implementation of Project-Based Learning (PjBL) method in SMK Muhammadiyah 7 Gondanglegi?

B. RESEARCH METHODS

This research uses Qualitative methods with a case study approach at SMK Muhammadiyah 7 Gondanglegi with descriptive data exposure. Because the purpose of this research is to fully understand the phenomenon from the participants' point of view, the technique used is qualitative (Gunawan, 2022; Gunawan et al., 2017). Qualitative research allows researchers to explore the meanings, experiences, and perspectives of research subjects in their natural context (Saldana, 2014; Saldaña, 2021; Saldaña & Omasta, 2016). Through these method and approach, researchers can better

capture the complexity of the phenomenon being studied. Case study was used as the research design.

The case study in this research focuses on an in-depth understanding of the implementation of school programs at SMK Muhammadiyah 7 Gondanglegi and its impact on the quality of education and student development. This case study approach allows the exploration of various aspects of a complex phenomenon, including the social, cultural and organizational contexts that influence the school (Jesionkowska et al., 2020; Yuanita et al., 2020). Research informants include teachers as learning facilitators, public relations as part of the school in charge of communicating with the industry, the vice principal in the curriculum affairs, who is mandated for additional duties to assist the principal in managing the academic field at SMK Muhammadiyah 7 Gondanglegi. Data collection techniques include documentation, interviews with informants, and observation (Maisyaroh et al., 2021; Sarosa, 2021). Teaching and learning activities and interactions in the school were observed directly through observation and further information regarding the experience of teachers, public relations, and the head of curriculum affairs on the implementation of school programs was obtained through in-depth interviews. Documentation involved collecting documents related to school activities such as learning processes and activity reports.

Data analysis for this study was conducted inductively using procedures including data reduction, data visualization, conclusion drawing, and verification (Saldana, 2014). Data reduction aims to identify relevant and important information, while the reduced data is presented in the form of matrices, tables or diagrams to facilitate analysis. Conclusions were drawn based on the patterns and themes found, and then verified to consider the validity and reliability of the findings. To ensure the validity and reliability of the data, this study used strategies such as triangulation, member check, and audit trail.

C. RESULTS AND DISCUSSION

RESULTS

The results of observations made on March 04, 2024 show that the location of the implementation of Project-Based Learning (PjBL) in the Automotive Light Vehicle Engineering department at SMK Muhammadiyah 7 Gondanglegi is known as DOJO. This term was given directly by Astra Daihatsu as a strategic partner of the school in supporting the development of student competencies. DOJO functions as a practice room designed to resemble the working environment of the automotive industry, complete with modern facilities and equipment in accordance with Astra Daihatsu standards. The existence of DOJO not only provides an authentic learning experience for students, but also supports the application of project-based learning methods that are relevant to the needs of the professional world. This reflects the strong synergy between SMK Muhammadiyah 7 Gondanglegi and Astra Daihatsu in improving the quality of vocational education.

Figure 1.1 Project-based learning at the DOJO location

Project-based learning in the Automotive Light Vehicle Engineering (TKRO) department at SMK Muhammadiyah 7 Gondanglegi emphasizes the development of students' practical skills. Utilizing a curriculum that has been adapted to the industry curriculum and the Ministry of Vocational Education, this method incorporates real-world applications relevant to the industrial sector. Students learn engine theory and vehicle maintenance through real-world projects starting in grade ten. Competency targets include servicing vehicles with a distance of 10.000 kilometers for grade ten, 20.000 kilometers for grade eleven, and 30.000 kilometers for grade twelve. This approach assists students in measuring their progress as well as developing relevant practical skills. The educational program in the department of Automotive Light Vehicle Engineering (TKRO) is formed together with industry, especially PT Astra Daihatsu, which includes industrial internship programs, industrial certification, as well as competitions to train students' skills. the statement was conveyed directly by the Head of Curriculum affairs, Mr. Martono, ST.

Figure 2.1 implementation of Project-based learning

According to Mr. Ahmad Muhtadi, S.Pd. SMK Muhammadiyah 7 Gondanglegi in general has met the eight educational standards set by the government. One of the efforts to improve student skills is through the DOJO in the TKR department, where students train their hard skills and soft skills to elevate competent services. The DOJO supports innovation and creativity, helping students generate effective and efficient solutions to problems. The facilities in the DOJO have been met according to the quality standards of the World of Business and Industry (DUDI), with significant improvements after the collaboration with PT Astra Daihatsu in 2017. Adequate facilities facilitate the educational process and equip students to confidently face the demands of the professional world. The provision of the latest equipment and technology at DOJO TKR allows students to learn and practice with tools that are in line with industry standards. The cooperation with PT Astra Daihatsu also includes knowledge transfer and training

from experts to teachers and instructors, improving their teaching competence. SMK Muhammadiyah 7 is committed to improving the quality of vocational education, which is expected to have a positive impact on students, schools, and the automotive industry as a whole. Through the fulfillment of facilities according to DUDI standards and cooperation with industry, SMK Muhammadiyah 7 continues to strive to generate competent graduates for their readiness in the global job market.

The results of the interview with Mr. Drs. Alip Supriyadi, M.M., one of the Light Vehicle Engineering (TKR) teachers, revealed that the main challenge faced in the implementation of learning is the lack of time effectiveness. According to him, the available time allocation is sometimes insufficient to complete all stages of project-based learning, especially when students are involved in practical activities in the DOJO that require attention to detail and high precision. However, this challenge can still be overcome through more flexible scheduling and good coordination between teachers and students. Adequate facilities and high student motivation are supportive factors in completing projects optimally despite time constraints.

Mr. Drs. Alip Supriyadi, M.M., Mr. Martono, ST, explained in detail the implementation process of Project-Based Learning (PjBL) at SMK Muhammadiyah 7 Gondanglegi, particularly in the Automotive Light Vehicle Engineering department. This process begins with project planning, where the teacher determines topics relevant to the basic competencies, such as machine maintenance or electrical systems. After that, students are divided into working groups to enhance their collaboration skills, and together with the teacher, they set learning objectives and the expected final product. This stage ensures that the project has a clear direction and is relevant to industry needs. At the preparation stage, students are given an understanding of the technical problems that need to be solved and conduct research to gather supporting information. Then, the project is carried out through the stages of design, implementation, and monitoring by the teacher as a facilitator. This process concludes with evaluation and reflection, where students present the project results, such as the repaired vehicles, and receive assessments from the teacher based on technical criteria and work processes. A joint reflection is conducted to identify the strengths and weaknesses of the project. The project results are often used as further learning materials, such as student portfolios or preparations for competitions and industry certifications, which contribute to the improvement of the quality of education at SMK Muhammadiyah 7 Gondanglegi.

DISCUSSION

The implementation of Project-Based Learning (PjBL) in the Automotive Light Vehicle Engineering department at SMK Muhammadiyah 7 Gondanglegi through the DOJO facility has become one of the flagships learning models that brings students closer to the needs of the automotive industry. DOJO, which is the name of the learning location resulting from a strategic collaboration with Astra Daihatsu, is designed to resemble a real professional environment in the industry. The existence of DOJO not only serves as a practice space, but also as a platform for the integrated development of students' competencies, combining both hard skills and soft skills. The availability of adequate facilities and industry standards enables students to develop technical skills while also fostering creativity and the ability to solve problems independently.

The implementation of PjBL at SMK Muhammadiyah 7 Gondanglegi has several significant advantages. One of the important innovations is the adjustment of the curriculum designed to align with industry standards and vocational education policies. Students from the 10th grade are already involved in real projects, such as periodic vehicle servicing based on kilometers. This project is staged according to the educational level, so students' competencies develop progressively. The learning stages that begin with theoretical concepts and progress to hands-on practice in industry-standard facilities equip students with authentic experiences and readiness to face challenges in the workforce.

The partnership with Astra Daihatsu strengthens the relevance of the learning experience. Not only does it include complete DOJO facilities, but this collaboration also encompasses teacher training, industry certification, and knowledge transfer from experts. Thus, educators are able to provide high-quality guidance that meets the needs of the business and industrial world. (DUDI). Modern facilities such as advanced vehicle service tools and the latest vehicle diagnostic technology are important elements in supporting learning at DOJO. This is in line with the research findings of Yoto et al., (2024), which show that collaboration between schools and industry can improve vocational students' skills by up to 40% better than conventional learning models.

The process of implementing PjBL involves careful planning. The teacher determines the project topic according to basic competencies, such as machine maintenance and vehicle electrical systems, and then forms work groups to enhance students' collaboration skills. Next, students conduct technical research as the basis for project implementation. This approach creates solution-oriented learning, where students not only understand the theory but also apply it directly. According to Pratiwi et al., (2024), project-based learning methods relevant to the workforce can increase students' confidence and independence, especially when students are given full responsibility for the success of their projects.

The implementation of PjBL at SMK Muhammadiyah 7 Gondanglegi also encounter challenges, particularly related to time allocation. Practical activities that require high precision often take longer than the available learning duration. Nevertheless, this challenge can be overcome through flexible scheduling and intensive communication between teachers and students. Adequate facility support and high student motivation are the main factors that contribute to the optimal completion of the project. Similar findings were reported by Belwal et al., (2020), who mentioned that good time management and adequate facilities can reduce the barriers to implementing project-based learning.

One important aspect of the DOJO learning model is the evaluation and reflection after the project is completion. Students present their work and receive direct feedback from the teacher based on technical criteria and work processes. Joint reflection allows the identification of the project's weaknesses and strengths, which serve as learning materials for the next project. The projects produced are often used as student portfolios, competitions, or certifications, which add value for the professional world preparation. This strategy has proven effective results, as reported by Oktafianto, (2024), that students engaged in reflective evaluation improvement in analytical skills compared to students who only underwent conventional evaluation.

The implementation of Project-Based Learning (PjBL) abroad, such as in Finland and Germany, has become an integral part of vocational education oriented on the development of students' practical skills. In Finland, PjBL is applied by integrating real projects based on modern technology that involves collaboration between schools, industry, and the local community (Mielikäinen, 2021). Meanwhile, in Germany, the dual system concept combines classroom learning and intensive work practice in the industry (Yang et al., 2023). Both approaches emphasize authentic learning experiences that are relevant to the needs of the professional world. A similar implementation can be seen at SMK Muhammadiyah 7 Gondanglegi through the DOJO facility, where students practice theory on real projects that meet industry standards. With the support of Astra Daihatsu, DOJO has become a learning space that resembles a professional environment, promoting a strong connection between learning and the needs of the automotive industry, in line with global practices that equip students to compete in the international job market.

D. CONCLUSION

The implementation of Project-Based Learning (PjBL) in the Automotive Light Vehicle Engineering department at SMK Muhammadiyah 7 Gondanglegi through DOJO facilities has become an effective learning model in bridging the gap between education and industry needs. Strategic collaboration with Astra Daihatsu, industry-based curriculum adjustments, and modern facilities that meet DUDI standards provide authentic and relevant learning experiences for students. Although several challenges exist, such as time constraints, availability in schedule management and limited adequate facilities that support allow students to remain optimal in completing projects. Reflective evaluation and collaborative approaches not only enhance students' technical competencies but also their critical thinking, innovation, and adaptability skills. This model demonstrates the great potential of vocational education in producing competent, highly competitive graduates, who are ready to contribute to the global workforce.

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