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Teaching Factory Management Strategy on Light Vehicle Engineering Expertise Competency in SMK Muhammadiyah Mungkid

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ABSTRACT

Teaching factory is a learning model that integrates theoretical and practical learning processes in schools by creating conditions that resemble the industrial world. The purpose of this study is to provide an overview of the teaching factory management strategy for light vehicle engineering expertise competencies at SMK Muhammadiyah Mungkid in improving students' competency and work readiness. This study uses a qualitative approach with a case study model with sources including the principal, vice principal for curriculum, head of teaching factory and industry partners. Data sources are taken from in-depth interviews, observations and analysis of learning administration documents. To validate the data used by comparing one source with another then comparing the results of the interview and data obtained from the results of the document review. The results of the study indicate that teaching factory management carried out with the stages of planning, organizing, implementing, effective and efficient supervision, through the integration of link and match learning involving industry partners in implementing a learning environment that is in accordance with industry standards, has been proven to improve students' competency and work readiness.

Keywords: Management, Teaching Factory, Student Competence, Vocational High School

INTRODUCTION

Vocational High School (SMK) is an education that aims to produce graduates who are ready to enter the world of work with relevant technical competencies. SMK has a strategic role in preparing a workforce that has skills that are in line with industry needs. SMK is designed to support vocational education that focuses on practical skills rather than theory, so that students can work immediately after graduation. Then of course this role becomes very important in increasing the competitiveness of students in the increasingly competitive world of work [1][2][3].

SMK faces great challenges in aligning the curriculum with the evolving needs of the industry, these challenges include the readiness of educational institutions in providing adequate facilities, teacher competence in teaching current skills, and collaboration with industry to provide real learning experiences for students [4][5][6]. These challenges require vocational education institutions, especially SMK, to continuously improve the quality and relevance of educational programs in order to produce graduates who are ready to compete in the job market. SMK student competencies include specific technical abilities in accordance with the field of expertise studied. SMK graduates must have the ability not only in the mastery of theory, but also practical skills that can be implemented in the workplace [7][8][9].

The learning process in SMK emphasizes a practice-based approach by strengthening hands-on experience through activities such as field work practice, internships, and project-based learning programs. In addition, the importance of collaboration between SMKs and industry can help SMKs align their curriculum with the needs of the workforce [10][11][12]. This includes providing facilities relevant to the latest technology, updating teaching methods, and providing internship and training opportunities for students. Thus, with this collaboration, SMKs can produce graduates who are more work-ready, competent, and adaptive to industry developments [13][14][15]. Therefore, SMKs have an important role in improving student competencies through the provision of applicable and relevant learning, as well as close cooperation with industrial partners to create graduates who are highly competitive in the world of work.

One of the strategic steps that can be implemented to realize this goal is through the *teaching factory* learning model, which is learning that integrates the educational process with real industrial practice. *Teaching factory* is a learning innovation in order to bridge the gap between the world of education and the world of work by integrating real production processes in schools, so that students can gain practical experience that is relevant to industry standards. This helps students to develop technical skills, managerial skills, and work ethics needed in the industrial world. Therefore, *teaching factory* provides an

opportunity for students to improve their skills in an environment that resembles the real world of work [16][17][18].

In its implementation, *teaching factory* requires cooperation between schools and industries. The success of the *teaching factory* is highly dependent on close cooperation between SMK and industrial partners, where the industry plays a role in providing input related to quality standards, technology used, and actual work processes. Collaboration between schools and industries in the curriculum and teaching methods in SMK can be adjusted to the needs of the labor market, so that SMK graduates are better prepared to face the demands of the industrial world [2][17][18][19].

The teaching factory model is also recognized as one of the effective solutions to improve students' work readiness [2][20]. This is because *teaching factory* not only provides technical skills but also trains students in problem solving, decision making, and adapting to the industrial work climate so that by implementing *teaching factory,* it is expected to produce graduates who are more competent and have skills that are in accordance with current industry needs. *Teaching factory* also provides opportunities for students to learn directly in a relevant work environment, so that they can understand production flow, time management, and work efficiency. In addition, in learning, students also not only learn cognitive skills, but also affective, psychomotor and social skills [21]. So in this case, students not only learn in theory but also through real project-based practice, which allows them to face the challenges of work directly.

However, the effectiveness of teaching factory management implementation still requires further research to ensure that the program is able to optimally improve students' competence and work readiness. More in-depth research is needed to identify the supporting and inhibiting factors in the implementation of teaching factory, so that better strategies can be found in its management. Among these obstacles are limited practical facilities, collaboration between vocational schools and industries that have not been maximized, and the implementation of a curriculum that is relevant to industry needs [22][23][24].

Previous studies have mostly focused on the general implementation of teaching factory or its curriculum content. There is still a gap in research that discusses teaching factory from a management perspective, especially related to planning, organizing, implementation, and supervision. As a result, schools lack a clear reference in managing teaching factory effectively [25][26].

This study offers novelty by developing a management strategy model for teaching factory that integrates the four main management functions. The model is expected to serve as a practical reference for vocational schools (SMKs) to improve

student competence and better prepare graduates for the workforce [27][28].

This research was conducted at SMK Muhammadiyah Mungkid, an educational unit located in Magelang Regency. This school is known as one of the favorite private vocational schools that is widely trusted by the community, with a total of 1.303 students. SMK Muhammadiyah Mungkid has seven Expertise Competencies, namely: Hospitality, Culinary, Machining Engineering, Motorcycle Engineering, Light Vehicle Engineering, Electrical Power Installation Engineering and Computer Network and Telecommunication Engineering. In its learning process, SMK Muhammadiyah Mungkid has implemented an industry-based learning model through a teaching factory. Therefore, it is very relevant to conduct research on the implementation of teaching factory management at SMK Muhammadiyah Mungkid, especially in the Light Vehicle Engineering Expertise Competency, as an effort to improve students' competency and work readiness.

RESEARCH METHOD

This research uses a descriptive qualitative approach with a case study design to describe the teaching factory management strategy in the competence of light vehicle engineering expertise at SMK Muhammadiyah Mungkid. The research subjects included the principal, vice principal for curriculum, head of teaching factory and Mitsubishi as an industrial partner. Data were collected through in-depth interviews, direct observation, and documentation analysis, such as activity reports, learning administration, and cooperation documents with industrial partners.

Technical instruments used in data collection included a semi-structured interview guide and an observation sheet. The interview guide was designed to explore aspects of planning, organizing, implementing, and monitoring in teaching factory management. It included core questions and follow-up prompts aimed at understanding the roles, challenges, and strategies applied by each stakeholder. The observation sheet was structured to record real-time activities and behaviors during the implementation of teaching factory, such as the use of facilities, industry involvement, student practice sessions, and supervision mechanisms. Both instruments were developed based on the research focus and validated by experts in vocational education before use [29][30].

Data analysis was carried out through three stages, namely data reduction to select relevant information, data presentation in the form of descriptive narratives, and conclusion drawing based on findings in accordance with the research focus. Data validity was ensured through source triangulation by comparing the results of interviews, observations, and documentation, as well as member checks to confirm the accuracy of the data with the

informants [31]. This process aims to produce an accurate and credible picture of the planning, organizing, implementing, and monitoring strategies of teaching factory in the school [32][33].

RESULT AND DISCUSSION

Research Results

The following research flowchart illustrates the relationship between elements consisting of planning, organizing, implementing, and supervising the teaching factory. Each element is integrated and runs in a structured manner. This flow also shows how teaching factory management is implemented comprehensively to improve students' competency and work readiness.

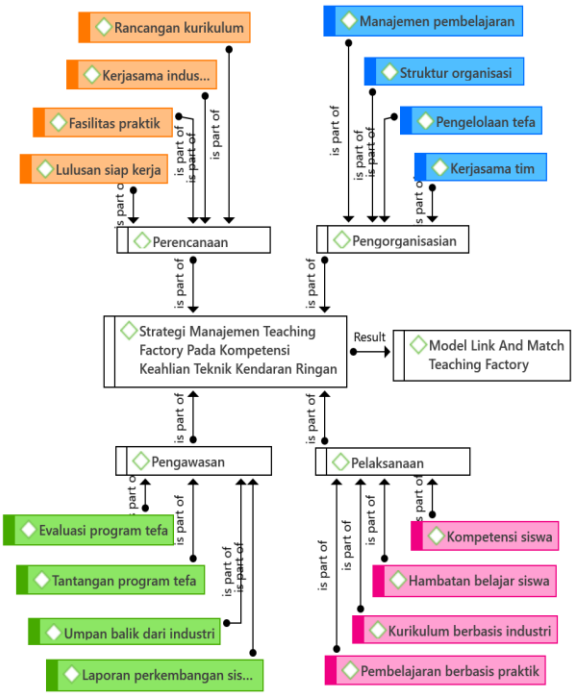

Figure 1. Research flow

Planning

The planning of teaching factory starts from analysing the needs of the industry. The school conducts surveys to several industrial partners to identify the most needed competencies, which are then used as the basis for curriculum preparation, procurement of practical facilities, and preparation of student competency roadmaps.

Statement P1 (Principal) :

"The qualifications of the workforce in the industry are our concern. Before the teaching factory was implemented, we surveyed the industry to find out the most needed competencies. The results are used as the basis for compiling an industry-based independent curriculum and determining the necessary practical facilities."

P2 (Vice Principal for Curriculum) stated:

"*We apply the concept of link and match, so our curriculum is always aligned with industry needs. Since the beginning, we have involved the industry in curriculum discussion and validation."*

P3 (Head of Teaching Factory) said:

"We develop a roadmap of competencies that students must achieve. We start from analysing industry needs, current student potential, and semester targets. This becomes our reference in determining the materials and practice scenarios."

Analysis:

The planning steps taken include:

1. Industry needs survey.
2. Discussion and validation of the curriculum with industry partners.
3. Preparation of competency roadmap per semester.
4. Adjustment of practice facilities according to industry standards.

With this approach, the teaching factory curriculum becomes more contextual and based on the needs of the world of work.

Organizing

The organisational structure of the teaching factory is established by the principal and involves a core team consisting of the head of the expertise programme, productive teachers, and administrative staff. Tasks and responsibilities are clearly divided so that each part focuses on its function.

P1 (Principal) explains:

"Our structure is simple but functional. The core team consisting of programme heads, teachers, and administrative staff are fully responsible for planning, implementing, and evaluating all teaching factory activities."

P3 (Head of Teaching Factory) adds:

"*Once the team is formed, we divide the tasks. Some focus on managing the practical materials, ensuring the tools are available. There are also those who organise the practice schedule so that it does not collide with class lessons."*

Analysis:

The organising structure consists of:

1. Core Team: In charge of the entire teaching factory management cycle.
2. Specialised Divisions: For example, logistics of practical materials, scheduling, documentation.
3. Coordination is conducted regularly to monitor progress and resolve obstacles in the field.

With a clear division of labour, teaching factory implementation is more efficient and there is minimal overlap between activities.

Implementation

The implementation of teaching factory is carried out with an industry-based learning approach. Collaboration with industry partners is key in curriculum implementation, use of practical facilities, and direct training by industry experts.

P1 (Principal) said:

"In terms of student competence, there are many positive changes. They are now better prepared in terms of hard skills. They practice directly with equipment that meets industry standards."

P4 (Head of Mitsubishi Industry) said:

"This programme helps students gain real-world experience. They not only learn theory, but also hands-on practice in an environment that resembles our workplace."

P3 (Head of Teaching Factory) adds:

"Industry is a key partner in shaping the practical learning environment. Even productive teachers are trained in the latest technology so that they can teach it back to the students."

Analysis:

Some important aspects of implementation:

1. Students practice directly using industry-standard tools.
2. The curriculum is developed with the industry and is based on real production projects.
3. Productive teachers receive training from industry partners to update their competencies.

Teaching factory becomes a real bridge between learning at school and the needs of the working world.

Supervision

Supervision is carried out systematically and regularly through internal evaluation by schools and external evaluation with industry. Evaluation includes the learning process, competency achievement, quality of student products, and feedback from industry partners.

P1 (Principal) stated:

"Regular evaluations are carried out to ensure that learning is according to plan. Evaluation is not only administrative, but also the quality of teaching, student understanding, and industry involvement."

P3 (Head of Teaching Factory) adds:

"Every week we have a team meeting. We use checklists to look at production targets, quality of student work, and industry involvement."

P4 (Head of Mitsubishi Industry) explained:

"We always give feedback, such as the latest tools that should be introduced, or skills like analysis and troubleshooting that should be strengthened."

Analysis:

Monitoring measures include:

1. Regular weekly evaluations with the management team.
2. Checklist of quality indicators for products and learning processes.
3. Direct feedback from industry for standardisation**.**

Collaborative supervision helps the programme remain adaptive to industry dynamics and enhances students' work readiness.

Discussion

***Teaching* Planning**

The planning stage in *teaching factory* learning at SMK Muhammadiyah Mungkid involves setting goals that focus on improving students' skills according to industry needs. To realize this, the school collaborates with industrial partners to understand the skills that are relevant to the world of work. Collaboration between schools and industries in planning is essential to develop an adaptive and applicable curriculum. Through input from partners, schools design an industry-based curriculum that includes technical and practical skills, enabling students to have the competencies demanded by the workforce [26][27][34].

Teaching factory planning includes the provision of industry-standard facilities, such as practical tools and materials to simulate real work. This provision is crucial to foster a learning environment that enhances students' practical competencies. Adequate facilities are a key component in a *teaching factory* as they allow students to experience hands-on practice to industry standards. Planning these facilities ensures that students not only understand the theory, but are also skilled in its application, which will ultimately improve their readiness to enter the workforce after graduation [35][36][37][38].

***Teaching* Organization**

The organization of *teaching factory* learning at SMK Muhammadiyah Mungkid involves a clear division of roles and responsibilities for all parties, including teachers, students, and industry partners. Teachers act as facilitators and mentors, while students are placed in roles that resemble industrial workers. The clear division of roles in the *teaching factory* helps students understand the work process professionally and improves their work ethic. This structure not only trains students' technical skills, but also teaches professional attitudes that are relevant to the demands of the working world [35][39].

The school forms a working team that integrates teachers, students and industry to direct practical activities. Industry partners in this team provide practical input and supervision so that industry standards are maintained. The involvement of industry in the organization of *teaching factory* allows for more effective knowledge transfer. With this organization, *teaching factory* learning activities become more structured and applicable, helping students to experience a more real and relevant work experience before they enter the professional world [40][41][42].

***Teaching Factory* Implementation**

The implementation of *teaching factory* at SMK Muhammadiyah Mungkid is carried out by applying learning methods that integrate theory and practice. In this activity, students are directly involved in work simulations according to industry standards under the guidance of teachers and supervision of industrial partners. The implementation of a practice-based *teaching factory* helps students understand technical skills in an applicative manner, so that they can apply the theory learned in a real context. Thus, students not only gain theoretical understanding but are also able to apply the technical skills needed in the world of work [43][44][45].

The implementation of *teaching factory* at SMK Muhammadiyah Mungkid involves continuous evaluation of students' work, which is conducted together with the industry. Teachers and industry partners provide direct feedback to students to improve their skills. Feedback from industry partners in the implementation of *teaching factory* plays an important role to ensure

students are ready to face the challenges of work in the industry. So with evaluation, students can improve their competencies continuously, making them more prepared and confident when facing real challenges in the world of work [46][47][48].

***Teaching* Supervision**

Supervision in the implementation of *teaching factory* at SMK Muhammadiyah Mungkid is carried out on an ongoing basis to ensure that learning activities run in accordance with work procedures applied in the industry and achieve the goal of improving student competency. Teachers and the industry work together in supervising the students' practical process, providing direct evaluation, and recording the development of students' skills during the learning process. Consistent supervision in *teaching factory* is essential to ensure that industry standards are properly implemented in the educational environment. With strict supervision, any mistakes or shortcomings in practice can be corrected immediately, so that students get a more accurate and applicable learning experience [13][49][50].

Teaching factory supervision also involves monitoring student work in the form of periodic performance and skills assessments. Teachers and industry provide targeted feedback that enables students to refine and improve their competencies. Supervision that involves feedback from the industry helps students understand the expectations of the world of work and encourages them to achieve the desired competency standards. With this supervision method, *teaching factory* learning can be more effective in producing graduates who are ready to work, and able to face industry deands with adequate skills [51][52][53].

So in this case the aspects of planning, organizing, implementing, and supervising *teaching factory* learning at SMK Muhammadiyah Mungkid are strategic steps to improve student competence. Planning that involves an industry-based curriculum and facilities according to student standards can obtain a learning environment that supports practical skills. Organizing with the cooperation of industrial partners, creating learning that is relevant to the world of work. Implementation based on the integration of theory and practice helps students understand and apply skills in real life. Then continuous supervision will ensure that industry standards are applied correctly, students become more prepared to face challenges and are able to compete in the world of work [54][55][56][57].

From the discussion above, the concept of *link and match* emerged in the implementation of the *teaching factory* management model in SMK.

The stages for the First step, planning is carried out by compiling a relevant industry-based curriculum and involving industrial partners to ensure student competence according to the needs of the world of work. Second, organizing is done through the

formation of a work team consisting of teachers, students, and industry partners, as well as a clear division of roles in simulating the real work process. Third, schools need to provide practice facilities according to industry standards, such as modern laboratories, to support effective job simulation. Finally, implementation and supervision are carried out through periodic evaluations involving industry partners, so that students get constructive feedback that helps improve their skills and work readiness [14][58][59][60].

CONCLUSION

Teaching factory learning at SMK Muhammadiyah Mungkid is designed for improving student competencies through various strategic stages. Planning stage, This involves developing an industry-based curriculum by involving industry partners to ensure the relevance of learning materials to the needs of the world of work. In addition, the provision of practical facilities according to industry standards is a priority to create a learning environment that supports the mastery of practical skills. At the organizing stage, the school forms a working team consisting of teachers, students and industry partners, with a clear division of roles, so that students can experience a simulation of the real work process that improves their professional work ethic.

In the implementation stage, theory and practice are integrated through job simulation under the guidance of teachers and supervision of industry partners, enabling students to understand and apply technical skills well. Supervision is conducted on an ongoing basis through periodic evaluations and feedback from industry partners to ensure industry standards are properly implemented, while helping students refine and improve their competencies. However, the implementation of teaching factory faces obstacles, such as limited facilities and teacher readiness, which can be overcome by improving infrastructure and training teachers to be more adaptive to industry developments. Through this approach *link and match, teaching factory* is an effective strategy in producing graduates who are ready to compete in the world of work while directly responding to industry needs.

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