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The Quality Improvement of Certified Teachers' Teaching Performance Using the Deming Cycle Model

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ABSTRACT

Teacher performance enhancement is vital for optimal education quality. This research portrays the Deming Cycle's application in improving certified teachers' performance at SMK Negeri 1 Sorong Regency. Using a qualitative descriptive approach, data were gathered from a principal and 13 purposively selected teachers through interviews, observations, and FGDs. Data were validated via triangulation and analyzed using Miles and Huberman's interactive model. Results indicate that the Deming Cycle (PDCA) effectively enhances teaching performance. The Plan step identified needs for innovation, while the Do step implemented Project-Based Learning (PjBL) to boost students' analytical and creative skills. The Check step showed significant growth in teacher confidence and student engagement. Finally, the Act stage established sustainable mentoring and collaboration. Practically, the Deming Cycle serves as a "Kaizen" framework, aligning teacher professionalism with industrial demands. These findings suggest that systematic mentoring is essential for translating certification into classroom innovation, positively impacting overall learning quality.

***Keywords**: Deming Cycle, Certified Teaching Performance, Project-Based Learning (PBL)*

Article Info

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INTRODUCTION

In an effort to improve the quality and equity of education in Indonesia, the government has run several programs, one of which is teacher certification with the intention of improving the qualifications, competence and professionalism of teachers and supporting their welfare (Latiana, 2019; Budyawati et al., 2023; Juniardi & Suci, 2024). Therefore, the implementation of this program not only improves the competence and professionalism of teachers but also their welfare, which is an important part of motivation in carrying out tasks and work. This effort is made as it is teachers who are at the forefront of the implementation of the educational process and are directly transferring the knowledge and technology to the students as well as educating positive values through guidance and exemplary actions. Thus, teachers are the main and most important component of education in determining the quality of education. Basri et al (2023); Manurung et al (2023); Muat & Rahmat (2024) state that it is in the hands of teachers

that high quality human resources (HR) will be produced.

Certification according to Aufa & Ahwy (2018); Syamel & Jusman (2024) is a process of awarding a person who has met certain criteria or prerequisites. This is in accordance with Acts Number 14 of 2005 concerning Teachers and Lecturers which states that education certification is given to teachers or lecturers who have met the qualifications of professional standards as a learning agent. Teacher certification is formal evidence signed as an acknowledgement that has been given by the institution or college issuing the certification (Sulaiman & Qolbi, 2023). According to Government Regulation Number 19 of 2005, the main objectives of establishing a teacher certification program are: a). determining the level of eligibility of teachers or lecturers in carrying out their duties and responsibilities as a learning agent and realising each of the objectives of national education, b). improving the quality of the process and results of education and teaching, c). improving the prominence of teachers or lecturers, d). improving the professionalism of teachers or lecturers, e). improving the welfare of teachers or lecturers. Therefore, with this program, teachers or lecturers are expected to have a fairly positive impact on their welfare so that it supports the improvement of the teaching performance, more specifically in improving the quality and excellence of education on an ongoing basis.

Latiana (2019); Pardede & Yafizham (2020); Subekti et al (2024) explain in detail that educators who have been certified will have higher ability to carry out the education process that it has an impact on the quality of education, as a manifestation of their professionalism. In addition, the certification benefit obtained by teachers will motivate them to do the job very well. This statement is in line with Kartini & Muhammad (2019); Fahrurrizal et al (2024) who state that the level of educator welfare will have a positive impact on the quality and standard of their teaching performance. Therefore, certified teachers must be able to carry out their duties very well in realising the objectives of national education. Hasan (2017); Franky & Rachima (2021) also agree that by offering proper teacher certification benefits will help improve their performance.

The reality that has developed in the field to date, it is found that the teacher certification program affixed by the government does not seem to have fully produced maximum results in teacher behaviour. This is in line with research by Pravitasari (2018); Kuku et al (2023) stating that certified teachers still lack the awareness to improve their quality and standard. Furthermore, in their findings, Lamasitudju (2018); Utomo et al (2019); Widayati et al (2020) state that the performance of certified teachers is still less than optimal because teachers do not plan the learning process very well. In addition, teachers were found to be less professional in carrying out their duties and work (Oetpah & Vinsensia, 2022).

The aforementioned problems are in agreement with the results of preliminary studies conducted by researchers at SMK Negeri 1 Sorong Regency, that the quality of teaching performance possessed by 13 teachers with certification has not been effective in managing learning. The application of learning methods that involve students actively was still lacking at SMK Negeri 1 Sorong Regency. The principal revealed that most of the certified teachers, who are senior teachers in majority, often use lecture methods and manual exercises that focus on repetition of technical tasks. This shows the lack of effort to apply innovative and interesting learning methods that can encourage students to think critically and actively participate in learning. This condition contradicts the demands of vocational education which should be oriented towards

developing vocational-based skills that are relevant to the needs of the world of work. In addition, it was also found that some teachers did not prepare learning tools properly, even for a full semester, giving the impression of a lack of motivation to improve the quality of learning. This finding is in line with the research of (Masengi et al., 2023) which shows that the performance of certified teachers is still relatively of low quality, one of which is caused by the lack of initiative to develop themselves and improve professional competence. The low quality of learning produced has an impact on the achievement of student competencies that are not maximised, especially in meeting the standards of the working context. Therefore, strategic efforts are needed to improve the quality and standards of certified teachers' teaching performance to make it more relevant to the needs of quality vocational education.

Research on the performance of certified teachers has been extensively documented in the last three years. Several studies have focused on the influence of professional allowances on work motivation Budyawati et al (2023), while others have highlighted administrative hurdles that impede teacher professionalism (Masengi et al., 2023). Furthermore, the application of the PDCA (Plan-Do-Check-Act) model in school management has also been explored as a tool for evaluating managerial performance (Mayangsari et al., 2023). However, most of these studies were conducted in general high schools (SMA) or urban institutions with abundant access to training resources. There remains a significant research gap concerning how the Deming cycle is specifically applied to revitalize the performance of senior certified teachers within a vocational education (SMK) environment, particularly in regions with unique geographical characteristics and accessibility challenges like Sorong Regency.

The uniqueness of this research lies in its locus and subjects. SMK Negeri 1 Sorong Regency faces a dual challenge: first, the dominance of senior teachers who have long remained in the "comfort zone" of conventional methods; and second, the discrepancy between the competencies taught and the rapidly evolving needs of the industrial world (DUDI) in West Papua. While previous PDCA research has tended to be generic, this study positions the Deming cycle as a pedagogical transformation instrument focusing on the integration of Project-Based Learning (PjBL) to meet the specific demands of the vocational curriculum. Thus, this research fills a practical void regarding sustainable mentoring models for certified teachers in vocational high schools located in national development buffer zones.

In regard to this, the solution to improving and following up on the problems described regarding education can be done with one of the approaches from change management, namely the Deming cycle model. Isniah et al (2020); Nguyen et al (2020); Qiu & Weiwei (2021) state that in essence, the Deming cycle is a management approach to carry out a continuous improvement or renewal process that can be trusted to improve the quality and standards of certified teachers' teaching performance in each educational institution. This notion is reinforced by Riyantini (2017); Giribaldi et al (2021); Zeng et al (2022); Lie et al (2024) who assert that the follow-up improvement process through the Deming cycle management approach can provide recommendations in an effort to improve the quality and results of high-quality teacher teaching performance in any institution including educational institutions both at the lowest and highest levels. This notion is supported by the research findings from Kusumawati (2017); Yunitasari (2019); Tilman et al (2023); Mayangsari et al (2023) which state that applying the Deming cycle model is very effective and efficient in improving quality and standards in various area of work including education. Conceptually, the Deming cycle

model of change management has been offered and wished to be applied to improve the quality of certified teachers' teaching performance with the cycle phase focuses on organisational development such as the six-sigma cycle. According to Fitriani (2018); Realyvásquez-Vargas et al (2018); Hadi (2020); Li et al (2022); Yao et al (2022), the phases offered by Deming in each cycle will not be interrupted at one stage just like that, but the activities continue to spin like a wheel so that the process becomes continuous improvement or kaizen, meaning that the cycle forms like a circle which includes four stages, namely the planning stage (plan), the implementation (do), the inspection stage (check), and the follow-up/improvement stage (act) (Dudin et al., 2017; Na Pan et al., 2022).

Based on the background described above, this study aims to examine how the implementation of the Deming Cycle model can improve the teaching performance quality of certified teachers at SMK Negeri 1 Sorong Regency. This study explores the process of identifying teaching performance problems, implementing innovative and student-centered learning strategies as an improvement effort, evaluating the results of its implementation, and formulating follow-up actions to ensure continuous improvement in teaching practices.

This study has both theoretical and practical significance. Theoretically, it contributes to the development of educational management, particularly in applying the Deming Cycle as a continuous improvement framework for enhancing teacher performance. Practically, the findings are expected to provide guidance for school principals and teachers in improving learning quality through systematic planning, implementation, evaluation, and follow-up. From a pedagogical perspective, this study also emphasizes the importance of shifting from teacher-centered learning to student-centered approaches to develop students' analytical, critical, creative, and practical skills relevant to vocational education.

METHOD

This research was a qualitative study using a descriptive method. This method, as explained by Sukmadinata (2017) and Sugiyono (2022), aims to describe in depth the events or occurrences observed in the field. In descriptive research, researchers presented data in the form of written or spoken words that were clear, concise, and detailed, thus providing a comprehensive picture of the processes that occurred during the research.

This study focused on the management process of improving the quality and standards of teaching performance of certified teachers at SMK Negeri 1 Sorong Regency. The research site was selected because it was considered one of the institutions committed to improving the quality of human resources through innovation in teacher performance management. In this study, a continuous improvement management model known as the Deming Cycle was applied. This model consists of four main stages, namely Plan, Do, Check, and Act (follow-up or corrective action) (Realyvásquez-Vargas et al., 2018; Aggarwal, 2020; Rachman, 2020; Taufik, 2020). These stages are designed to help systematically improve the effectiveness of teaching performance. The stages of the Deming Cycle model are shown in Figure 1.



Figure 1. Model Deming Cycle Process
(Source: ShiftIndonesia)

The *Plan* stage aims to investigate and analyze the potential problems that occur in the field, specifically analyzing the gap between current teaching methods and vocational industry needs. Problems found during the initial study are analyzed in depth and then solutions are provided for improvement and change. Furthermore, at the *Do* stage, the concepts and action plans that have been designed previously, primarily the transition from conventional lecture-based methods to project-based learning (PjBL), begin to be implemented through a series of actions designed to overcome these problems. After that, the *Check* stage is conducted to assess in detail the results of the planning and implementation process, focusing on evaluating the effectiveness of PJBL through student engagement and teacher confidence levels. If the assessment results show a very satisfactory achievement, the process can continue to the next stage. Otherwise, it is necessary return to the previous stage for improvement. Finally, the *Act* stage is the process of making decisions on the follow-up that has been carried out, including formulating future quality assurance strategies as the final step in the improvement cycle (Paais, 2023).

The subjects of this study consisted of one principal and 13 certified teachers at SMK Negeri 1 Sorong Regency. The selection of subjects was conducted using a purposive sampling technique based on specific criteria: teachers must hold a professional educator certificate, have more than 10 years of teaching experience to address the tendency of remaining in a “comfort zone” of conventional teaching methods, and represent various instructional challenges identified by the principal. This technique was used because the participants were considered to have direct experience and involvement in the process of improving teaching performance. The principal was selected due to his role as an instructional leader, while the certified teachers were selected because they were directly involved in planning, implementing, and reflecting on the learning improvement process. Therefore, the selected subjects were relevant to the objectives of this study.

Data were collected through three main techniques: interviews, observation, documentation study, and FGD. To ensure transparency the instruments were designed to measure specific indicators; the interview guides focused on teachers' perceptions of innovative pedagogy, while the observation sheets measured teachers' facilitation skills and student-teacher interaction during PJBL. Documentation in the form of lesson plans and reflection journals was used to verify the alignment between planning and execution.

These techniques aimed to obtain holistic information related to the application of the *Deming Cycle* model in the research context. The data obtained were then analysed qualitatively using source triangulation and technique triangulation techniques, as suggested by (Fajarrini & Fetty, 2020; Paais & Andreas, 2021; and Sugiyono, 2022). Data triangulation is carried out to check the validity of information by comparing various existing data sources. The data collection and validation techniques adapted to the *Deming Cycle* steps are presented in Table 1.

Table 1. Data Collection and Validation Techniques

***Deming Cycle* Steps**	**Data Collection Technique**	**Instrument**	**Data Validation Technique**
Plan	Interview (initial)	Interview guide for needs identification	Source triangulation: comparing data from the principal and teachers
	Documentation	Format of lesson plan analysis	Triangulation technique: comparing interviews and documents

Do	Observation	Learning process observation sheet	Triangulation technique: comparing observations and reflection journals
Check	Interview (reflective)	Reflectie interview guide	Source triangulation: validation from the principal and teachers
	Documentation	Teachers' reflection journal	Source triangulation: validation from each teacher
Act	*Focus Group Discussion* (FGD)	Discussion guide and evaluation and revision	Triangulation technique: discussion results were compared with revised documents

The data that has been collected is then analysed by referring to the Miles and Huberman interactive model, which involves four systematic stages. First, data collection involves gathering all field notes and interview transcripts. Second, data condensation is performed by selecting and simplifying raw data to focus strictly on behavioral changes following the PDCA stages. Third, data display is conducted by organizing the condensed data into structured narratives and matrices to identify patterns of improvement. Finally, conclusion drawing and data verification are carried out to interpret the effectiveness of the model, which is then verified through continuous triangulation to ensure the validity and credibility of the findings (Sugiyono, 2022). With this approach, the research is expected to provide an in-depth and valid picture of the effectiveness of the *Deming Cycle* model in improving the quality of certified teachers' teaching performance.

RESULT AND DISCUSSION

Result

This study provides an in-depth description of improving the quality of teaching performance of certified teachers at SMK Negeri 1 Sorong Regency by applying the *Deming Cycle* model, which is elaborated through four stages, namely: *plan, do, check, and act*.

Plan Stage

The results of initial interviews with the principal and certified teachers show that the learning process at SMK Negeri 1 Sorong Regency has been running quite well, supported by strong mastery of the material by the teachers. However, the application of learning methods that involve students actively is still a challenge. The principal revealed that most teachers mostly used lecture methods and manual exercises that tend to focus on the repetition of technical tasks. As a result, students were rarely given opportunities to explore their analytical abilities and problem-solving skills independently.

In addition, although school facilities are very accommodating, learning effectiveness has not been fully achieved. The principal stated that some teachers still lack confidence in applying interactive methods in the classroom. This condition indicates the need for adjustments in the learning approach to be more able to motivate students, especially in the development of vocational-based skills that are relevant to the needs of the working field.

This assessment is further validated by a sisytematic review of the teachers' pedagogical framework. Specifically, an analysis of lesson plan documents shows that most of the lesson plans prepared by teachers are still simple and only include lecture methods, short discussions, practice questions and manual exercises that tend to be procedural in nature. There is no application of project-based learning that is relevant to vocational skills that can improve students' analytical skills, critical thinking and creativity. The results of the needs analysis obtained at the *Plan* stage are shown in Table 2.

Table 2. Results of the Needs Analysis at the *Plan* Stage

Aspects	Current Condition	Needs
Learning Methods	Domination of lecture method and limited manual exercises	Implementation of project-based active learning model
Learning Plan	Simple lesson plans, less emphasis on projects	Preparation of project-based lesson plans
Teacher Self Confidence	Still low in implementing innovative learning models	Training on innovative learning models
Student Skills	Less trained in analytical, critical and creative thinking	Practical skills-based learning that prioritises active student roles

Source: Research Data

Based on these findings, the principal and teachers had agreed on some preparatory steps that need to be taken by teachers to improve the quality of learning before classroom observations were conducted. The agreed preparations to be made are presented in Figure 2.

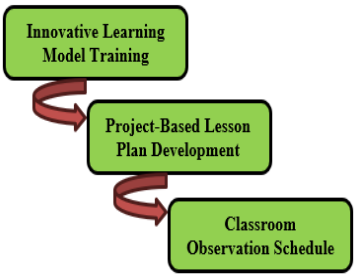


Figure 2. Preparation Before Classroom Observation

Do Stage

At this stage, teacher began to implement the lesson plans that had been prepared with a *project-based learning* (PjBL) approach in accordance with the agreed classroom observation schedule. Observations conducted by the principal noted a change in learning methods, from the lecture approach, individual assignments, and limited practice to learning that involves students actively in group work. In this learning, students were asked to design simple projects relevant to their vocational competencies, such as making tool prototypes, analyzing work cases in the industry, or developing vocational-based project plans.

The observation results showed that students began to show more active participation. They discussed in groups, shared tasks, and presented their work to the class. Students were asked to not only complete the project but also explain the process they undertook, including the reasons for choosing a particular method, analysis of the results, and reflection on the challenges faced. This approach indirectly encourages students to think analytically, critically, and creatively.

Teachers' reflections also show that the implementation of project-based learning provides new challenges that encourage them to be more creative in designing learning activities. Teachers stated that although initially it takes time for adaptation, they felt this method was effective in increasing student engagement, especially in practicing higher order thinking skills. This is further evidenced by a collective statement from the reachers, who highlighted that the shift to a project-oriented approach fostered a more collaborative atmosphere and allower for more authentic assessment of student competencies. The results of classroom observations and teachers' reflections at the *Do* stage are presented in Table 3.

Table 3. Results of Teacher Observation and Reflection at the *Do* Stage

Aspects	The Principal Observation Results	Teacher Reflection Results
Teacher		
Learning Methods	Teachers implemented project-based learning effectively	Teachers found learning more meaningful when developing innovative methods in project-based learning
Self Confidence	Teachers looked more comfortable facilitating students in project-based learning	Teachers felt more confident with project-based learning outcomes
Students		
Engagement	Students actively discussed, cooperated, and completed projects	Students were more enthusiastic and fully engaged in the learning process
Analytical Skills	Students were able to identify project problems	Students were more enthusiastic and fully engaged in the learning process
Critical Skills	Students gave logical reasons for the choice of work method	Some students still needed guidance for deeper analysis
Creative Skills	Students produced projects with varied ideas	Students produced projects with varied ideas

Source: Research Data

The results of the principal's observation and teachers' reflections in Table 3 show quite good results in improving teachers' teaching performance. The application of innovative project-based learning models not only makes teachers more confident in designing and implementing learning that actively involves students but also encourages them to continue developing more creative and relevant methods. This success can be seen from teachers' ability to direct students to collaborate, think analytically, critically and creatively, thus reflecting an increase in more professional teaching competencies. However, despite the improvement in learning quality, the implementation of new methods still faces some barriers, such as limited time and limitations in implementing more complex project-based learning.

Check Stage

Reflective interviews with the principal and 13 certified teachers at SMK Negeri 1 Sorong Regency show that the implementation of *project-based learning* has a positive impact on the quality of teachers' teaching performance. Based on the interview with the principal, there was a significant improvement in teachers' confidence in designing and implementing learning. Based on the tabulation of reflective interviews and teachers' reflection journals, almost all participants showed a positive response toward the new model. Specifically, 12 out of 13 teachers reported feeling more confident after seeing the tangible results students achieved in their projects. This improvement in the quality of teaching performance is not only measured by confidence but also by practical skills; 11 out of 13 teachers stated that they felt more skillful in using learning techniques that encourage active student participation, such as group discussions and project-based problem solving.

However, challenges remain regarding consistency and time management. A total of 9 out of 13 teachers revealed that while the implementation of PjBL had gone well, they felt the need for regular mentoring to overcome certain challenges, such as managing the implementation time across various subjects. Therefore, teachers suggested continuous support to maintain the quality of teaching performance. A summary of the results at the Check stage is presented in Table 4.

Table 4. Summary of *Check* Stage Results

Aspects	Interview Results and Documentation	Percentage of Supportive Teachers
Teacher Self Confidence	Increased teacher confidence in using *project-based learning*	12 of 13 teachers
Active Teaching Skills	Teachers felt more skilful in actively engaging students in learning	11 of 13 teachers
Routine Assistance	The need for regular mentoring to optimise *project-based* learning	9 of 13 teachers

Source: Research Data

Act Stage

Based on the evaluation results at the *Check* stage, the FGD conducted with the principal and teachers at SMK Negeri 1 Sorong Regency revealed some important steps that need to be implemented to ensure continuous improvement in the quality of teachers' teaching performance. The main focus is on regular mentoring, strengthening collaboration among teachers, and refining evaluation techniques to improve the effectiveness of project-based learning implementation. Principals play a key role in directing and supporting teachers in implementing these steps to optimise learning. Suggested follow-ups include regular mentoring, regular meetings between teachers to share experiences, and the development of more comprehensive evaluation rubrics to better assess students' skills. The follow-up results that were successfully formulated at the *Act* stage are presented in Table 5.

Table 5. Follow-Up Results at the *Act* Stage

Follow Up	Objective	Person in Charge	Schedule
Regular mentoring and ongoing supervision	Supports optimal implementation of project-based learning	Principal, Certain entrusted teachers	Every month (mentoring session)
Strengthening collaboration between teachers	Enhances cooperation among teachers in designing joint projects	Teacher	Every semester
Refinement of evaluation and reflection techniques	Ensures more comprehensive and precise evaluation in assessing student projects	Teacher, Principal	Before the next project implementation
Improved communication and support from the principal	Provides more intensive support in the implementation of project-based learning	Principal	Every month

Source: Research Data

Discussion

Improving the quality of certified teachers' teaching performance is an important factor in creating effective and meaningful learning. Teacher performance not only includes the ability to plan and implement learning but also involves evaluating learning outcomes and following up according to students' needs. Kartomo & Slameto (2016); Fitriasari et al (2024); and Safey et al (2024) emphasise that optimal teachers' performance is an important foundation for successful learning, especially if teachers are able to design innovative learning that is relevant to the needs of students. In the context of vocational education in SMK, or Vocational School, the focus of learning is not only on theoretical aspects but also practical skills that are relevant to the working field. This is reinforced by Helyer (2018); Shantha Nair et al (2020); and Pratama & Bambang (2024), who explain the importance of competency-based learning through practical experience to ensure graduates' readiness to face the challenges of the industrial context.

The results showed that the implementation of the *Deming Cycle* model or PDCA cycle (*Plan-Do-Check-Act*) at SMK Negeri 1 Sorong Regency had a significant impact on improving the teaching performance of certified teachers. The PDCA cycle, introduced by Edward Deming, has been recognised as an effective method of identifying problems, designing solutions, and making continuous improvements (Patel & Vivek A, 2017; Fauzy et al., 2021; Jin et al., 2022; Paais, 2023). The effectiveness of the Deming Cycle in this study is deeply rooted in its systematic approach to change management, which aligns with the principles of Total Quality Management (TQM). The cycle succeeded at SMK Negeri 1 Sorong because it transformed the "comfort zone" of senior teachers who previously relied on conventional lecture methods into a structured "learning by doing" ecosystem.

At the *Plan* stage, the need for more innovative learning methods is identified to replace conventional approaches that still rely on limited manual exercises. Teachers need methods that are more active and support the development of higher order thinking skills. This stage succeeded because of a participatory approach where teachers were involved in identifying their own pedagogical gaps, creating a sense of psychological ownership over the proposed changes. The *Do* stage involves the implementation of project-based learning (PjBL) with the assistance of the principal, designed to develop students' analytical, critical, and creative skills. According to Hsin & Hsin-Kai (2023) and Younis et al (2021), PjBL provides student-centered learning experiences that encourage responsibility for their own learning process. PjBL proved highly effective specifically because of the vocational nature of SMK, where it bridges the gap between abstract theory and industrial application, resonating with the kinesthetic learning styles of vocational students.

At the *Check* stage, the evaluation showed an increase in students' engagement and teachers' confidence in teaching. The principal noted that students were more active in learning, while teachers felt more confident using PjBL method after seeing positive results in students. This is in line with the research of Habibah (2024) and Safitri et al (2024), which showed that PjBL was able to increase student-teacher interaction and improve learning outcomes significantly. The significant increase in teacher confidence (where 12 out of 13 teachers felt more empowered) was a result of the "Check" phase acting as a safe space for reflection without the fear of formal administrative sanctions. This is consistent with Andreas et al (2025), who emphasize that professional supervision must be supportive and collaborative to foster teacher innovative behavior. Teachers' reflection journals corroborated these results, noting that PjBL method not only improved students' skills but also helped teachers implement more meaningful learning. However, teachers suggested the need for regular mentoring to ensure consistent application of this method in various subjects.

The *Act* stage resulted in recommendations to strengthen the sustainability of PjBL implementation. Regular mentoring by the principal and collaboration among teachers are proposed as strategic steps to ensure long-term effectiveness. Locke et al (2019) and Hasan (2017) stated that the principal's intense supervision is proven to improve teacher performance, while Firnanda & Reva (2024) emphasised the importance of continuous supervision in promoting quality learning. By institutionalizing regular mentoring, the school applied the TQM principle of "Continuous Improvement" or *Kaizen*. This aligns with Sasmita et al (2023), suggesting that the consistency of school

leaders in providing clinical supervision is the main determinant in maintaining teaching standards. Additionally, Rahayu et al. (2023) noted that systematic cycles like PDCA are vital in vocational settings to ensure that teacher competencies remain synchronized with the rapidly changing demands of the industrial world. With the mentoring, teachers not only become more competent but also more confident in implementing innovative methods. This support also plays an important role in ensuring that SMK graduates have competencies that are relevant to industry needs (Sudarsono, 2020; Ilham et al., 2024).

As a result of applying the Deming cycle, this study confirms the importance of a systematic approach in educational change management. The PDCA cycle not only assists teachers in designing and implementing project-based learning but also creates an educational ecosystem that supports the development of students' critical, creative and analytical thinking skills. This study supports the findings of Luthfia (2024), which showed that the PDCA approach in PjBL significantly improved teacher professionalism and student achievement. In addition, research by Hsin & Hsin-Kai (2023) and Karaçalli & Fikret (2014) confirmed that PjBL is able to improve students' soft skills and teachers' skills in creating innovative learning. Therefore, the Deming cycle can be considered as an effective strategic framework to promoted learning innovation in vocational schools and education in general.

CONCLUSION

The application of the Deming Cycle model at SMK Negeri 1 Sorong Regency has proven effective in improving the quality of certified teachers' teaching performance through a systematic "Continuous Improvement" or *Kaizen* approach. The cycle allowed for in-depth needs identification at the Plan stage, leading to the implementation of Project-Based Learning (PjBL) at the Do stage, which not only fostered students' analytical and creative skills but also provided experiences relevant to industrial needs. Evaluation at the Check stage demonstrated significant improvement in teacher confidence and student engagement, while the Act stage ensured sustainability through institutionalized mentoring and collaboration. Overall, the Deming cycle serves as a transformative management tool that creates a systemic impact on both teacher professionalism and student learning outcomes.

Despite these positive results, this study has several limitations, including a relatively short research duration that only covered one full PDCA rotation, which may not fully capture the long-term stability of teacher behavioral changes. Additionally, the scope was limited to a single institution, SMK Negeri 1 Sorong Regency, meaning the findings may reflect specific local dynamics and might not be directly generalizable to different geographical contexts. Furthermore, the focus primarily on senior certified teachers means the study does not account for potential performance variations among non-certified or junior staff. Based on these findings, it is suggested that the Local Education Office facilitate periodic technical workshops to ensure that teacher professional allowances are directly linked to pedagogical innovation. Principals should strengthen their role as instructional leaders by implementing supportive clinical supervision and internal mentoring communities. Finally, future researchers are encouraged to conduct longitudinal studies across multiple vocational schools in West Papua to provide a broader comparative perspective on the model's effectiveness.

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