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Determinants of teacher performance: Assessing the influence of training and mentoring in top tiers' vocational schools

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Abstract: This study investigates the impact of training and mentoring on teacher performance in SMK PK vocational schools. Using a sequential explanatory mixed-method approach, the research was conducted in two phases: quantitative and qualitative. The study involved 1,110 teachers from 222 vocational schools across West Java Province. Quantitative data were gathered through structured questionnaires and analyzed using PLS-SEM, while qualitative insights were obtained through interviews and document analysis using thematic analysis. The findings reveal that (1) training has a direct positive effect on teacher performance; (2) mentoring has a direct positive effect on teacher performance; (3) training has a direct positive effect on mentoring implementation; (4) training has an indirect positive effect on teacher performance through mentoring; and (5) training and mentoring simultaneously contribute positively to improving teacher performance in SMK PK. Practically, the results underscore the importance for policymakers and school leaders to design integrated professional development programs that combine both elements to foster sustained teacher growth and educational outcomes.

Keywords: *Center of excellence vocational schools, Mentoring, Teacher performance, Training.*

1. Introduction

Improving the quality of vocational education has become a strategic priority in responding to the increasing complexity and demands of the modern labor market [1, 2]. One of the most critical elements in this endeavor is teacher performance [3] which plays a pivotal role in shaping students' competencies and their readiness for industrial settings. In top-tier vocational schools, expectations for teacher performance are significantly higher, as educators are required not only to master subject matter but also to align their teaching with evolving industry needs and standards.

Within this context, professional training and mentoring are often regarded as key determinants of teacher effectiveness [4, 5]. Ongoing training equips teachers with updated pedagogical and technical knowledge, while structured mentoring programs offer personalized and professional support through peer collaboration and guidance. These interventions are believed to enhance teachers' instructional capabilities, increase job motivation, and ultimately improve classroom outcomes and student engagement [6-8]. Nevertheless, the extent to which training and mentoring influence teacher performance in high-performing vocational schools remains an open empirical question. Contextual factors such as school culture, leadership support, and teachers' openness to change may act as mediating or moderating variables in the effectiveness of such initiatives [9, 10].

Improving teacher performance in the implementation of the Centre of Excellence Vocational School Program (SMK PK) is a key strategy to enhance the quality of vocational schools in Indonesia. Teacher performance is a crucial determinant of both school quality and student academic achievement [11]. Alongside teacher performance, school effectiveness and student outcomes are influenced by factors such as school leadership, school culture, collegial support, collaboration, school supervision, and

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a learning climate that fosters students' knowledge, attitudes, and academic skills [12, 13]. The term "performance "refers to job performance, which is defined as the value of a set of employee behaviors that contribute, either positively or negatively, to achieving organizational goals [14].

Various reports and studies have shown that the current level of teacher performance in vocational schools remains suboptimal. The 2015 Teacher Competency Test (UKG), as reported by the Directorate General of Teachers and Education Personnel (GTK), revealed that the average test score of vocational schoolteachers was still low, at 58.83 out of a possible 100. Several issues related to teacher performance have been documented in studies by Preechawong, et al. [15]; Arinaitwe [16]; Goldhaber, et al. [17] and Parker, et al. [18]. These issues include: (1) lack of teacher discipline, (2) low pedagogical competence, and (3) insufficient professional competence.

The SMK PK program involves a range of interventions including the improvement of school facilities, human resource training, mentoring, partnerships, and supervision. Human resource training is provided by vocational education quality assurance centers (BB/BPPMPV) to Learning Committees, including school principals, vice principals for curriculum, vocational and general subject teachers, and school supervisors. The purpose of this training is to prepare the Learning Committee for effective implementation of the SMK PK program. The facilitators of this training are individuals who have previously completed technical guidance in mentoring learning implementation.

Teacher training under the SMK PK program is an important form of human resource development at the school level aimed at achieving the program's goals. Additionally, In-House Training (IHT) is conducted for both general and vocational subject teachers as a follow-up to the Learning Committee training. The goal of IHT is to build shared understanding among teachers regarding the SMK PK program, the philosophy of independent learning, the Pancasila Student Profile, and their implications for classroom practices. The IHT covers twelve key topics, including: introduction to learning platforms, orientation to SMK PK policy, reflection on the Independent Curriculum, development of operational school curricula, instructional design, learning and assessment, project-based learning (P5), and learning community development.

Mentoring is a strategic component designed to support the achievement of SMK PK program goals. This activity is carried out by partner universities and technical units under the main vocational education authority. The designated technical units include the BB/BPPMPV, which work with national instructors to mentor the Learning Committees. These mentors serve as guides, learning partners, and facilitators in strengthening teaching materials related to instructional implementation.

The SMK PK program has been running for four years since its inception in 2021. However, schools have faced various challenges in their implementation. For example, SMKN 3 Penajam Paser Utara encountered managerial, operational, and infrastructure-related issues [19]. Other challenges include limited mentoring mechanisms [20] and a shortage of vocational teachers [21]. Problems have also been identified in university-based mentoring. Studies by Raihani, et al. [22] revealed mismatches between university mentors' areas of expertise and the vocational schools they were assigned to. Furthermore, mentoring was often superficial and lacked depth due to limited time and follow-up

2. Objectives

This study aims to examine and explore the effects of teacher training and mentoring on teacher performance within the SMK PK program. The research questions addressed in this study are: (1) Does teacher training influence teacher performance directly or indirectly? (2) Do mentoring affect teacher performance in SMK PK? (3) Do training and mentoring simultaneously affect teacher performance in SMK PK? (4) Do training has an indirect effect on teacher performance through mentoring? (5) Do training and mentoring have a simultaneous effect on teacher performance?

3. Methods

This study employed a mixed-method approach using a sequential explanatory design. The research was conducted in two stages. The first stage involved the collection and analysis of quantitative data.

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This was followed by the second stage, which consisted of the collection and analysis of qualitative data. The purpose of the second stage was to gain a deeper understanding of, and to further explain, the quantitative findings. The research population consisted of Centre of Excellence Vocational High School (SMK PK) teachers in West Java Province, which is divided into 13 Regional Education Offices. The school sample included 222 SMKs selected from a total of 278 SMK PKs, with a total teacher sample of 1,110 individuals. The unit of analysis was the school. The school sample was selected using random sampling, while the teacher sample was determined using quota sampling. The sample size was calculated using Slovin's formula.

Qualitative data were collected from four SMK PK schools purposively based on the following considerations: 1) a school that received the program in 2021 but did not continue (SMKS Almaarif Langut), 2) a school that received the program in 2023 (SMKN 1 Bungursari), and 3) schools that received the regular program from 2021 to 2023 and also participated in the mentoring program (SMKN 1 Arahan and SMKN 2 Kota Cirebon). Quantitative data collection was conducted through the distribution of questionnaires using a Likert-scale response format to obtain data on training and mentoring, and a verbal frequency scale to collect data on teacher performance self-assessments. Qualitative data were collected through interviews and document analysis.

Data analysis was conducted quantitatively, both descriptively and through hypothesis testing, using the PLS-SEM path analysis technique with SmartPLS version 4.1.0.8. The PLS-SEM analytical approach consists of two types: measurement model analysis (outer model) and structural model analysis (inner model). Evaluation of the measurement model includes parameters such as outer loading factors, t-values, and the Average Variance Extracted (AVE) index. Evaluation of the structural model includes path coefficients, t-values, p-values, coefficients of determination (R^2), and effect size (f^2 square). Qualitative data were analyzed to explore and clarify the findings from the quantitative data.

4. Results and Discussion

4.1. Measurement Model

First, the evaluation results on the context components that are evaluated are related to the program foundation, school community involvement, vision, mission and objectives of the Adiwiyata school program.

The measurement model analysis aims to evaluate whether the instrument items meet the required standards. Item testing was carried out to obtain valid items in accordance with the measurement criteria using the PLS-SEM model. The standard used to determine item validity was based on convergent validity, with an outer loading factor (OLF) >0.70 and an AVE index >0.50 as the standard for measurement reliability.

The results of the validity testing of the training, mentoring, and teacher performance items are presented in Table 1.

Table 1.
Validity testing of the training, mentoring, and teacher performance.

Type of instrument	*Outer loading factor* (Standard >0.70)		*Average Variance Extracted* (AVE) (Standard >0.50)	Alpha Cronbach (Standard>0.70)	Number of Fit Items
	Max.	Min.			
Training Instrument	0.827	0.710	0.586	0.980	36
Mentoring Instruments	0.919	0.740	0.771	0.988	27
Teacher performance instrument	0.813	0.704	0.589	0.942	13

The analysis on Table 1 shows that all instruments meet the standard criteria for validity and reliability. The outer loading factor for all items exceeds the minimum threshold of 0.70, with the training instrument ranging from 0.710 to 0.827, the mentoring instrument from 0.740 to 0.919, and the teacher performance instrument from 0.704 to 0.813. The Average Variance Extracted (AVE) values

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are also above the required minimum of 0.50, with 0.586 for training, 0.771 for mentoring, and 0.589 for teacher performance, indicating good convergent validity. Additionally, the reliability of the instruments, as measured by Cronbach's Alpha, is very high 0.980 for training, 0.988 for mentoring, and 0.942 for teacher performance demonstrating excellent internal consistency. The number of items that met the validity criteria includes 36 items for the training instrument, 27 for mentoring, and 13 for teacher performance. These results confirm that all three instruments are valid and reliable for measuring their respective constructs.

4.2. Hypothesis Testing

The hypothesis testing in the path analysis using the PLS-SEM approach is conducted through the evaluation of the structural model (inner model). The standard criterion for accepting H_0 is based on a t-value <1.96 and a p-value <0.05 for statistical significance. The path indices resulting from the analysis model for training (X1) and mentoring (X2) on teacher performance (Y) are presented in Figure 1.

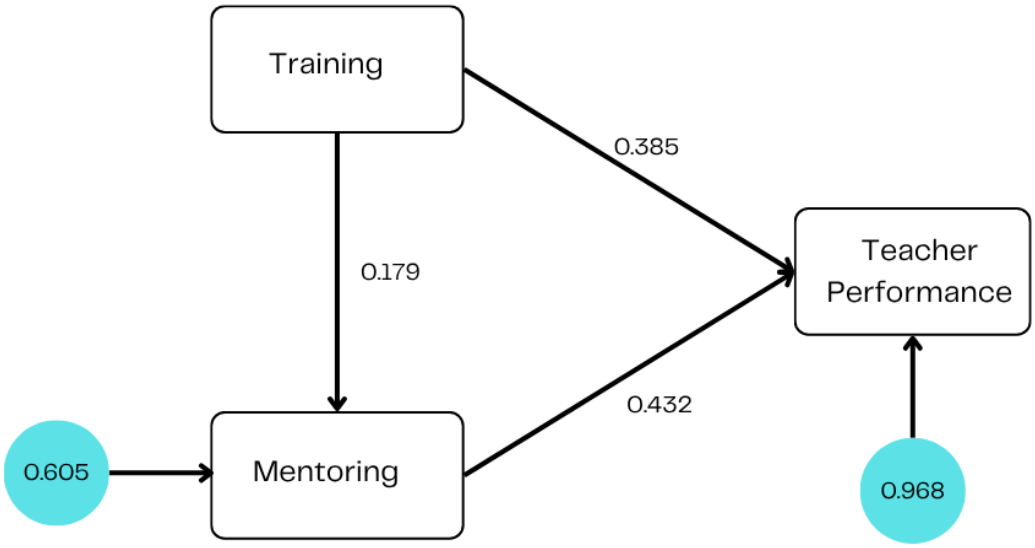

Figure 1.
Path analysis index.

The model on Figure 1 shows that Training has a direct positive effect on Teacher Performance, with a path coefficient of 0.385. Training also indirectly influences Teacher Performance through Mentoring, as it has a smaller direct effect on Mentoring (0.179), while Mentoring in turn has a more substantial impact on Teacher Performance (0.432). Additionally, the diagram includes two circles indicating R-squared values: 0.605 for Mentoring and 0.968 for Teacher Performance. These values suggest that 60.5% of the variance in Mentoring is explained by the model, primarily by Training, and 96.8% of the variance in Teacher Performance is explained by the combined effects of Training and Mentoring. Overall, the diagram highlights the significant roles of both Training and Mentoring in enhancing Teacher Performance.

The parameters of the path model analysis, including direct and indirect effects of training (X1) and mentoring (X2) on teacher performance (Y), comprising path index, t-value, p-value, and f^2, are summarized in Table 2.

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Table 2.
The hypothesis testing.

Variable path	Path Index	t-value	p-value	f-Square
Training →Performance	0.385	7.313	0.000	0.237
Mentoring → Performance	0.432	7.879	0.000	0.299
Training → Mentoring	0.179	2.767	0.000	0.033
Training → Mentoring → Performance	0.077	2.685	0.007	

The hypothesis testing results presented in Table 2 reveal significant relationships among the studied variables. First, training has a direct positive effect on performance, with a path coefficient of 0.385, a t-value of 7.313, and a p-value of 0.000, indicating strong statistical significance. The f-square value of 0.237 suggests a medium effect size. Similarly, mentoring also significantly influences performance, with a slightly higher path coefficient of 0.432, a t-value of 7.879, and a p-value of 0.000. Its f-square value of 0.299 indicates a relatively strong effect. Additionally, training has a significant effect on mentoring (path coefficient = 0.179, t-value = 2.767, p-value = 0.000), although with a smaller effect size (f-square = 0.033). Finally, the indirect effect of training on performance through mentoring is also statistically significant, with a path coefficient of 0.077, a t-value of 2.685, and a p-value of 0.007. These findings suggest that both training and mentoring contribute positively to performance, with mentoring playing a mediating role in the relationship between training and performance.

4.2.1. Training Has a Direct Effect on the Performance of SMK PK Teachers

The effect of training (In-House Training/IHT) on the performance of SMK PK teachers was analyzed using the PLS-SEM approach. The analysis yielded a path coefficient of 0.385, a t-value of 7.313, and a p-value of 0.000. The hypothesis testing result t-value = 7.313 > 1.96 and p-value = 0.000 < 0.05—indicates that training (X1) has a statistically significant direct effect on teacher performance (Y) at the 5% significance level. Therefore, the training (IHT) conducted by the learning committee has a positive direct effect on the performance of teachers at SMK PK. The effect size of the training (IHT) variable on the variation in teacher performance scores is represented by an f-square index of 0.237, which falls into the medium category.

According to Ivancevich and Konopaske [23] training and development can improve performance by enhancing or correcting deficiencies in skills and competencies. The training activities implemented by the learning committee were shown—through hypothesis testing—to have a positive effect on the performance of SMK PK teachers in West Java. This conclusion is consistent with previous studies, including those by Audah [24]; Putra and Kumalaputra [25] and Pambreni, et al. [26].

Audah [25] found that training contributed 33.4% to the performance of teachers at SMA Muhammadiyah Martapura. Putra & Kumalaputra [26] found a 59.1% contribution of training to teacher performance at high schools in Bandung. Meanwhile, Pambreni, et al. [26] reported a 59.9% contribution at SMK Bina Mandiri in Sukabumi Regency. Studies conducted in primary education also support these findings. Kalkoy [27] reported a 35.1% contribution of training to the performance of elementary school teachers in Southeast Maluku Regency. Risdiantoro [28] found a 24.7% contribution to teacher performance in Islamic elementary schools (MI) in Batu City. Listiyani and Fu'ad [29] concluded that teacher training had a direct impact on performance at the Bumi Kartini Jepara Educational Foundation, with a determination coefficient of 31.2%.

According to informants, the impact of training on teacher performance is evident in improved knowledge and competencies. Teachers have developed a better understanding of the *Merdeka Curriculum* and teaching-related administrative work. Competencies relevant to industry needs have also been acquired through the Teacher Internship and Guest Teacher programs. Furthermore, teachers have begun to complete required documents for curriculum implementation and started engaging with the PMM platform, although usage remains suboptimal.

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4.2.2. Mentoring Has a Direct Effect on the Performance of SMK PK Teachers

The effect of mentoring (*Program Implementasi Pembelajaran*/PIP) on teacher performance was analyzed using the PLS-SEM approach. The path coefficient was 0.432, with a t-value of 7.879 and a p-value of 0.000. Given that t-value = 7.879 > 1.96 and p-value = 0.000 < 0.05, it can be concluded that mentoring (X2) has a statistically significant direct effect on teacher performance (Y) at the 5% significance level. Accordingly, the mentoring (PIP) conducted by BB/BPPMPV has a positive direct effect on the performance of SMK PK teachers. The effect size of the mentoring (PIP) variable on the variation in teacher performance scores is indicated by an f-square index of 0.299, categorized as medium.

In the context of corporate organizations, mentoring can be conducted by leaders. The role of a mentor includes teaching and developing employees, offering problem-oriented consultation, and accepting feedback. Mentoring typically focuses on enhancing employee performance [30]. According to Ivancevich and Konopaske [23] mentoring can be implemented by pairing senior employees with junior employees. In West Java, mentoring activities provided by BB/BPPMPV showed a positive influence on teacher performance, consistent with findings from previous research. Studies by Sulistyorini and Parmin [31]; Ngadino [32] and Sukabul [33] concluded that mentoring significantly improves teacher performance and professionalism in secondary schools. Arifah [34] found that mentoring contributed approximately 27.2% to teacher performance in primary schools.

The current study's effect size of 0.299 is consistent with the findings of Prasmawaty [35] who concluded that mentoring contributed approximately 26.6% to teaching performance in the implementation of the 2013 Curriculum. These findings contradict those of Faisah, et al. [36] who found a negative impact of curriculum mentoring on teacher performance in senior high schools piloting the 2013 Curriculum in Palu.

In practice, mentoring activities by BB/BPPMPV included training, consultation, and workshops. In 2021, these were mainly conducted online, while in 2022, they were implemented in person. The Learning Committee (Kombel) invited mentors to provide reinforcement training, covering topics such as the establishment and optimization of learning communities, Reskilling and Upskilling follow-up plans (RTL), and curriculum strengthening. Challenges in implementing mentoring included difficulties in communication and coordination due to the distance between schools and mentors, mismatches in mentoring schedules with school activities, changes in assigned mentors, and limited frequency of mentoring sessions.

4.2.3. Training Has a Direct Effect on Mentoring at SMK PK

The effect of training (IHT) on mentoring (PIP) at SMK PK was analyzed using the PLS-SEM approach. The resulting path coefficient was 0.179, with a t-value of 2.777 and a p-value of 0.000. Since t-value = 2.777 > 1.96 and p-value = 0.000 < 0.05, it is concluded that training (X1) has a significant direct effect on mentoring (X2) at the 5% alpha level. This indicates that the training (IHT) conducted by the learning committee has a positive direct effect on the mentoring conducted by BB/BPPMPV at SMK PK. The coefficient of determination (R^2) is 0.032, meaning that training explains only 3.2% of the variation in mentoring scores. The effect size of training (IHT) on the variation in mentoring scores, with an f-square index of 0.033, is considered weak.

Training and mentoring serve as strategies to improve the performance of underperforming employees. Mentoring, as a form of on-the-job training, is especially applicable for new managers. It can also involve pairing senior staff nearing retirement with junior employees to prepare for executive succession. Additional training methods include transitory anticipatory experiences and job rotation [23]. From a human resource management perspective, Armstrong [37] notes that training and mentoring are essential approaches for developing individual employee capabilities. Gibson, et al. [38] argue that training is necessary to teach proper procedures to new employees and to develop essential skills. Mentoring serves as a follow-up to training, as many skills introduced during training require practical application through guided mentoring [37].

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Mentoring by BB/BPPMPV aims to provide technical-operational assistance to vocational schools implementing the SMK PK Program, enabling them to apply the *Merdeka Curriculum* as a new educational paradigm effectively and efficiently. SMKs are expected to reach Stage 4 of the vocational transformation process aligned with Indonesia's education vision. The scope of mentoring includes planning, preparation, implementation, and assessment phases.

4.2.4. Training Has an Indirect Effect on Teacher Performance through Mentoring

The indirect effect of training (IHT) on teacher performance through mentoring was analyzed using the PLS-SEM approach. The path coefficient was 0.077, with a t-value of 2.685 and a p-value of 0.007. As the t-value = 2.685 > 1.96 and the p-value = 0.007 < 0.05, it is concluded that training (X1) has a significant indirect effect on teacher performance (Y) through the mediating variable of mentoring (X2) at the 5% significance level. This indicates that mentoring (PIP) conducted by BB/BPPMPV mediates the relationship between training and teacher performance at SMK PK.

Previous studies have shown that training has a partial effect on teacher performance. According to Pambreni, et al. [26] training contributes about 59.9% to performance variation. Putra and Kumalaputra [25] found the contribution to be 77.6%, while Helniha [39] reported a contribution of 80.8%. In contrast, Risdiantoro [28] observed a lower contribution of only 24.7%.

Mentoring has also been found to positively affect teacher performance, as indicated by studies from Arifah [34] and Prasmawaty [35] with the latter reporting a contribution of 26.6%. However, Faisah, et al. [36] arrived at a different conclusion, suggesting that mentoring negatively affects teacher performance. These varied findings indicate that the impact of mentoring on teacher performance can be either positive or negative.

The findings of this study support the hypothesis that training (IHT) provided to teachers has a significant indirect positive effect on performance through the mediating role of mentoring. Although the contribution of training through mentoring is only 7.7%, this may be due to the dual nature of the mentoring-performance relationship, which may be positive or negative.

4.2.5. Training and Mentoring Have a Simultaneous Effect on Teacher Performance at SMK PK

The path analysis using the PLS-SEM approach yields the following structural model: Y (Teacher Performance) = 0.385(X1) + 0.432(X2) + 0.605 (see Figure 1). In this structural model, the path coefficient for training is 0.385 and for mentoring is 0.432. Both coefficients are statistically significant at the 5% significance level. Thus, the hypothesis testing leads to the rejection of H0 and acceptance of H1: training (X1) and mentoring (X2) have a simultaneous positive effect on teacher performance (Y).

This finding aligns with the study by Yuniarti and Lingga [40] which demonstrated the impact of teacher training on communication and interaction skills that ultimately improved student achievement at SMKN 1 Muntok. Similarly, Anam and Prasetyo [41] concluded that competency and motivation training positively influenced teacher performance at SMKN 4 Bojonegoro. The partial effect of mentoring on teacher performance is also supported by a t-value of 7.879 and a p-value of 0.000. These results are consistent with the findings of Faisah, et al. [36]; Ngadino [32] and Arifah [34].

The combined contribution of training and mentoring to the variation in SMK PK teachers' performance, with an R^2 of 0.395, is considered moderate [42, 43]. The error rate (ε) of 0.605 or 60.5% indicates the influence of other variables on teacher performance. These other variables—both internal and external have been substantiated in various studies. Internal factors include teacher competence, motivation, and work discipline [44, 45] work ethic [46] teacher commitment [47] and job satisfaction [48]. External factors influencing teacher performance include transformational leadership [49, 50] organizational culture [51] work environment [52] compensation [53] and supervision [54-56].

These previous studies indicate that variables other than training and mentoring play a significant role in determining teacher performance. The combined effect of training conducted by Kombel and mentoring by facilitators from BB/BPPMPV on SMK PK teacher performance, while statistically significant, remains moderate at approximately 39.5%. These findings suggest the need for further

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improvement in both training and mentoring components in the implementation of the SMK PK Program.

4.3. The Coefficient of Determination (R^2)

The coefficient of determination (R^2) for teacher performance is 0.395. This R^2 value reflects the combined effect of the exogenous variables (training and mentoring) on the endogenous variable (teacher performance), indicating that 39.5% of the variation in teacher performance scores can be explained by training and mentoring. According to Hair Jr., et al. [43] an R^2 value greater than 0.25 is categorized as medium. Therefore, the combined effect of training and mentoring on teacher performance falls within the medium category.

Meanwhile, the remaining 60.5% of the variation in teacher performance is attributed to other factors (errors) outside the scope of training and mentoring. The total effect of training and mentoring on teacher performance at SMK PK, both directly and indirectly, is presented in Table 3.

Table 3.
Total effect of exogenous variables on endogenous variables.

Exogenous Constructs to Endogenous Constructs	Direct Influence Index	Indirect Influence Index	Total Effect
Training→Performance	0.385	0.077	0.415
Mentoring→ Performance	0.432	-	0.432
Training → Mentoring	0.179	-	0.179

Source: Data output SmartPLS.

The results presented in Table 3 illustrate the total effects of the exogenous variables—training and mentoring on the endogenous variable, performance. The analysis reveals that training has both a direct and an indirect impact on performance. The direct effect of training on performance is measured at 0.385, while the indirect effect, mediated through mentoring, is 0.077. This brings the total effect of training on performance to 0.415, indicating that training not only improves performance directly but also contributes indirectly through its influence on mentoring. On the other hand, mentoring exerts a direct effect on performance with an index of 0.432 and does not involve any indirect pathways in this model. Additionally, training is shown to have a direct influence on mentoring, with a coefficient of 0.179, further emphasizing the role of training in shaping mentoring activities that, in turn, enhance performance. These findings suggest that both training and mentoring are significant contributors to performance, with training playing a dual role through direct and indirect effects.

5. Conclusion

Teacher training exerts a significant and positive direct impact on the performance of vocational high school (SMK PK) teachers. The effect size of in-house training (IHT) on teacher performance falls within the moderate range. Instructional mentoring also demonstrates a significant and positive direct effect on teacher performance. The effect size of the mentoring program (PIP) on teacher performance is similarly classified as moderate. Teacher training has a significant and positive direct influence on the implementation of instructional mentoring. However, the effect size of training on mentoring is considered weak. Training contributes positively to teacher performance through an indirect pathway mediated by mentoring. The magnitude of this indirect effect is relatively small. When combined, training and mentoring have a significant positive effect on teacher performance. Among the two, mentoring accounts for a greater proportion of the variance in performance outcomes compared to training. The coefficient of determination (R^2) indicates that both variables jointly explain a substantial portion of the variance in teacher performance. In summary, the findings underscore that enhancing teacher performance within the SMK PK framework can be effectively achieved through integrated strategies that combine structured training with sustained instructional mentoring.

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Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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