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# The Interconnection Between Teacher Professional Education Parameter to The Student Learning Outcomes in Indonesia

# Interkoneksi Antara Parameter Pendidikan Profesional Guru dengan Hasil Belajar Siswa di Indonesia

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***Abstract***

*Effective education is crucial for instructing students to attain competencies aligned with the curriculum of their educational level. This study aims to assess the teaching profession and its correlation with teacher performance, professionalism, and teacher confidence in connection with student learning outcomes. This research was carried out on vocational educators in West Sumatra who have participated in the teacher professional education program. This research employs the Partial Least Squares Structural Equation Modeling (PLS-SEM) analytical technique. Data was gathered through purposive sampling from vocational educators in vocational high schools in West Sumatra. The findings indicated that teacher professional education (X1) exerts a significant direct influence on Teacher Performance in the Merdeka Curriculum (Z1), Professional Teachers in Indonesia (Z2), and Self-Confidence (Z3), in addition to Student Learning Outcomes (Y1). Notably, professional teachers have a substantial impact on the execution of the Merdeka Curriculum in contemporary vocational high schools, as evidenced by the largest path coefficient of the relationship between X1 and Z1 (0.558). Professional education for vocational high school teachers in West Sumatra has a significant effect on teacher professionalism, self-confidence and improving student learning outcomes, even though Indonesia is implementing a new curriculum, namely the Merdeka curriculum, teachers are still ready to be professional, confident to have an impact on student learning outcomes.*

***Keywords:*** *professionalism, self-confidence, student learning outcome, teacher performance, teacher professional program.*

**Abstrak**

Pendidikan yang efektif sangat penting untuk membimbing siswa mencapai kompetensi yang sesuai dengan kurikulum tingkat pendidikan mereka. Penelitian ini bertujuan untuk mengevaluasi profesi mengajar dan korelasinya dengan kinerja guru, profesionalisme, serta kepercayaan diri guru terkait dengan hasil belajar siswa. Penelitian ini dilakukan pada pendidik vokasi di Sumatera Barat yang telah mengikuti program pendidikan profesional guru. Penelitian ini menggunakan teknik analisis Partial Least Squares Structural Equation Modeling (PLS-SEM). Data dikumpulkan melalui sampling purposif dari pendidik vokasi di sekolah menengah kejuruan di Sumatera Barat. Temuan menunjukkan bahwa pendidikan profesional guru (X1) memiliki pengaruh langsung yang signifikan terhadap Kinerja Guru dalam Kurikulum Merdeka (Z1), Profesionalisme Guru di Indonesia (Z2), dan Kepercayaan Diri (Z3), serta Hasil Belajar Siswa (Y1). Secara menonjol, guru profesional memiliki dampak yang signifikan terhadap pelaksanaan Kurikulum Merdeka di sekolah menengah kejuruan modern, sebagaimana dibuktikan oleh koefisien jalur terbesar antara X1 dan Z1 (0,558). Pendidikan profesional bagi guru sekolah menengah kejuruan di Sumatera Barat memiliki pengaruh signifikan terhadap profesionalisme guru, kepercayaan diri, dan peningkatan hasil belajar siswa, meskipun Indonesia sedang menerapkan kurikulum baru, yaitu Kurikulum Merdeka, guru-guru tetap siap menjadi profesional dan percaya diri untuk memberikan dampak pada hasil belajar siswa.

**Kata Kunci:** profesionalisme, kepercayaan diri, hasil belajar siswa, kinerja guru, program pengembangan profesional guru.

## 1. Introduction

The fundamental cornerstone of nation-building is the education of future generations through learning. In Indonesia, educational institutions have sought to fulfill the objective of learning as a fun-damental element in cultivating knowledgeable and skilled individuals. A key factor that advances the objective of the lecture system in Indonesia is quality education.

Torrisi et al. (2021) underscores that learning is fundamentally an endeavor, a process inherently linked to humans due to their engagement arising from interactions with their environment. According to (Peng et al., 2024), educators are professionals who must continually adapt in response to advancements in science and technology. The function of educators is crucial for a nation, as they are pivotal in fostering and enhancing the educational framework of a country. Furthermore, Martínez-León et al. (2024) asserted that educators should possess the autonomy to regulate their schedules, enabling them to manage media usage duration and integrate it with educational objectives.

A professional educator possesses profound self-awareness. As indicated in (Liu et al., 2025), a proficient educator will be evident in the execution of service assignments, distinguished by mastery of materials and methodologies. Professional educators are those possessing exceptional competencies in their respective domains. From Hatuye et al. (2023) and Zhu (2025), there are at least four criteria for a teacher to be deemed professional: the capacity to manage or adapt the curriculum, the ability to relate curriculum content to the environmental context, the skill to inspire students to engage in independent learning, and the proficiency in synthesizing diverse disciplines into a cohesive concept.

In Indonesia, one must undergo education and training prior to completing the evaluation to become a professional teacher. Education and training can be conducted at the university level. Professional teacher education participants must implement their university education in their respective schools. During the implementation phase, participants are instructed by a lecturer. To ensure that the implementation procedure adheres to the appropriate regulations. Subsequently, they must prepare a report for evaluation to be reviewed with the supervisor. Through the review process, educators can enhance both instructional strategies and learning execution. The learning implementation process must be documented via video. This approach facilitates a straightforward evaluation process.

The readiness and receptiveness to undergo assessment for enhancement will foster professionalism (Janapati & Vijayalakshmi, 2024; Pradipto & Abraham, 2014). Repetitive engagement in the processes of enhancement and assessment will instruct educators in refining their performance (Mufanti et al., 2024; Yasdin et al., 2023). Furthermore, the repetitive tasks involved in conducting training, producing videos, evaluating with lecturers, and enhancing lesson preparation and execution by teachers foster confidence in student education. Ultimately, it yields graduates with exemplary academic performance (Misbah et al., 2015; Suharno et al., 2020). The educational outcomes, represented by grades and competencies, will empower students to realize their potential in both personal and professional spheres. Moreira et al. (2024) and Fu et al. (2025) assert that the management of emotions, thoughts, and behaviors across diverse settings is a fundamental aspect of self-competence, as defined by the Collaborative for Academic, Social, and Emotional Learning. Self-confidence is intricately linked to social-emotional development, integrating learning with technology (Luo & Li, 2024; Najjarpour, 2024).

Currently, vocational high schools in Padang city offer diverse specialization programs, including automotive engineering, mechanical engineering, building engineering, electrical


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engineering, electronic engineering, and audio-visual engineering. Most teachers possess professional certifications that denote their expertise. The evaluation method has not been thoroughly analyzed. This research is crucial for enhancing instructors' competencies following the attainment of their professional certification. To date, the teacher workload parameter has just been utilized as an indication, neglecting its impact on teacher confidence, performance in implementing the Merdeka curriculum, and their self-assurance, which ultimately affects optimal learning results. This study used the Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis technique to elucidate the comprehensive data on variables. This research aims to investigate intricate relationships by analyzing significant factors that together impact the enhancement of student learning results.

## 2. Research Methods

This study employed structural analysis of parameters by PLS-SEM (Hair et al., 2019). The sample for this study comprised vocational high school educators who have successfully completed the teacher professional program. The educators are distributed around Padang city. The study's sample size comprises 100 teachers chosen via purposive selection approach. Data was gathered by a questionnaire, with survey items presented in Table 1. The questionnaire was distributed using an internet form for a duration of one month. Furthermore, we examined the sample distribution throughout each academic program, encompassing Automotive Engineering, Mechanical Engineering, Building Engineering, Electrical Engineering, Electronics Engineering, and Audio-Visual Engineering.

**Table.1**. Survey Item

| Parameters | Survey Item | Index |
|---|---|---|
| Professional teacher education | X.1 A | Prepare learning tools according to the curriculum |
| | X.1 B | Make learning videos according to learning tools |
| | X.1 C | Create case studies with real cases in the field |
| Teacher performance in Merdeka Curriculum | Z.1 A | Teacher activity in preparing learning media |
| | Z.1 B | Evaluate the implementation of learning |
| | Z.1 C | Doing the learning |
| | Z.1 D | Reflecting on learning |
| | Z.1 E | Creating case studies on learning implementation |
| | Z.1 F | Creating plan of improvement process |
| Professional teachers in Indonesia | Z.2 A | Always professional in carrying out activities in learning |
| | Z.2 B | Always be attuned to improvisation in improving skills |
| | Z.2 C | Develop social skills in interaction with the academic community |
| | Z.2 D | Embrace a carefree personality towards all activities in learning |
| Self-confidence | Z.3 A | Confidence and trust to do the learning |
| | Z.3 B | Optimistic in action in teaching |
| | Z.3 C | Objective in making decisions in learning |
| | Z.3 D | Accept constructive criticism and suggestions |
| | Z.3 E | Responsible for acting |
| Student learning | Y.1 A | Student learning outcome scores |
| | Y.1 B | Students have high discipline |


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| | | |
|---|---|---|
| outcomes | Y.1 C | Responsible in behavior |
| | Y.1 D | Demonstrate communication skills |
| | Y.1E | Having good social emotional skills |

This study employed the PLS-SEM model to assess the validity and reliability of survey items developed within a construct. Convergence validity is assessed by the average variance extracted (AVE). The AVE value utilized as a benchmark in validation must exceed 0.5 to ascertain that the indicators reliably assess the same construct. The Discriminant Validity Benchmark is utilized to assess discriminant validity. The square root of the AVE must surpass the correlation among other components. The Heterotrait-Monotrait Ratio (HTMT) should remain below 0.9 (Ab. Hamid et al., 2017; Afthanorhan et al., 2021; Kyriazos & Poga, 2023). Reliability is evaluated by Composite Reliability and Cronbach's Index, both of which must surpass 0.7 to ensure strong internal consistency among indicators inside a singular construct.

This study employed correlation techniques to analyze the structural model among the constructs. The metric route coefficient quantifies the size and direction of the interaction between components (Hair et al., 2017). A P-coefficient value below 0.05 is deemed statistically significant. R-squared ($R^2$) is a statistical metric used to evaluate the degree to which external variables explain variance in dependent variables. The predictive value of $R^2$ varies among different fields. A number of 0.25 signifies a poor association, 0.50 denotes a moderate relationship, and 0.75 represents a strong relationship. The Variance Inflation Factor (VIF) was computed to verify the absence of substantial multicollinearity among the predictor variables. A VIF value under 5 signifies the absence of a substantial multicollinearity issue inside the model (Hair et al., 2021).

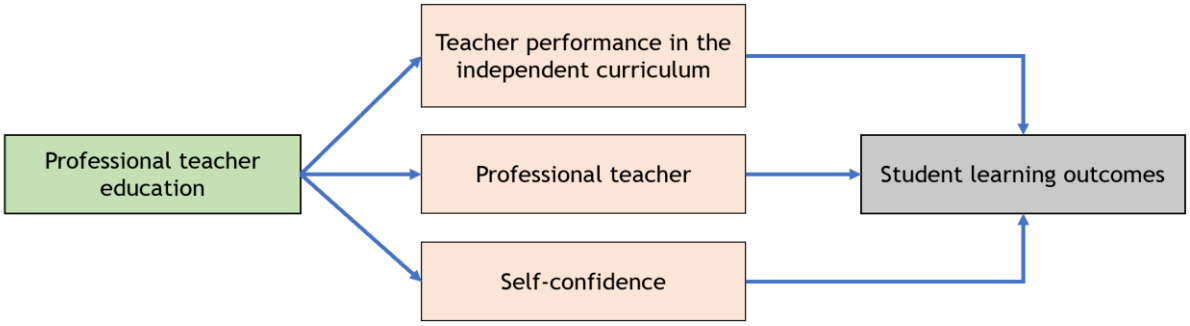


**Figure.1**. Model Framework

The overall model fit in this study was assessed by PLS-SEM utilizing numerous indices. The Standardized Root Mean Square Residual (SRMR) is a statistic employed to evaluate the overall fit of a model (Chicco et al., 2021; Shin et al., 2023; Althof & Rodrigues, 2021). A number under 0.08 is seen as indicative of an acceptable model fit. This analysis utilized Smart PLS software to input data, construct measurement and structural models, and apply the PLS-SEM method, resulting in outputs interpreted according to pertinent values. Consequently, the findings of this study are anticipated to provide significant practical, theoretical, and policy ramifications, while acknowledging the study's limits and offering recommendations for further research.

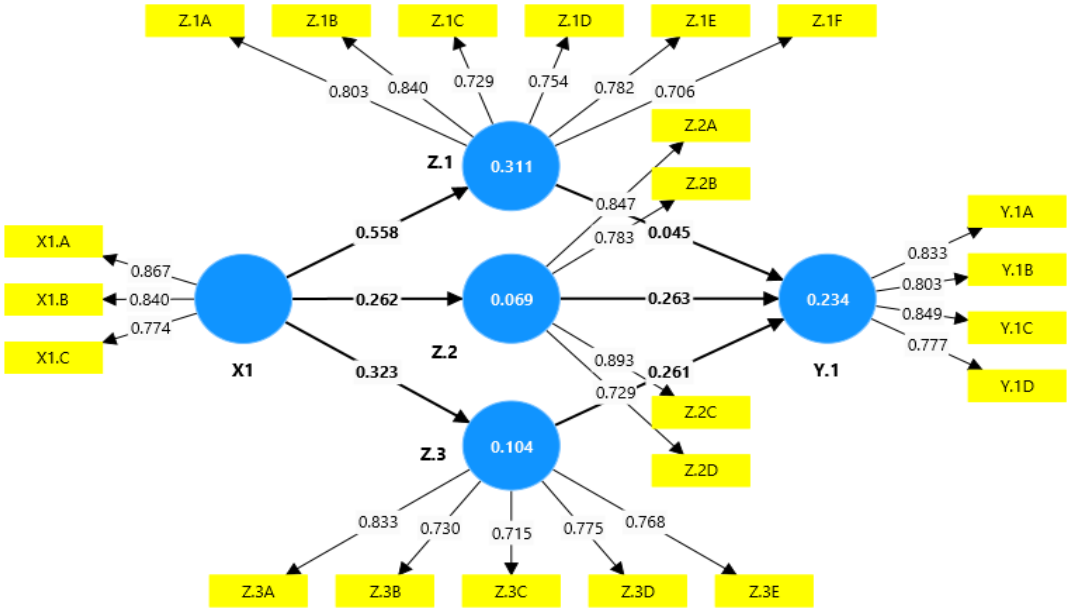


**Figure.2**. Output of PLS-SEM

**Table.2.** Instrument Validity and Reliability

| Parameters | Indicator | Outer Loading | Cronbach's Alpha | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|---|---|
| Professional teacher education | X1.A | 0.867 | 0.771 | 0.785 | 0.867 |
| | X1.B | 0.840 | | | |
| | X1.C | 0.774 | | | |
| Teacher performance in Merdeka Curriculum | Z1.A | 0.803 | 0.863 | 0.874 | 0.897 |
| | Z1.B | 0.840 | | | |
| | Z1.C | 0.729 | | | |
| | Z1.D | 0.754 | | | |
| | Z1.E | 0.782 | | | |
| | Z1.F | 0.706 | | | |
| Professional teachers in Indonesia | Z2.A | 0.847 | 0.837 | 0.875 | 0.888 |
| | Z2.B | 0.783 | | | |
| | Z2.C | 0.893 | | | |
| | Z2.D | 0.729 | | | |
| Self-confidence | Z3.A | 0.833 | 0.846 | 0.876 | 0.586 |
| | Z3.B | 0.730 | | | |
| | Z3.C | 0.715 | | | |
| | Z3.D | 0.775 | | | |
| | Z3.E | 0.768 | | | |
| Student learning outcomes | Y1.A | 0.833 | 0.834 | 0.850 | 0.888 |
| | Y1.B | 0.803 | | | |
| | Y1.D | 0.849 | | | |
| | Y1.E | 0.777 | | | |


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## 3. Result and Discussion

### 3.1 Research Result

This study's analysis results employ the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach, facilitating the concurrent assessment of both the measurement model and the structural model, as illustrated in Figure 1. The PLS SEM approach is utilized due to its capacity to manage intricate models featuring many latent components and causal pathways. This methodology is appropriate for this investigation as it accommodates relatively small sample sizes and does not necessitate normally distributed data. Figure 2 presents the PLS-SEM output depicting the comprehensive research model together with path coefficient values and R-squared for each endogenous construct. The visualization of the model in Figure 2 indicates that Teacher Professional Education (X1) significantly influences Teacher Performance in the Merdeka Curriculum (Z1), Professional Teachers in Indonesia (Z2), Confidence (Z3), and Student Learning Outcomes (Y1). The highest path coefficient is observed in the correlation between X1 and Z1 (0.558), signifying that Teacher Professional Education significantly impacts teacher performance in the execution of the Merdeka Curriculum.

The R-square value for each endogenous construct is displayed within the construct circle, with the greatest result at Z1 (0.311), signifying that 31.1% of the variance in Teacher Performance within the Merdeka Curriculum may be elucidated by Teacher Professional Education. Additional assessments of the psychometric characteristics of the measuring model and the significance of the pathways in the structural model are required to validate these findings. Analyses of validity and reliability for the research instruments were performed to confirm that the measuring tools accurately and consistently assess the variables, with results displayed in Table 2.

According to the data in Table 2, all indicators across the five parameters possess outer loading values beyond 0.7, signifying their validity in measuring the respective constructs. Cronbach's Alpha values for all parameters exceed the 0.7 threshold, ranging from 0.771 to 0.863, signifying robust internal consistency. Likewise, Composite Reliability exhibited values over 0.7 for all parameters, reinforcing the evidence of the study instrument's reliability. The Average Variance Extracted (AVE) for all factors surpasses the minimum threshold of 0.5, with certain parameters, including Teacher Performance in the Merdeka Curriculum, Professional Teachers in Indonesia, and Student Learning Outcomes, attaining notably high values (>0.8). This suggests that the variance in the indicators is adequately accounted for by their constructions, demonstrating sufficient discriminant validity. The study instruments possess psychometric features that adhere to established standards, demonstrating that the measurements of the five parameters are trustworthy, valid, and consistent for subsequent analyses (Hair et al., 2019). The Fornell-Larcker criteria is employed to assess the discriminant validity among items in the model by comparing the square root of the AVE with the correlations between constructs, as illustrated in Table 3.

Table 3 presents the Fornell-Larcker criterion, illustrating the discriminant validity among constructions within the research model. The emphasized diagonal values denote the square root of the Average Variance Extracted (AVE) for each construct, whereas the remaining values reflect the correlations among constructs. According to the table, all diagonal values (0.828 for X1, 0.816 for Y.1, 0.770 for Z.1, 0.815 for Z.2, and 0.765 for Z.3) exceed the correlations between constructs in the respective columns and rows. This affirms that each construct possesses strong discriminant validity, indicating that each construct effectively assesses a unique notion without substantial overlap with other constructs. The most robust correlation was noted

between Z.2 and Z.3 (0.574), signifying a moderate association between professional educators in Indonesia and their confidence levels; however, this value remains inferior to the comparable diagonal value, hence preserving discriminant validity. These findings substantiate the measurement fit inside the study model. To evaluate discriminant validity, a Heterotrait-Monotrait Ratio (HTMT) analysis was performed, with the findings shown in Table 4.

**Table.3**. Kriteria Fornell-Larcker

| | X1 | Y.1 | Z.1 | Z.2 | Z.3 |
|---|---|---|---|---|---|
| X1 | 0.828 | | | | |
| Y.1 | 0.196 | 0.816 | | | |
| Z.1 | 0.558 | 0.225 | 0.770 | | |
| Z.2 | 0.262 | 0.423 | 0.240 | 0.815 | |
| Z.3 | 0.323 | 0.432 | 0.447 | 0.574 | 0.765 |

**Table.4**. Heterotrait-Monotrait Ratio (HTMT)

| | X1 | Y.1 | Z.1 | Z.2 | Z.3 |
|---|---|---|---|---|---|
| X1 | | | | | |
| Y.1 | 0.267 | | | | |
| Z.1 | 0.652 | 0.294 | | | |
| Z.2 | 0.300 | 0.454 | 0.285 | | |
| Z.3 | 0.402 | 0.493 | 0.540 | 0.659 | |

Table 4 HTMT displays values that quantify the degree of correlation among constructs in the study model. HTMT values below 0.85 or 0.90 signify that the constructions exhibit strong discriminant validity. According to the table, all HTMT values are below the 0.85 threshold, signifying that the constructions in the model possess sufficient discriminant validity. The maximum HTMT value is 0.659, seen between Z.2 and Z.3, signifying a moderately strong yet acceptable association between the conceptions of Professional Teachers in Indonesia and Self-Confidence. The minimum HTMT value is 0.267, seen for X1 and Y.1, signifying a comparatively weak correlation between Professional Teacher Education and Student Learning Outcomes. The outcomes of this HTMT research enhance and corroborate the Fornell-Larcker criterion findings, affirming that the five constructs in the model exhibit significant distinctions and assess disparate concepts. The model's predictive capacity in elucidating variance in endogenous variables was assessed using the coefficient of determination ($R^2$) displayed in Table 5.

**Table.5**. Koefisien Determinasi ($R^2$)

| | R-square | R-square adjusted |
|---|---|---|
| Y.1 | 0.234 | 0.210 |
| Z.1 | 0.311 | 0.304 |
| Z.2 | 0.069 | 0.059 |
| Z.3 | 0.104 | 0.095 |

Table 5 Coefficient of Determination illustrates the extent to which variation in the dependent variable can be elucidated by the independent variables within the model. The $R^2$ score for Y.1 (Student Learning Outcomes) is 0.234, indicating that 23.4% of the variance in student learning outcomes is accounted for by the predictor variables in the model. For Z.1 (Teacher Performance in the Merdeka Curriculum), the $R^2$ score is 0.311, signifying that 31.1% of the variance is explicable by the model. Conversely, Z.2 (Professional Teachers in Indonesia)


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exhibits a low $R^2$ value of 0.069, signifying that merely 6.9% of its variation is explicable. Correspondingly, Z.3 (Self-Confidence) possesses a $R^2$ score of 0.104, signifying that 10.4% of its variability is elucidated by the model. The adjusted $R^2$ score, marginally lower than $R^2$, signifies that the model retains stability when accounting for the number of predictor variables. The model more effectively elucidates variations in Teacher Performance within the Merdeka Curriculum compared to other dependent variables, although its predictive capacity for Professional Teachers in Indonesia is somewhat limited (Asmayawati et al., 2024). To identify potential multicollinearity issues among the predictor variables in the model, the Variance Inflation Factor (VIF) was computed, with the findings presented in Table 6.

**Table.6**. VIF Inner Model

| | **VIF** |
|---|---|
| X1 -> Z.1 | 1.000 |
| X1 -> Z.2 | 1.000 |
| X1 -> Z.3 | 1.000 |
| Z.1 -> Y.1 | 1.250 |
| Z.2 -> Y.1 | 1.493 |
| Z.3 -> Y.1 | 1.758 |

Table 6 is Variance Inflation Factor (VIF) The Inner Model indicates the degree of multicollinearity among the predictor variables in the model. The optimal VIF is below 5, with diminished values signifying reduced collinearity. The data indicates that all pathways in the model have modest VIF values, ranging from 1,000 to 1,758, signifying the absence of a substantial multicollinearity issue. The trajectory from X1 (Teacher Professional Education) to Z.1, Z.2, and Z.3 has an identical VIF value of 1,000, signifying the absence of correlation across predictor factors at this tier. The pathways Z.1, Z.2, and Z.3 to Y.1 (Student Learning Outcomes) exhibit marginally elevated VIF values; nevertheless, they remain far below the concerning threshold, with the maximum value recorded at Z.3 -> Y.1 being 1.758. This model satisfies the assumption of minimal multicollinearity, ensuring that the parameter estimates are stable and accurate (Kyriazos and Poga, 2023). The overall adequacy of the model is assessed using multiple fit indices, comparing the saturated and estimated models as presented in Table 7.

**Table.7**. Model Fit Measuring Results

| | **Saturated Model** | **Estimated Model** |
|---|---|---|
| SRMR | 0.086 | 0.137 |
| d_ULS | 1.861 | 4.721 |
| d_G | 0.735 | 0.844 |
| Chi-square | 398.555 | 428.564 |
| NFI | 0.675 | 0.651 |

Table 7 Model Fit Test Results displays multiple indications to assess the appropriateness of the research model. The SRMR (Standardized Root Mean Square Residual) value of 0.086 for the saturated model is acceptable as it is below the 0.10 threshold, however the estimated model's SRMR value of 0.137 exceeds this barrier, indicating a suboptimal model fit. The d_ULS and d_G values, which denote the Euclidean and geodesic distances between the empirical correlation matrix and the model implications, exhibit significant discrepancies between the saturated and estimated models. The elevated Chi-square values in both models signify substantial discrepancies between the sample and anticipated covariance matrices. The NFI (Normed Fit Index) values of 0.675 for the saturated model and 0.651 for the estimated model

fall short of the required threshold of 0.9, signifying that the model has not attained the optimal level of fit. The findings of the model fit test demonstrate that, despite the model's established validity and reliability from prior analyses, there remains potential for enhancement in its structural fit.

A bootstrapping approach with 100 resamples was conducted to assess the statistical significance of the path coefficients in the model. This bootstrapping methodology is a nonparametric method that does not presume a normal distribution, and yields estimates that are more resilient to type I errors. Figure 3 illustrates the bootstrapping outcomes, presenting the t-statistic values for each path in the model, with values over 1.96 (at the 5% significance level) or 1.65 (at the 10% significance level) signifying a significant effect. The bootstrapping results in Figure 3 validate the statistical relevance of most paths in the model. The relationship between Teacher Professional Education (X1) and Teacher Performance in the Merdeka Curriculum (Z1) exhibits the highest significance, evidenced by a t-statistic of 8.562, significantly exceeding the 1.96 criterion. The trajectory from X1 to Self-Confidence (Z3) demonstrates considerable importance (t = 3.373). Conversely, the pathway from Z1 to Student Learning Outcomes (Y1) exhibits a low t-statistic value (0.440), signifying that the influence of Teacher Performance in the Merdeka Curriculum on Student Learning Outcomes is not statistically significant. This finding highlights the significance of additional mediating variables, specifically Professional Teachers in Indonesia (Z2) and Self-Confidence (Z3), which exhibit t-statistic values exceeding the significance threshold in mediating the relationship between Professional Teacher Education and Student Learning Outcomes. The importance and applicability of the path coefficients in the structural model were evaluated using a bootstrapping process with 100 resamples, yielding the statistics presented in Table 8.

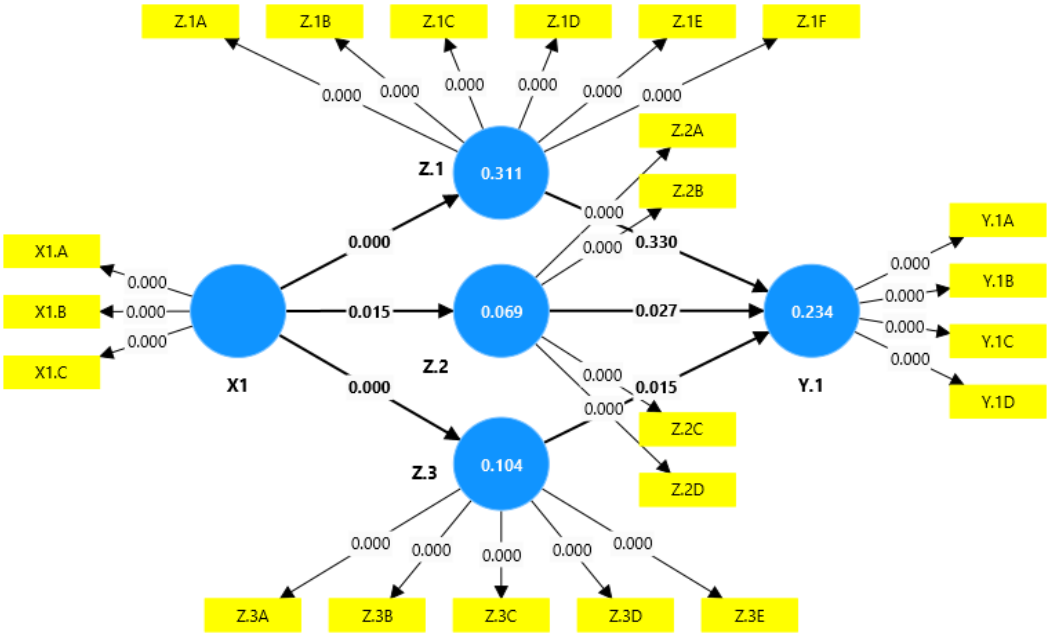


**Figure.3**. Output of Bootstrapping

Table 8 displays the outcomes of evaluating the relevance of the pathways in the structural model. Out of the seven hypotheses evaluated, six were affirmed and one was dismissed. Teacher Professional Education (X1) demonstrates a substantial positive impact on all variables within the model, exhibiting the most pronounced influence on Teacher Performance in the Merdeka Curriculum (Z.1), as evidenced by a path coefficient of 0.558 and the highest t-statistic


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value of 8.562 (p<0.001). X1 significantly influences Student Learning Outcomes (Y.1) with a coefficient of 0.178 (p=0.007), Professional Teachers in Indonesia (Z.2) with a coefficient of 0.262 (p=0.015), and Self-Confidence (Z.3) with a coefficient of 0.323 (p<0.001). Notably, while X1 exerts a substantial influence on Z.1, the impact of Z.1 on Y.1 is negligible, evidenced by a path coefficient of merely 0.045 and a p-value of 0.330, leading to the rejection of this hypothesis. Z.2 and Z.3 have a substantial influence on Y.1, with nearly identical path coefficients of 0.263 (p=0.027) and 0.261 (p=0.015), respectively. The results demonstrate that Professional Teacher Education directly influences Student Learning Outcomes and indirectly affects them through Professional Teachers in Indonesia and Self-Confidence but does not impact Teacher Performance within the Merdeka Curriculum.

**Table.8**. Statistical Significance and Relevance of Path Coefficients

| Research Hypothesis | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Result |
|---|---|---|---|---|---|---|
| X1 -> Y.1 | 0.178 | 0.182 | 0.073 | 2.456 | 0.007 | Accepted |
| X1 -> Z.1 | 0.558 | 0.568 | 0.065 | 8.562 | 0.000 | Accepted |
| X1 -> Z.2 | 0.262 | 0.275 | 0.120 | 2.184 | 0.015 | Accepted |
| X1 -> Z.3 | 0.323 | 0.330 | 0.096 | 3.373 | 0.000 | Accepted |
| Z.1 -> Y.1 | 0.045 | 0.043 | 0.104 | 0.440 | 0.330 | Rejected |
| Z.2 -> Y.1 | 0.263 | 0.265 | 0.137 | 1.922 | 0.027 | Accepted |
| Z.3 -> Y.1 | 0.261 | 0.279 | 0.121 | 2.159 | 0.015 | Accepted |

To assess the mediating effect within the model, an analysis of the indirect effect was performed to determine the importance of the indirect relationship between Teacher Professional Education and Student Learning Outcomes, with the findings detailed in Table 9.

**Table.9**. Specific Indirect Effect

| Research Hypothesis | Original Sample (O) | Sample Mean (M) | Standard deviation (STDEV) | T Statistics (\|O/STDEV\|) | P values | Result |
|---|---|---|---|---|---|---|
| X1 -> Z.3 -> Y.1 | 0.084 | 0.092 | 0.049 | 1.714 | 0.043 | Accepted |
| X1 -> Z.2 -> Y.1 | 0.069 | 0.065 | 0.042 | 1.651 | 0.049 | Accepted |
| X1 -> Z.1 -> Y.1 | 0.025 | 0.025 | 0.060 | 0.425 | 0.336 | Rejected |

Table 9 Specific Indirect Effect examines the mediating influence of Teacher Professional Education (X1) on Student Learning Outcomes (Y.1) via several intermediary factors. The findings indicate that two of the three mediation pathways are validated, whilst one is dismissed. The mediation pathway via Self-Confidence (X1 -> Z.3 -> Y.1) demonstrated significance with an indirect effect of 0.084 (p=0.043), suggesting that instructor Professional Education enhances instructor self-confidence, therefore positively influencing student learning outcomes. The mediation pathway involving Professional Teachers in Indonesia (X1 -> Z.2 -> Y.1) is significant, but with a lesser effect size of 0.069 (p=0.049), indicating that Teacher Professional Education enhances teacher professionalism, which subsequently elevates student learning results. The mediation pathway including Teacher Performance in the Merdeka Curriculum (X1 -> Z.1 -> Y.1) is not significant, exhibiting an indirect effect of merely 0.025 (p=0.336); thus, this

hypothesis is rejected. This outcome aligns with the previous table's findings, indicating that Z.1 exerts no substantial influence on Y.1. These findings highlight the significance of teacher confidence and professionalism as mediators in the correlation between teacher professional education and student learning outcomes (Ofem et al., 2024).

### 3.2 Discussions

The professional teacher program has been consistently implemented in Indonesia since 2021. This approach aims to establish teachers who conform to the learning framework created by the Indo-nesian government (Kholifah et al., 2025; Abdurrahman et al., 2019). The research depicted in Figure 2 indicates that teacher professional education significantly impacts teacher performance and that curriculum modifications affect student learning outcomes. During the COVID-19 pandemic, the Indonesian country responded by developing a new curriculum known as the Merdeka curriculum. The curriculum requires a learning method that is enforced both in the classroom and during individual study by student (Gregson, 2020; Lim et al., 2020; Nilsson, 2010; Chiu et al., 2024). Therefore, a teacher need to adjust to facilitate learning that yields graduates of at least the same quality as prior to the COVID-19 pandemic. Adaptive power is essential for educators to develop learning scenarios that are pertinent to the circumstances. A professional teacher, as outlined in the survey item Table 1, must be capable of preparing lessons, creating instructional films, and analyzing case studies relevant to the field for each session. An enhancement in learning preparation pertinent to student circumstances will be established during and after the epidemic.

The process of attaining professional teaching credentials equips educators to enhance their work ethic, fostering self-confidence, optimism in learning, receptiveness to criticism, and accountability in their actions, particularly in the educational context (Chiu et al., 2024; Abramczyk and Jurkowski, 2020; Klijnstra et al., 2024). A lesson will be developed that aligns with the curriculum and the circumstances of the students. The confidence exhibited by a professional educator will influence the thinking. This will consequently foster a positive perspective. Optimistic thinking and composure in all situations can enhance a teacher's emotional well-being. Confident educators adeptly manage their emotions and thoughts, rendering them resilient to situational challenges, especially throughout curriculum alterations. By adopting a positive mindset, educators can perceive situations favorably and disseminate positive energy.

Consequently, education in vocational high schools in Padang city significantly impacts the de-velopment of teacher performance. This is illustrated in Figure 2. The professional education that teachers have undergone significantly impacts their performance in executing the Merdeka curriculum. It is therefore unsurprising that the Merdeka curriculum has been effectively applied by educators in Padang city thus far. To enhance and refine the skills of certified teachers, they typically convene a subject-specific meeting. This group will also offer support to teachers facing challenges in class preparation or encountering barriers to learning. Consequently, the findings of this study demonstrate that teacher professional education has substantially contributed to the development of proficient graduates, as evidenced by student learning outcomes.

## 4. Conclusions

This study concluded that Teacher Professional Education (X1) significantly directly influences Teacher Performance in the Merdeka Curriculum (Z1), Professional Teachers in Indonesia (Z2), Self-Confidence (Z3), and Student Learning Outcomes (Y1). The relationship


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between Teacher Professional Education (X1) and Teacher Performance in the Merdeka Curriculum (Z1) exhibits the greatest significance, evidenced by a t-statistic of 8.562, significantly exceeding the 1.96 benchmark. Moreover, the most significant outcome is the correlation between teacher professional education and the execution of an autonomous curriculum. The correlation between the two is 0.558. This study's PLS-SEM elucidates the variation in Teacher Performance within the Merdeka Curriculumrelative to other dependent variables. However, the predictive capacity for Professional Teachers in Indonesia is comparatively weak, indicating an absence of significant multicollinearity. Consequently, the parameter estimates in the model can be regarded as stable and reliable.

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