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How does principal's instructional leadership shape teacher performance mediated by teacher self-efficacy in Indonesian education context?

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Introduction: This study seeks to examine the relationships among principal instructional leadership (PIL), teacher self-efficacy (TSE), and teacher performance (TP) within the Indonesian educational setting, specifically in schools implementing the Merdeka Belajar curriculum.

Methods: Employing a quantitative approach utilizing Partial Least Square Structural Equation Modeling (PLS-SEM), this research involved a sample of 127 productive teachers randomly selected from 247 teachers. Surveys were administered to measure perceptions of PIL, TSE, and TP, and relevant literature was reviewed to provide theoretical frameworks and research hypotheses.

Results: The findings reveal significant direct relationships between PIL and both TSE (0.721) and TP (0.598), indicating that strong instructional leadership positively influences teachers' self-efficacy and performance. Moreover, TSE is found to directly impact TP (0.358), suggesting that teachers' beliefs in their capabilities play a crucial role in their instructional practices and outcomes. TSE is also identified as a significant mediator in the relationship between PIL and TP (0.258), highlighting the importance of fostering teachers' self-efficacy to enhance their performance indirectly through instructional leadership.

Discussion: This research underscores the crucial significance of instructional leadership in influencing school culture, which ultimately affects teacher confidence and facilitates teacher performance. By understanding the mechanisms through which PIL impacts TSE and TP, educational leaders can implement strategies to foster a supportive environment that empowers teachers.

KEYWORDS

instructional leadership, teacher performance, self-efficacy, merdeka belajar curriculum, teacher confidence

1 Introduction

Amid the Fourth Industrial Revolution and the emergence of Society 5.0, the need for educational reform becomes apparent. Society 5.0 focuses on enhancing the quality of life and discovering innovation centres, unlike the Industrial 4.0 era, which focused on production processes. This is an effort towards transformation and improvement by

integrating the online world, where human work is transferred to technology (Harahap et al., 2023). The development of technology and information significantly impacts various aspects of societal life, including the field of education. However, in reality, many people still use technology and information unwisely. Therefore, to prepare students with character in the era of Society 5.0, schools need good habituation, especially teachers. They are the learning facilitators who determine the success of education in schools (Lesmana et al., 2023). Teachers, the key figures in the education system, hold a pivotal role in shaping the trajectory of progress, whether it leads to advancement, stagnation, or regression in education. The ever-evolving fields of science and technology act as motivators for educators to deliver pertinent and contemporary learning experiences (Maisyaroh et al., 2017). Teachers, as pivotal figures in the education landscape, play a crucial role in shaping educational progress amidst evolving technological landscapes. However, challenges such as resistance to change hinder the effective integration of technology into teaching practices (Aspi, 2022). Some obstacles include adapting optimally to using Information Technology (IT) for educational purposes and creating enjoyable and creative learning experiences. The quality of education is difficult to improve if teachers are not of high quality and professionalism (Rachmawati, 2022). Ultimately, the inability to address these challenges impacts the quality of teachers' performance in carrying out their duties.

Furthermore, in the era of the "Merdeka Belajar" curriculum, teachers are required to be creative and innovative in their teaching strategies to develop competencies and reinforce the values of the student profile that align with the principles of Pancasila. In the teaching process, teachers must pay special attention to learners' development and individual stages, focusing on essential materials. Technology is also utilized optimally to support the learning process. Evaluation and reflection are conducted regularly to ensure the effectiveness of learning (Efendi et al., 2023a). Several initiatives have been undertaken to enhance teacher performance in Indonesia, including training programs and providing incentives through certification policies. However, it can be observed that these efforts have not uniformly resulted in improved teacher performance nationwide. Researchers have explored the issue of low teacher performance in the "Merdeka Belajar" era. Previous studies suggest that many teachers in school settings still lack a thorough understanding of the "Merdeka Belajar" curriculum paradigm, both conceptually and practically (Komariah et al., 2022; Sari et al., 2023). Hence, there is a need for a deeper understanding and evaluation of teacher performance in the "Merdeka Belajar" curriculum era through an analysis of factor models involving other relevant variables.

In parallel, school principals are critical in promoting student-centred education and facilitating self-directed learning. Through effective leadership, principals can support teachers in translating educational freedom into meaningful learning experiences, aligning with the demands of the digital era (Efendi et al., 2023b). The shift towards self-directed learning empowers schools to develop "Merdeka Belajar" curriculum, emphasizing different learning approaches and technology integration. However, challenges such as limited teacher competencies and suboptimal implementation persist. Through mentoring programs, school principals can support teachers in translating educational freedom into meaningful student learning experiences, fostering skill mastery and democratic interaction. This transition to self-directed learning aligns with the current digital era, aiming to equip learners with the necessary skills for the 5.0 society revolution while promoting extracurricular activities, research, entrepreneurship, and practical experiences to enhance employability and competitiveness. The school principal's leadership plays a crucial role as a determinant of the school's success in achieving its goals. Effective leadership encompasses three critical aspects in the context of learning: defining the school's mission and objectives, designing academic structures and processes, and developing individuals. Research findings regarding school leadership and learning emphasize three primary pathways: (1) defining the school's mission and goals, (2) crafting academic structures and processes, and (3) fostering human development (Hallinger and Heck, 2011). However, challenges arise when leadership cannot be reduced to a list of dispositions, strategies, or behaviors. Therefore, understanding the determinants of teacher performance becomes imperative (Bafadal et al., 2019). The success of school leadership can be measured by its ability to create an effective learning environment, foster the growth and development of learners, and initiate changes to enhance performance. In the context of learning, instructional leadership by the school principal is critical to achieving quality teaching and learning in schools (Gawlik, 2018). Several studies indicate that instructional leadership by school principals is closely related to teacher behaviour, including teacher self-efficacy (Özdemir et al., 2020; Alanoglu, 2021; Karakose et al., 2024). Ultimately, teachers' self-efficacy plays a crucial role in their performance. High levels of teacher self-efficacy are critical to success in carrying out teaching tasks, overcoming challenges, and achieving set goals (Gunawan et al., 2019). Teacher self-efficacy is positively associated with cognitive engagement and performance and significantly impacts students' academic success (Ashton and Webb, 1986).

Therefore, a deeper understanding of the impact of school principal leadership on teacher performance is needed, as well as how self-efficacy can mediate this relationship in the era of "Merdeka Belajar." This research aims to explore and investigate the influence of instructional leadership on teacher performance mediating by teacher self-efficacy, which is expected to contribute to understanding the dynamics of interaction between instructional leadership, self-efficacy, and teacher performance in the "Merdeka Belajar" era in Indonesia. This research is urgent because no specific study examines and develops a model of the influence of instructional leadership on teacher performance through teacher self-efficacy in the "Merdeka Belajar" era. This research outlined significant importance for educational policymaking, teacher training, school leadership practices, and filling research gaps. By understanding the interplay between instructional leadership, teacher self-efficacy, and teacher performance in the "Merdeka Belajar" era in Indonesia, policymakers can develop more effective strategies to support teachers and improve educational outcomes. This research also informs tailored teacher training programs and support initiatives, empowers school leaders to create supportive environments, and contributes valuable insights to the broader body of knowledge on educational dynamics. Finally, this paper's finding will inform readers of the interconnectedness of various factors within the educational ecosystem and underscores the need for targeted interventions to strengthen leadership practices and teacher beliefs to optimize educational outcomes.

2 Literature review

This section will outline several concepts regarding teacher performance, instructional leadership, and teacher self-efficacy. First, we provide a general overview of each variable under study. Second, we present several indicators that serve as benchmarks in specific contexts. Third, we explore the interrelation and influence concepts among the variables under study based on previous research studies. Finally, that construct a visualization of the connections among the variables that we will investigate based on the concepts and research we have found and compiled.

2.1 Teacher performance

Performance is the outcome of work achieved in fulfilling responsibilities assigned by leaders in terms of quality and quantity (Satria, 2021). Furthermore, employees or workers who are dedicated to achieving organizational goals are referred to as performance. Performance can be reflected through daily work activities, providing an overview of how employees or workers carry out tasks to achieve organizational goals (Efendi, 2023a). Therefore, in the context of teacher performance, it is the outcome of teachers' activities within the school organization to achieve overall educational goals. Regarding teacher performance, it is stated that this does not happen automatically but instead needs to be identified, facilitated, developed, and maintained to achieve the school's vision (Kusumaningrum et al., 2020). Finally, the attention of the school principal to teacher performance is necessary. Two main factors can influence teacher performance: environmental factors, including the organization, and factors originating from within the employees themselves (Kamijan, 2021). Teacher performance can be seen in the learning process, such as planning, implementation, and teaching evaluation (Octaviarnis et al., 2021).

Teacher performance in the realm of education in Indonesia can be assessed by referring to Permenpan (Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform Number 16 the Year 2009, the stages of learning include planning, implementation, and evaluation; (Permenpan No 16, 2009). In the planning stage, teacher performance can be observed by developing learning objectives via diagnostic assessment. Diagnostic assessment is conducted to identify students' competencies, strengths, and weaknesses, allowing for the customization of learning to meet students' needs (Rachman et al., 2021). Subsequently, the implementation stage focuses on applying the lesson plan and classroom management, implementing strategies, utilizing learning resources, and engaging students. In the context of "Merdeka Belajar," this means that teachers must teach according to the curriculum and students' development, focusing on fundamentals and integrating technology into the learning process (Efendi et al., 2023a). Lastly, the evaluation stage pertains to measuring students' learning progress by evaluating strategies and methods and providing feedback. Assessment and reflection, as well as teaching based on methods, develop skills and enhance students' Pancasila values profiles (Efendi et al., 2023a). The implementation of the "Merdeka Belajar" curriculum as a continuation of the 2013 curriculum involves using assessment techniques across cognitive, affective, and psychomotor aspects (Achmad et al., 2022).

2.2 Principal instructional leadership

Leadership derived from the Anglo-Saxon term "lead," which denotes "guiding a ship," has evolved over centuries to encompass a wide array of elements involved in influencing individuals, groups, or organizations (Usman, 2015). Leaders are viewed as individuals who navigate complex networks of systems and communication within groups, organizations, or societies (Yukl, 2014). Pertiwi and Oka Suryadinata (2019) defines leadership as the leader's actions to influence individuals and groups toward achieving specific goals under certain conditions. In the context of educational organizations, especially schools, the role of the principal as a leader is highly crucial in enhancing the quality of education within the school (Kusumaningrum et al., 2020). When a school has an effective principal, great teachers will be present and work diligently; they strive, grow, and ultimately impact student growth (Bafadal, 2016).

Instructional leadership can be described as the principal's initiative to ensure that teachers can effectively deliver instruction and perform their duties, which is expected to ultimately enhance student academic achievement (Juharyanto, 2017). Similarly, other studies have found a correlation between the leadership style of the principal and teacher performance (Elpisah and Hartini, 2019; Mayasari, 2021; Yulyanti and Hasanah, 2021). Furthermore, research in Malaysia found that instructional leadership benefits education practitioners in planning professional development programs (Hui and Singh, 2020). School organisational conditions, such as leadership centred on learning opportunities, positively impact teacher self-efficacy (Huang et al., 2020). This is consistent with Karim et al. (2020) indicate that the ability of school principals to manage the curriculum and create a conducive school climate positively impacts teacher self-efficacy.

Instructional leadership is the key for school principals to empower teachers to teach at their fullest potential (Bafadal et al., 2019). Instructional leadership focuses on enhancing student learning (Bush et al., 2022). Gumus et al. (2018) discovered that around 50% of leadership model research between 1980 and 1995 centered on instructional leadership. Notably, Hallinger and Murphy's (1985) theory stood out prominently, stemming from their instructional management model and informed by 10 elementary school principals' observations and a literature review on school effectiveness. Hallinger and Murphy (1985) stressed the significance of instructional leadership, which directly addresses curriculum and teaching methods, in achieving institutional effectiveness, especially within the teaching and learning framework. The dimensions used to explore and measure instructional leadership include (1) Formulating the vision, mission, and goals of the school organization; (2) Strategically managing school resources, particularly in the context of learning; (3) Planning, coordinating, assessing learning activities, and implementing the school curriculum; (4) Enhancing the professional development of teachers/staff through promotion and participation aimed at improving the learning capacity of teachers or educators; and (5) Ensuring the availability of a conducive organizational environment within the school (Burhanuddin et al., 2018).

2.3 Teacher self-efficacy

Self-efficacy denotes an individual's confidence to effectively execute tasks and achieve favourable outcomes within a particular

context. It pertains to one's belief in their competence to navigate challenges and accomplish objectives within a defined setting or domain (Bandura, 1997). When facing academic or professional challenges, an individual's level of self-efficacy will influence their decisions, motivation, preparation, and perseverance (Bandura, 1997). In social cognitive career theory, self-efficacy is central to career development (Lent and Brown, 2019). Self-efficacy can be seen as an individual's belief in their ability to manage both their work tasks and their environment (Rachmawati, 2022). Teacher self-efficacy refers to their belief in their ability to handle professional tasks, particularly in the teaching profession, successfully (Yuen et al., 2020). Teacher self-efficacy can be evaluated through the utilization of the General Self-Efficacy Scale (GSE), which comprises three primary dimensions: level (difficulty level of tasks), generality (breadth of behavioural domains), and strength (intensity of belief; Bandura, 1997).

Sehgal et al. (2017) suggest that schools should focus on enhancing teacher self-efficacy through teacher collaboration to improve teacher performance regarding lesson delivery, teacher-student interaction, and student learning management. A study by Runhaar and Sanders (2016) found that job self-efficacy can strengthen knowledge sharing among teachers and enhance overall teacher performance. Additionally, research indicates that teachers with high self-efficacy positively influence student performance by maintaining adequate teaching quality (Finnegan, 2013; Shahzad and Naureen, 2017). Therefore, the findings of this research provide insights into the importance of teacher self-efficacy in enhancing the quality of teaching and the holistic performance of teachers. The instructional leadership of the school principal positively influences teacher self-efficacy. Previous research shows that teachers' perception of principal leadership positively impacts teacher self-efficacy (Xie et al., 2022). Expressly, the positive effects of principal instructional leadership practices on teacher self-efficacy in classroom management, instruction, and student engagement have been noted (Bellibas and Liu, 2017). Furthermore, it has also been found that instructional leadership practices, directly and indirectly, enhance teacher efficacy through staff trust in the principal (Ma and Marion, 2021). Thus, it can be concluded that teacher self-efficacy acts as a mediator in the influence of principal instructional leadership on teacher performance, specifically in the "Merdeka Belajar" curriculum era.

Building upon the conceptual review and existing research, this study seeks to empirically test hypotheses formulated based on the conceptual framework illustrated in Figure 1.

> **H1**: PIL directly affects TSE; **H2**: TSE directly affects TP; **H3**: PIL directly affects TP, and **H4**: TSE acts as a significant mediating in measuring the effect of PIL on TP.

3 Methods

3.1 Research design

This study employs a quantitative approach using a survey design method, utilizing a questionnaire as the instrument (Cresswell and Clark, 2014). Moreover, the utilized model is the regression design model with a systematic process or procedure. Initially, theory identification is executed concerning the examined variables. Subsequently, hypotheses stemming from the theoretical discoveries are formulated. Finally, an analysis is conducted on the examined variables utilizing the field-acquired data. The analyses include descriptive and Structural Equation Modelling (SEM) analysis utilizing IBM SPSS and PLS (Hair et al., 2021b). The selection of PLS-SEM for our study, which examines cross-sectional hypotheses and the relationships between variables, is justified based on its flexibility, predictive power, suitability for exploratory analysis, robustness to data distributional assumptions, ability to handle complex variable structures, and applicability to cross-sectional research designs. Model fit parameters from SmartPLS 3 are evaluated based on several criteria, such as SRMR, d_Uls, d_G, Chi-Square, and NFI. Research results that pass through various stages of analysis with SmartPLS 3 can be considered reliable or robust. The main objective of this research is to explore the structural impact of school principals' instructional leadership, teacher self-efficacy, and teacher performance, serving as benchmarks for educational institution excellence.

3.2 Research population and sample

The research population consists of all teachers employed in state high schools within the Sinjai District that hold an A accreditation status. This choice was made because the study seeks to evaluate teacher performance, and schools with an A accreditation are deemed to have met performance standards. There are 14 state high schools in the Sinjai District (source: https://dapo.kemdikbud.go.id/). Five schools with an A accreditation status were selected from this total, as detailed in Table 1.

The sampling method utilized is simple random sampling, employing the Isaac and Michael table specific to the population, with cumulative error rates set at 1, 5, and 10% (Isaac and Michael, 1971). In this study, a 10% margin of error was employed. Table 1 shows a population size of 247, resulting in a sample size of 127 teachers.

3.3 Research instrument

In this section, we will present three latent variables assessment including its indicators, namely teacher performance (TP), principal instructional leadership (PIL), and teacher self-efficacy (TSE) as mediating variables (see Appendix).

3.3.1 Teacher performance

To analyse and assess teacher performance achievement, we employed several dimensions as benchmarks based on the Minister of Administrative and Bureaucratic Reform Regulation No. 16 of 2009 concerning teacher performance evaluation. This evaluation includes the stages of teaching, namely planning, implementation, and evaluation (Permenpan No 16, 2009). Additionally, our survey instrument employed a rating scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument's reliability analysis resulted in a high-reliability estimate of 0.951, alongside validity ranging from $r = 0.437$ to 0.865. Items failing to meet the criteria were subsequently excluded from the analysis.

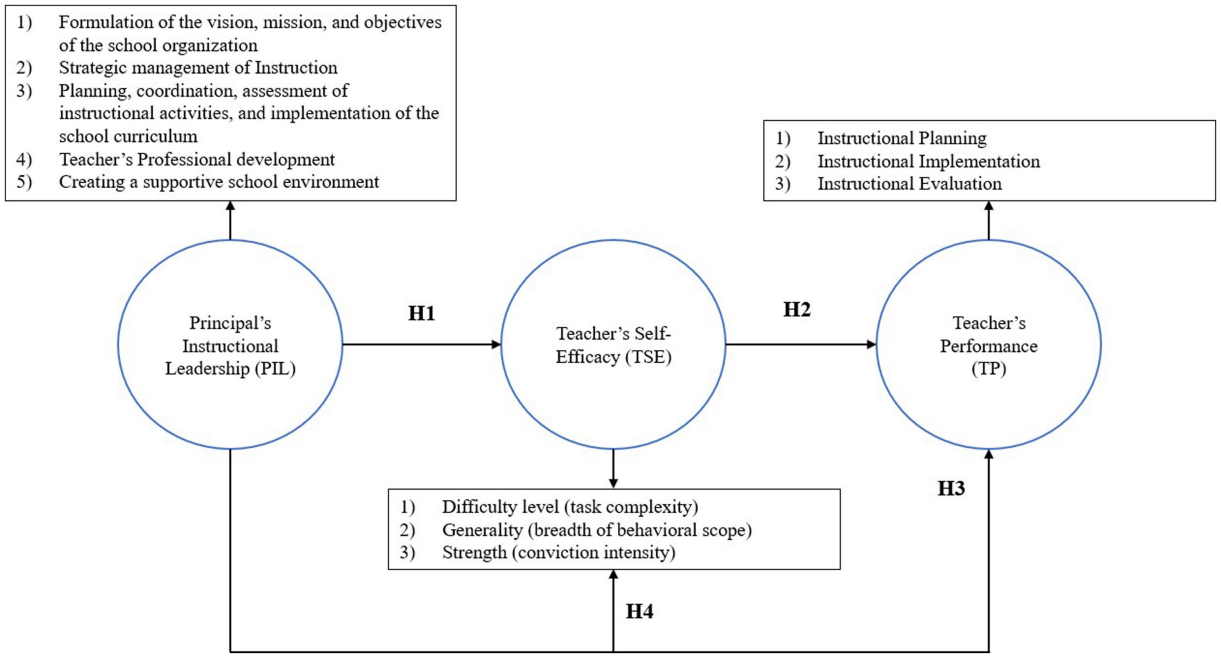

FIGURE 1
Conceptual model and hypotheses development.

TABLE 1 Population and sample.

No	School name	Population	Sample
1	UPT SMAN 1 Sinjai	63	30
2	UPT SMAN 2 Sinjai	62	30
3	UPT SMAN 3 Sinjai	45	23
4	UPT SMAN 5 Sinjai	38	24
5	SMAN 13 Sinjai Tengah	39	20
	Total	247	127

Source: https://dapo.kemdikbud.go.id/.

3.3.2 Principal instructional leadership

In our investigation of school principal instructional leadership, we embraced a multifaceted approach, assessing various dimensions, including the formulation of the school's vision, mission, and goals; strategic management of school resources, especially concerning learning; planning, coordinating, and evaluating learning activities alongside implementing the school curriculum; promoting professional development among teachers; and cultivating a supportive school environment (Burhanuddin et al., 2018). Our survey instrument featured a rating scale from 1 (strongly disagree) to 5 (strongly agree). We obtained a robust reliability estimate of 0.986 for the instrument through meticulous reliability analysis. Furthermore, validity ranged from $r = 0.466$ to 0.887. Any items failing to meet these rigorous criteria were systematically excluded from subsequent analyses.

3.3.3 Teacher self-efficacy

To assess teacher self-efficacy, we measured various dimensions, including the level of task difficulty, the breadth of behavioural domains, and the generality dimension (Bandura, 2012). Our survey instrument featured a rating scale spanning from 1 (strongly disagree) to 5 (strongly agree). The reliability analysis revealed a reliability estimate of 0.765, while validity ranged from $r = 0.148$ to 0.664. Any items failing to meet the set criteria were excluded from subsequent analysis.

3.4 Statistical analysis

Initially, Teacher background information is analyzed using SPSS, and hypotheses are tested using the PLS-SEM model. We deliberately chose not to control teacher background information from the PLS-SEM because our study aimed to elucidate PIL's direct and indirect impacts on TSE and TP rather than delving into the specific influence of individual teacher characteristics. Moreover, incorporating teacher background information as a control variable could have introduced unwarranted complexity, potentially overshadowing the primary relationships under investigation. Furthermore, given the constraints of limited sample size and the exploratory nature of our research, we emphasized simplicity and model interpretability to ensure the clarity of our findings. SPSS was also used for descriptive statistical analysis. Following that, a cross-sectional analysis was performed using Structural Equation Modeling with the PLS (PLS-SEM) method, incorporating latent constructs to evaluate the fit indices of the entire model. This analysis included latent variables such as the principal's instructional leadership, the teacher's self-efficacy, and the teacher's performance. Moreover, PLS-SEM consists of two distinct models: the measurement model and the structural analysis model PLS (Hair et al., 2021b). The outer measurement model encompasses the estimation of Average Variance Extracted (AVE), discriminant validity, Variance Inflation Factor

(VIF), and composite reliability (CR). It is recommended that the AVE value exceeds 0.5, while the CR value should be 0.7 or higher (Henseler et al., 2015; Hair et al., 2021b). Additionally, discriminant validity is evaluated using the Fornell and Larcker Criterion, which compares the square root of AVE values with correlations among latent variables. According to this criterion, the square root of AVE for each construct should be greater than its highest correlation with any other construct (Fornell and Larcker, 1981).

To test our hypotheses, we developed two structural equation models: firstly, a direct effect model, which involves examining the impact between the exogenous constructs [principals' instructional leadership and the endogenous construct (teachers' performance)], as well as a partial mediation model, where we introduced direct relationships from the exogenous constructs (Teachers' self-efficacy) to the endogenous constructs (teachers' performance). Secondly, we evaluated the indirect effect of exogenous constructs (primary instructional leadership) on the endogenous constructs (teachers' performance) mediated by Teachers' Self-Efficacy. Assessing the structural model in SEM PLS 3 involves analyzing coefficients of determination, chi-square results (R2), Q2, SRMR, NFI, d_G, and d_Uls (Hair et al., 2021b). Following the structural model fit test, the subsequent step entails bootstrapping analysis, which is a method for evaluating significance to measure (1) direct Effects, (2) indirect effects, and (3) overall structural effects (Hair et al., 2021b). Various metrics, including R2, adjusted R2, outer loading, and cross-loading, determine the significance levels in this study. Additionally, the bootstrapping procedure is employed, utilizing t statistics to evaluate the influence of exogenous variables on endogenous variables. Additionally, the *p* value, serving as an indicator of significance, is obtained through the bootstrapping procedure. The original research sample is utilized as regression coefficients to complete the structural equation (Henseler et al., 2015).

4 Results

In analyzing this research study, partial least squares (PLS) were used to answer the research hypothesis that had been established based on the model we built (Sarstedt et al., 2017; Hair et al., 2021a). Two stages of analysis were performed: the first was the measurement model, and the second was the structural model assessment.

4.1 Respondent research profile

In this section, we outline the demographics of our research participants, including the distribution of teachers across schools, gender distribution, certification status, and civil servant rank. The demographics of the research participants are necessary as they provide a better understanding of the characteristics of the group under study. The distribution of teachers among schools, gender distribution, certification status, and civil servant rank will give a more comprehensive overview of the composition and profile of the research participants.

4.1.1 Teacher's school distribution

Figure 2 below illustrates that this study's highest proportion of respondents originates from SMAN 1 and SMAN 2, comprising 23.62% each, collectively representing over half of the total respondents across the five schools examined. Conversely, respondents from SMAN 13 exhibit the lowest participation rate at 15.75%.

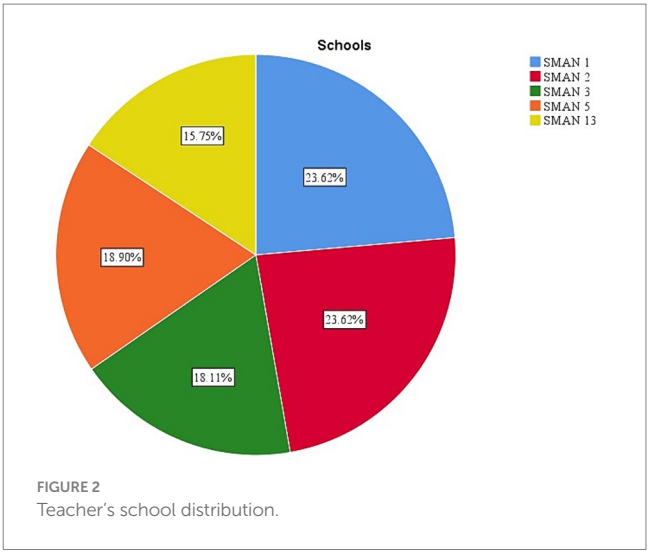

FIGURE 2
Teacher's school distribution.

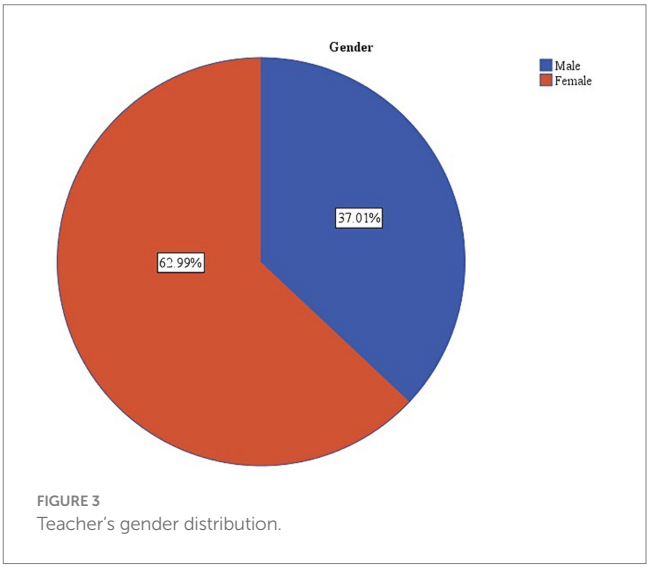

FIGURE 3
Teacher's gender distribution.

4.1.2 Teacher's gender distribution

In Figure 3, the gender distribution of teachers reveals a predominantly female respondent profile, accounting for 62.99% of the total, whereas males constitute only 37.01%. This indicates a significant imbalance, with the male percentage notably less than half that of females in this study.

4.1.3 Teacher's certification status

Figure 4 presents the visualization of teachers' certification status, indicating that the majority of respondents in this study are certified teachers, comprising 63.78% of the total. This figure significantly surpasses half of the number of teachers who are not certified.

4.1.4 Teacher's group rank civil servant

As illustrated in Figure 5, a substantial portion of participants in this study occupy the civil servant group rank of teachers at level

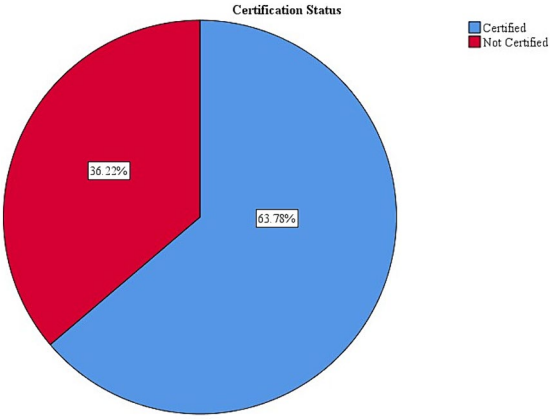

FIGURE 4
Teacher's certification status.

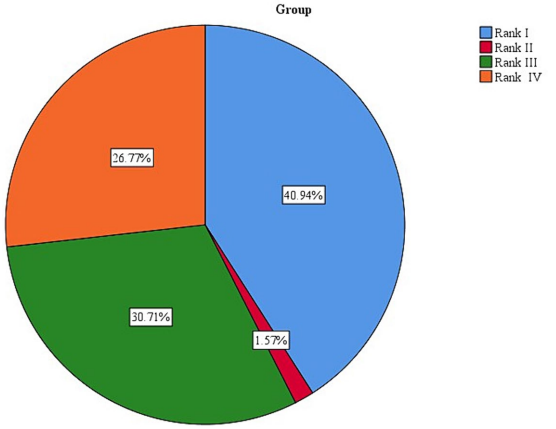

FIGURE 5
Teacher's group rank distribution.

I (low rank), constituting 40.94% of the total, which notably exceeds half of level IV (highest rank). Conversely, the least represented group rank is level II, comprising only 1.57% of the sample.

4.2 Descriptive statistics

Table 2 below shows that the three indicators' skewness and excess kurtosis values are relatively close to zero. Although excess kurtosis ranges from 6.764 to 10.278, skewness falls within the range of −2.176 to −1.977. This suggests that each indicator demonstrates a distribution that closely resembles a normal distribution, as discussed by Kock (2016). In other words, the data distribution for these indicators appears to be symmetrical and not heavily tailed.

4.3 Convergent validity, composite reliability, and VIF

In Table 3, the outer loading values for each item indicate that they exceed the specified threshold of 0.7 for items associated with the PIL, TSE, and TP variables. Additionally, the average variance extracted (AVE) value surpasses 0.5, consistent with the predetermined criterion, and the composite reliability (CR) score exceeds 0.7. Furthermore, the Variance Inflation Factor (VIF) values for each latent variable indicator suggest minimal correlation or collinearity, all below 10. Moreover, the Heterotrait-Monotrait (HTMT) analysis was conducted to evaluate the collinearity of latent variables, as detailed in Table 4.

4.4 Descriptive statistics

According to Table 4, the correlation coefficients between different latent variables are all below 0.90, indicating that each variable possesses its distinctiveness. This observation facilitates the exploration of additional effects in subsequent analyses, as there is no evidence of substantial overlap or redundancy between the latent variables. As a result, the assessments of convergent validity, composite reliability, and collinearity in this study are deemed to be satisfactory.

4.5 Discriminant validity

Discriminant validity is evaluated using the Fornell and Larcker Criterion. This well-established approach compares the square root of the Average Variance Extracted (AVE) values with the correlations between latent variables. According to the criterion established by Fornell and Larcker (Fornell and Larcker, 1981), for a construct to demonstrate uniqueness, its square root AVE should exceed its highest correlation with any other construct. Table 5 presents the results, indicating that the coefficients of the reflective measurement model in correlation with other constructs are consistently lower than the respective square root coefficients, thereby confirming the discriminant validity of the constructs. This indicates that the PIL, TSE, and TP constructs exhibit distinctiveness, as their correlations with other constructs do not surpass their respective square root values.

4.6 Goodness of fit

Table 6 illustrates that almost all the outcomes of the model, specifically the saturated model, meet the criteria outlined by the estimated model. This indicates that the model utilized in this study aligns well with the available data in the field (Henseler and Sarstedt, 2013). Consequently, conducting further bootstrapping analysis would allow for examining the influence between variables with confidence in the model's suitability (Figure 6).

4.7 Structural model and hypotheses

Table 7 illustrates that all null hypotheses (H0) are rejected based on p-value (< 0.05) and t-value (> 1.96). The direct effect of PIL on TP is 59.8%, and on TSE is 72.1%, while the impact of TSE on TP is 35.8%. Notably, the highest value among all path coefficients is from PIL to TSE, underscoring the pivotal role of TSE as a mediating variable. This is supported by the observed rise in the impact of

TABLE 2 Descriptive statistics of latent variables.

	N	Min	Max	Mean		Std. deviation	Skewness		Kurtosis	
	Stat.	Stat.	Stat.	Stat.	Std. error	Stat.	Stat.	Std. error	Stat.	Std. error
PIL	127	17	65	56.03	0.634	7.144	−1.977	0.215	7.350	0.427
TSE	127	7	35	29.42	0.356	4.017	−1.568	0.215	6.764	0.427
TP	127	14	65	54.91	0.601	6.775	−2.176	0.215	10.278	0.427
Valid N (listwise)	127									

TABLE 3 Assessment of convergent validity, composite reliability, and collinearity.

Construct	Item code	β	α	C.R	AVE	VIF	Reliability decision	Validity decision	Collinearity decision
PIL	PIL1	0.825	0.951	0.956	0.628	3.126	Yes	Yes	Yes
	PIL2	0.808				3.397			Yes
	PIL3	0.751				3.106			Yes
	PIL4	0.708				2.009			Yes
	PIL5	0.770				2.854			Yes
	PIL6	0.809				3.344			Yes
	PIL7	0.830				3.693			Yes
	PIL8	0.855				3.815			Yes
	PIL9	0.767				2.487			Yes
	PIL10	0.798				2.855			Yes
	PIL11	0.794				2.972			Yes
	PIL12	0.795				2.695			Yes
	PIL13	0.783				2.984			Yes
TSE	TSE1	0.811	0.917	0.933	0.668	2.417	Yes	Yes	Yes
	TSE2	0.808				2.544			Yes
	TSE3	0.805				2.345			Yes
	TSE4	0.825				2.543			Yes
	TSE5	0.894				5.753			Yes
	TSE6	0.760				2.032			Yes
	TSE7	0.811				3.896			Yes
TP	TP1	0.754	0.952	0.958	0.636	2.860	Yes	Yes	Yes
	TP2	0.791				3.051			Yes
	TP3	0.791				2.652			Yes
	TP4	0.821				3.648			Yes
	TP5	0.771				3.075			Yes
	TP6	0.849				3.354			Yes
	TP7	0.825				3.579			Yes
	TP8	0.860				4.779			Yes
	TP9	0.844				3.615			Yes
	TP10	0.849				3.926			Yes
	TP11	0.735				2.335			Yes
	TP12	0.729				2.686			Yes
	TP13	0.730				3.007			Yes

TABLE 4 HTMT assessment.

	PIL	TP	TSE
PIL			
TP	0.895		
TSE	0.761	0.843	

TABLE 5 Fornell-Larcker criterion assessment.

	PIL	TP	TSE
PIL	0.793		
TP	0.856	0.797	
TSE	0.721	0.790	0.817

TABLE 6 Goodness of model assessment.

	Saturated model	Estimated model	Consideration
SRMR	0.062	< 0.10	Good Fit
d_ULS	2.189	> 0.05	Good Fit
d_G	2.007	> 0.06	Good Fit
Chi-Square	1150.989	< 3.00	Marginal Fit
NFI	0.730	> 0.80	Marginal Fit

principal instructional leadership (PIL) on teacher self-efficacy (TSE) by 25.8% when TSE serves as a mediating role.

Table 8 shows that the coefficient of determination (R Square) when PIL and TP together have an effect on TSE is 0.520, with an adjusted R Square value of 0.517. This means that all constructs PIL and TP influence TSE by 51.7%. The influence of PIL and TP is considered strong. The R Square value of PIL and TSE on TP is 0.792, with an adjusted R Square value of 0.795. This means that the complete exogenous constructs (PIL, TSE, and TP) provide an influence of 79.5%. These results lead to the conclusion that the complete exogenous constructs have a strong impact on the endogenous construct. These results conclude that the variables of instructional leadership and teacher self-efficacy determine teacher performance. Further elaboration on these findings will be provided in the following section.

5 Discussion

5.1 Direct effect

The initial research findings indicate a direct relationship between principal instructional leadership (PIL) and teacher self-efficacy (TSE; H1). This suggests that PIL can considerably impact teachers' self-efficacy through various indicators assessed in this study, primarily by offering guidance, support, and resources to enhance teaching practices. Principals demonstrating robust instructional leadership are frequently visible, actively engaged in curriculum development and management, and set clear expectations for instructional quality. By fostering a culture of collaboration or supportive environment, professional growth, and open communication, principals are able to empower teachers to feel more confident in their teaching abilities. Consistent with Karim et al. (2020), school principals' proficiency in effectively managing the curriculum and fostering a conducive school climate significantly positively influences teachers' self-efficacy levels. This study highlighted the pivotal role of school principals in shaping the educational environment and supporting teachers in their professional development endeavours. Specifically, when principals demonstrate competence in curriculum management and cultivate a positive atmosphere within the school community, teachers are more likely to experience heightened levels of confidence in their abilities to effectively fulfil their classroom roles. Additionally, Alanoglu (2021) also highlights the connection between Principal Instructional Leadership (PIL) behaviours and Teacher Self-Efficacy (TSE) beliefs, suggesting that school principals can boost teachers' confidence by demonstrating effective instructional leadership. This, in turn, can improve student achievement by promoting positive classroom behaviours. In line with that, Özdemir et al. (2020) found that the instructional leadership actions demonstrated by principals have a positive impact on teachers' motivation and focus on tasks, as well as on students' capacity to learn and teachers' self-assessment skills concerning both themselves and their students.

The second result of this research shows that a teacher's self-efficacy (TSE) directly affects teacher performance (TP; H2). This demonstrates that a teacher's self-efficacy (TSE) can influence teacher performance (TP) in planning, implementing, and evaluating instructional practices. Specifically, when teachers possess high levels of self-efficacy, they tend to approach their tasks with confidence, enthusiasm, and perseverance. In the planning phase, teachers with strong self-efficacy are more likely to set ambitious yet attainable goals, design engaging and effective instructional activities, and anticipate potential challenges with a problem-solving mindset. Additionally, during implementation, TSE plays a crucial role in their ability to effectively deliver lessons, manage classroom dynamics, and adapt instruction to meet the diverse needs of their students. Teachers who believe in their capabilities are likelier to maintain a positive attitude, employ varied teaching strategies, and persist in facing obstacles, thereby maximizing student engagement and learning outcomes. Moreover, in the evaluation stage, TSE influences the thoroughness and accuracy of assessing student progress and the effectiveness of instructional strategies. Teachers with high self-efficacy are more inclined to reflect on their teaching practices critically, seek feedback, and make adjustments based on assessment data to enhance student learning. This finding is consistent with Shahzad and Naureen (2017) discovered that TSE correlates positively with students' academic performance by maximizing teacher-teaching effectiveness. Furthermore, Finnegan (2013) highlights that teachers possessing high levels of self-efficacy anticipate and have confidence in their ability to deliver challenging instruction effectively, which they believe will lead to improved student performance. These teachers actively engage in behaviours to reinforce their perception of themselves as effective educators.

The third finding in this study indicates that principal instructional leadership (PIL) has a direct impact on teacher performance (TP; H3). This implies that when principals exhibit strong instructional leadership, they offer clear guidance, support, and resources to teachers, thereby enhancing their ability to plan effective instruction, implement engaging teaching strategies, and evaluate student progress. In the planning phase, principals who exhibit instructional leadership effectively communicate academic goals, expectations, and

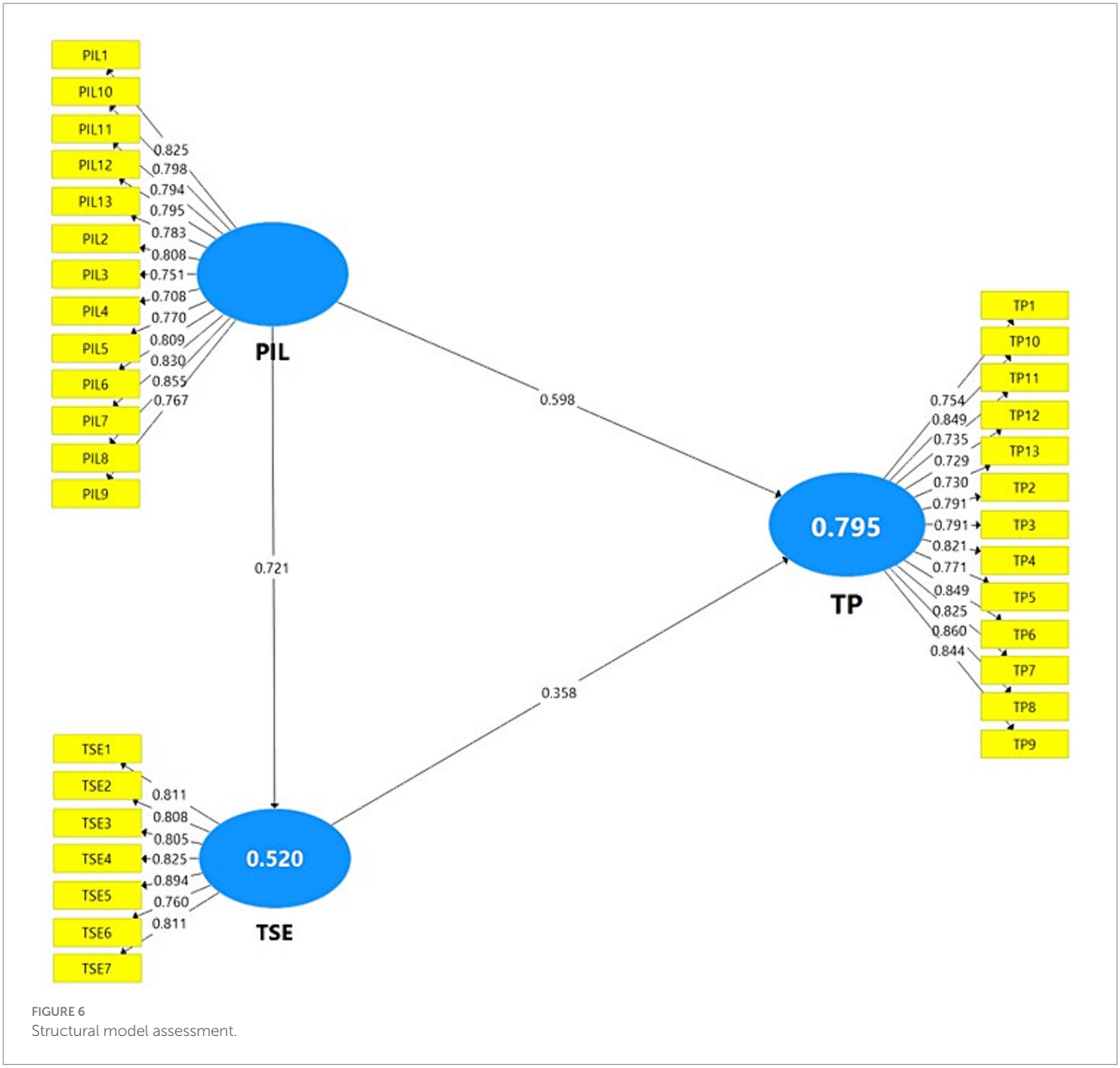

FIGURE 6
Structural model assessment.

TABLE 7 Summary of hypotheses assessment.

Path	Total direct effect	Total indirect effect	*t*-value	*p*-value	Bias	Confident interval bias corrected		Significance decision
						5.0%	95.0%	
PIL → TP	0.598		9.008	0.000	0.005	0.478	0.697	Yes
PIL → TSE	0.721		8.797	0.000	−0.015	0.563	0.820	Yes
TSE → TP	0.358		5.521	0.000	−0.011	0.255	0.463	Yes
PIL → SE → TP		0.258	4.155	0.000	−0.011	0.162	0.368	Yes

standards to teachers. They facilitate collaborative planning sessions, offer valuable feedback, and provide access to relevant instructional materials and professional development opportunities. As a result, teachers are better equipped to develop well-structured lesson plans that align with "Merdeka Belajar" curriculum objectives and cater to diverse student needs. Furthermore, during implementation, principals' instructional leadership sets the tone for a positive school environment that values effective teaching practices. Principals who actively observe classroom instruction, provide constructive feedback and model best practices inspire teachers to strive for excellence in their teaching. By fostering a supportive environment where risk-taking and innovation are encouraged, instructional leaders empower

TABLE 8 Coefficient of determination R square.

	R square	R square adjusted	Interpretation
TP	0.795	0.792	< 0.75 strong
TSE	0.520	0.517	< 0.75 strong

teachers to experiment with new instructional methods and adapt their teaching strategies to meet the evolving needs of students. Overall, principal instructional leadership catalyzes enhancing teacher performance throughout the instructional process. By providing guidance, support, and feedback, instructional leaders empower teachers to excel in planning, implementing, and evaluating instructional practices, ultimately leading to improved student achievement and academic success. Consistent with Elpisah and Hartini's (2019) study, applying leadership style, particularly delegation in instructional leadership, positively influences teacher performance. The same finding was also found by Mayasari (2021) that using discipline methods, motivation, work coaching, rewards, and principal leadership can improve teacher performance. Finally, the study by Yulyanti and Hasanah (2021) found that leaders possessing a well-defined and robust vision and mission, coupled with traits such as optimism, support, encouragement, and guidance, motivate and empower their subordinates to fulfil their responsibilities effectively. This style of leadership has the potential to enhance the performance of teachers.

5.2 Indirect effect

The fourth finding of this study establishes that teacher self-efficacy (TSE) significantly mediates the relationship between principal instructional leadership (PIL) and teacher performance (TP), contributing a total effect of 0.258 (H4). This suggests that teacher self-efficacy acts as a mediating, amplifying the positive impact of principal instructional leadership on teacher performance, particularly in the planning, implementing, and evaluating instructional activities. By nurturing a supportive and empowering school culture, principals can cultivate teachers' self-efficacy, thereby enhancing their performance and ultimately fostering improvements in student achievement. This discovery is in line with a study by Karakose et al. (2024), which delved into the interconnection between Principal Instructional Leadership (PIL) and Teacher Self-Efficacy (TSEF) and investigated the mediating function of Collective Efficacy (CEF). Employing meta-analytical structural equation modelling (MASEM), the research synthesized data from 26 studies, representing a total participant pool of 19,584 individuals across various geographical regions worldwide. The findings demonstrated notable correlations between PIL and both CEF and TSEF. Besides that, it can also be emphasized that teacher certification status might be a significant impact on increasing teacher performance, as the finding show its highest percentage with 63.78%. Certified teachers undergo rigorous training and professional development, gaining diverse strategies to engage students and promote learning. Certification also signals a commitment to ongoing professional growth and adherence to established standards, fostering a culture of continuous improvement among educators. This is aligns with previous studies (i.e., Amaya et al., 2018; Amruddin et al., 2021). Furthermore, teachers' gender can also signal the highest performance, as the finding shows that female teachers show the highest percentage (62.99%). Female teachers can maximize their performance compared to male teachers through their strong interpersonal skills, communication abilities, and higher levels of empathy. They often excel in building rapport with students, understanding diverse needs, and seeking professional development opportunities. Additionally, societal expectations may drive them to strive for excellence, contributing significantly to student success.

6 Conclusion

In summary, the discussion section unveils the substantial influence of principal instructional leadership and teacher self-efficacy on teacher performance across instructional domains, revealing their intricate connections. The initial findings underscore a direct link between principal instructional leadership and teacher self-efficacy, emphasizing the indispensable role of instructional leaders in fostering a nurturing and empowering school climate conducive to enhancing teachers' confidence and efficacy, ultimately bolstering performance outcomes. Furthermore, the tangible impact of teacher self-efficacy on teacher performance underscores the pivotal role of educators' beliefs in their abilities to shape instructional practices and student achievement positively. Teachers with elevated levels of self-efficacy exhibit heightened enthusiasm, resilience, and effectiveness in crafting, implementing, and evaluating instructional strategies, thereby contributing to heightened student success.

Therefore, the direct impact of principal instructional leadership on teacher performance highlights the critical importance of effective leadership practices in fostering a positive school culture that prioritizes collaboration, professional development, and excellence in teaching. Principals who provide clear guidance, robust support, and ample resources to teachers empower them to excel in their instructional roles, thereby driving improved student learning outcomes. Furthermore, the mediating of teacher self-efficacy in the correlation between principal instructional leadership and teacher performance highlights the critical importance of nurturing teachers' confidence in their abilities to enhance the beneficial impact of instructional leadership on teacher effectiveness. In summary, these results underscore the interdependency among principal instructional leadership, teacher self-efficacy, and teacher performance, highlighting the pivotal role of effective leadership strategies and teachers' beliefs in promoting excellence in instructional methods and student learning achievements.

7 Limitations and future research

The current quantitative study, while informative, may not fully capture the nuanced experiences and perspectives of teachers regarding principal instructional leadership, teacher self-efficacy, and their impact on teacher performance. While quantitative data provides valuable insights, it may lack depth in comprehending the subjective experiences of educators, which are often multifaceted and context-dependent. Additionally, the sample size in this study is relatively small and limited to a specific region within the Indonesian context. As such, the findings may not be generalizable to broader populations or diverse educational settings. Hence, future research in this area could explore diverse avenues to deepen our understanding of the complex relationship between

principal instructional leadership, teacher self-efficacy, and teacher performance. One avenue is incorporating qualitative research methods, such as in-depth interviews and focus groups, to delve into teachers' lived experiences and perspectives. Qualitative approaches offer a nuanced exploration of the factors influencing teachers' beliefs, attitudes, and behaviours, providing valuable insights that quantitative data may not fully capture. Additionally, forthcoming studies could examine the role of digital technologies in supporting principal instructional leadership and fostering teacher self-efficacy. Given the growing integration of technology in education, investigating how digital platforms can facilitate instructional leadership practices, offer tailored professional development opportunities, and enhance collaboration among educators is essential. This line of inquiry could uncover innovative strategies for enhancing teacher effectiveness and improving student learning outcomes in the digital era. Finally, considering the certification status and gender of teachers could be agenda for future research to examine exactly its role as mediator role of principal instructional leadership and how far these two variables can predict teachers' performance.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Research Ethics Committee of Universitas Negeri Malang. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

Elfira: Conceptualization, Formal analysis, Resources, Visualization, Writing – original draft. Rasdiana: Conceptualization, Formal analysis Methodology, Software, Visualization, Writing – original draft, Writing – review & editing. Fitrawati: Funding acquisition, Investigation, Writing – original draft, Writing – review & editing. MJ: Funding acquisition, Investigation, Resources, Supervision, Writing – review & editing. KR: Investigation, Resources, Supervision, Writing – review & editing. AA: Funding acquisition, Investigation, Resources, Writing – review & editing. Enaldi: Data curation, Formal analysis, Funding acquisition, Methodology, Software, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted without any commercial or financial relationships that could potentially create a conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2024.1401394/full#supplementary-material

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