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The Influence of Principal Leadership and Non-Physical Work Environment on Teacher Performance at SMA Negeri 6 Semarang

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Abstract

This study is motivated by the importance of teacher performance in education, and aims to analyze the influence of principal leadership and non-physical work environment on teacher performance at SMA Negeri 6 Semarang, both partially and simultaneously. The results of the study are expected to provide insight into improving teacher performance through a better managerial approach. The quantitative research method used is an ex post facto survey design. The sample consisted of 64 teachers selected through purposive sampling, and data were collected using a questionnaire. To analyze the influence of independent variables (principal leadership and non-physical work environment) on the dependent variable (teacher performance), multiple regression analysis was conducted through SPSS and JASP software. The findings showed that both independent variables had a significant effect on teacher performance at the location. Partially, both variables had a positive effect. The results of the simultaneous ANOVA test also confirmed that these two factors have a joint effect on teacher performance. The conclusion of the study is that principal leadership and non-physical work environment play an important role in improving teacher performance. Improving the quality of leadership and optimizing the work environment can contribute to enhancing teacher performance in planning, implementing, and evaluating learning. Therefore, it is important for all related parties to continue to pay attention to and develop these two factors to improve the quality of education in schools.

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INTRODUCTION

The leadership of school principals has a strategic role in determining the success of education in schools (Kurniawati, 2022). Effective principals are able to direct the school's vision and mission, motivate teachers, and create a work climate that supports improving teacher professionalism (Beno et al., 2022). A principal is a person who is considered qualified and appropriate enough to occupy the position of school leader (Brown & R. Wynn, 2009). The person most responsible for the implementation of the education system in schools. Responsible for the governance of school management. In fact, the success of a school is an achievement pinned on the principal (Price, 2012). So the burden as a school principal is not easy. Because

there are many challenges that must be overcome to achieve success. A good result will not be achieved if it is not supported by good leadership, good management, good human resources and good governance (Lingam & Lingam, 2015).

Previous studies have shown that good leadership can improve teacher performance through support, providing constructive feedback, and optimal resource management (Bagdžiūnienė et al., 2022). Teachers are the key to a school's success, it will not be possible for schools to produce quality graduates without results and hard work of teachers. Teachers are the primary source of school life (Saputra & Darmawan, 2023). So it is very unfortunate if teachers who are the spearhead of school success are not treated well by the principal. Teachers as the spearhead of school success must be able to display good performance, performance that can contribute to the development and improvement of quality in schools (Bagdžiūnienė et al., 2022). Teachers who have professional skills and skills will easily partner with the principal. So that the tasks imposed on teachers will be carried out so easily to be carried out (Schleicher, 2012). Likewise, a school principal who has leadership skills will be very easy to get along with and influence his subordinates to complete the tasks assigned to him (Northfield, 2014). Because a leader is the ability to influence others, the ability to move others so that they can achieve their desired goals and direction.

Quality education is born from a good planning system with good materials and governance (good governance system) and delivered by good teachers with a good educational component (Hénard & Roseveare, 2012). Therefore, improving the quality of education must be accompanied by mature steps and supported by professional school principals and teaching staff. Improving the quality of education requires systematic planning, transparent governance, and professional and dedicated teaching staff (Toor & Offori, 2008). School principals play the role of leaders who ensure that every component of education runs optimally, starting from curriculum management, teacher empowerment, to creating a conducive learning environment (Ismaya, 2024). In addition to the leadership of the principal, the non-physical work environment is also an important factor in improving teacher performance (Siddik et al., 2018). The non-physical work environment includes interpersonal relationships, organizational culture, and the social support that teachers receive in the workplace (Putra & Br, 2024). A supportive work environment will increase teachers' motivation, comfort, and job satisfaction, which ultimately has a positive impact on their performance in teaching and educating students (Hoy & Miskel, 2012).

However, in practice, there are still challenges in the implementation of effective leadership and the creation of a conducive non-physical work environment. Several studies show that teachers in some schools still face obstacles such as lack of good communication with principals, lack of professional support, and high work pressure that can affect their performance (İnandı et al., 2022; Suriagiri et al., 2022). Therefore, an in-depth study is needed to understand how the effectiveness of the principal's leadership and the non-physical work environment contribute to improving teacher performance, especially at SMA Negeri 6 Semarang which is the location of this research also has problems with leadership management in improving teacher performance.

METHOD

This study is a quantitative descriptive research with an ex post facto design, which aims to analyze the influence of principal leadership and non-physical work environment on teacher performance without providing direct treatment to the subject. Data was collected through a questionnaire distributed to teachers of SMA Negeri 6 Semarang with a purposive sampling technique of 64 respondents. The research procedure includes the planning stage (instrument preparation, problem determination, and permit management), data collection (distribution of questionnaires to selected respondents), data analysis (test of the validity and reliability of the instrument, descriptive statistical analysis, and multiple linear regression

test to test the influence between variables), as well as the stage of conclusion and reporting of results prepared in the form of scientific reports and recommendations. The data is analyzed using the help of statistical software to obtain valid and reliable results.

The data analysis technique in this study uses a quantitative approach that begins with descriptive statistical analysis to describe the data characteristics of each variable, such as minimum, maximum, mean, and standard deviation values. Furthermore, a validity and reliability test was carried out on the questionnaire instrument to ensure the feasibility of the measuring instrument. Inferential analysis was carried out using multiple linear regression to determine the influence of principal leadership and non-physical work environment on teacher performance, both partially and simultaneously. The F test is used to see the significance of the influence together, while the t-test is used to see the significance of each independent variable partially. All analyses are carried out with the help of JASP statistical software to obtain accurate and reliable results. Then to describe how this research was conducted, the following is a model of this research.

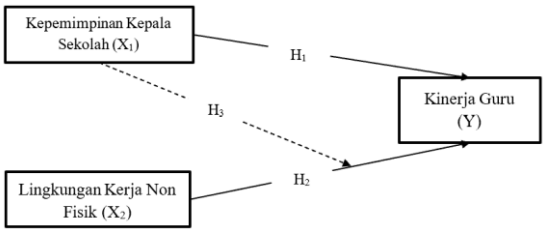

Figure 1. Research model

Based on the above framework, the hypotheses proposed in the study are as follows:

- H1: Principal leadership has a positive effect on teacher performance at SMA N 6 Semarang.
- H2: Non-physical work environment has a positive effect on teacher performance at SMA N 6 Semarang.
- H3: Principal leadership significantly moderates the relationship between non-physical work environment and teacher performance

RESULTS AND DISCUSSIONS

Classical Prerequisite and Assumption Tests

The data of the research results were statistically analyzed using a gradual regression analysis technique. Before the regression test is carried out, the data is analyzed first to find out if it meets the classical assumptions, namely: an important step in ensuring that the data used in statistical analysis meets the assumptions necessary to produce valid and appropriately interpretable results. Some of the basic assumptions made include:

Validity Test Analysis

The validity test of this questionnaire uses JASP Software. In the validity test, the researcher presented 20 items of teacher performance questionnaires, 26 items of non-physical work environment questionnaires and 20 items of school principals leadership questionnaires. The results of the analysis showed that all items in each variable had a significant correlation coefficient value ($p < 0.05$), which means that each questionnaire item had a fairly strong relationship to the total score of the variable. This indicates that the items in the questionnaire are valid and are able to accurately measure the construct in question. Thus, questionnaires on teacher performance, non-physical work environment, and principal's leadership were declared suitable for use in further research data collection. The high validity of each item also strengthens the instrument's reliability in representing real conditions in the field.

Reliability Test Analysis

The questionnaire reliability test in this study used the Alpha Crounbach formula with the help of the JASP program. The results of the analysis are presented in Table 1

Table 1. Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Teacher Performance	0.782
Principal's Leadership	0.871
Non-Physical Work Enviroment	0.718

Note. Of the observations, complete pairs of cases were used.

Based on the results of the analysis in Table 1, Cronbach's Alpha score was 0.782 for the teacher performance variable, 0.871for the principal's leadership, and 0.718 for the non-

physical work environment. All of these values are above the commonly used minimum reliability standard and acceptable, which is 0.70. This shows that the instruments in all three variables have a very high level of internal consistency and are reliable in measuring the construct in question. Thus, the questionnaire used in this study can be categorized very well in terms of reliability, so that the data obtained can be trusted and used for further analysis.

Normality Test

Before conducting the regression test, a normality test is carried out as one of the pre-test requirements which states that the residual distribution must follow the normal distribution and can be tested through the Standardized Residuals Histogram graph presented in Figure 2.

Figure 2. Normality Test Analysis

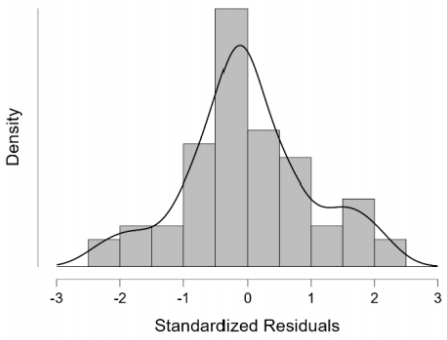

Figure 2, it can be seen that the histogram of standardized residuals shows a pattern that resembles a normal distribution, characterized by a bell-shaped curve shape and symmetrical around zero. This is reinforced by the kernel density line that follows the normal form of distribution. Thus, it can be concluded that the residual data is normally distributed, making it eligible for further regression analysis.

Multicollinearity Test

Multicollinearity tests are important in multiple regression analysis, where high correlations between independent variables can influence the results; this can be tested by calculating the Variance Inflation Factor (VIF) and the value of Tolerance (> 0.10) and VIF (< 10).

Table 2. Coefficients Multicollinearity

							Collinearity Statistics	
Model		**Unstandardized**	**Standard Error**	**Standardized**	**t**	**p**	**Tolerance**	**VIF**
H_0	(Intercept)	4.509	0.074		60.609	< .001		
H_1	(Intercept)	1.491	0.313		4.758	< .001		
	Non-Physical Environment	0.610	0.098	0.670	6.220	< .001	0.547	1.829
	Principal's Leadership	0.103	0.072	0.155	1.439	0.155	0.547	1.829

Based on Table 2, it is known that the Tolerance value for the Non-Physical Environment and Principal Leadership variables is 0.547, respectively, and the VIF value is 1.829. Since both the Tolerance value is greater than 0.10 and the VIF value is less than 10, it can be concluded that there is no multicollinearity between independent variables in this regression model. This means that these variables can be used together in multiple regression models without causing bias due to the high linear relationships between predictor variables.

Teacher Performance at SMA Negeri 6 Semarang

To find out an overview of teacher performance at SMA Negeri 6 Semarang, a descriptive analysis was carried out on three main aspects, namely Planning, Implementation, and Evaluation and Development. The data used came from 68 respondents without any missing value data. Descriptive statistical results of each aspect of teacher performance are presented in Table 3.

Table 3. Results of Descriptive Statistical Analysis of Teacher Performance

	Planning	*Implementation*	*Evaluation & Development*
Valid	64	64	64
Missing	0	0	0
Median	4.833	4.833	4.625
Mean	4.523	4.555	4.465
Std. Deviation	0.649	0.621	0.607
Coefficient of variation	0.144	0.136	0.136
Variance	0.421	0.385	0.369
Shapiro-Wilk	0.749	0.740	0.803
P-value of Shapiro-Wilk	< .001	< .001	< .001

The results in Table 3 shows that the highest average is in the Implementation aspect,

which is 4,554, with a low level of variation (coefficient of variation 0.136), indicating that most teachers have relatively even competence in this aspect. On the other hand, the Planning aspect has the highest coefficient of variation of 0.143, indicating that there is no significant difference between teachers in planning learning. In the aspect of Planning, although the average value obtained by teachers is 4,523 with a coefficient of variation of 0.143, it shows that there is uniformity in teachers' ability to plan learning activities. This is an important concern because thorough planning is the main foundation for the success of the learning process. In the Evaluation and Development aspect, the average value of 4,465 with a coefficient of variation of 0.136 shows that teachers' abilities in implementing learning are also quite varied. The relatively small standard deviation (0.774) indicates that although the average implementation is moderate, there is consistency among teachers in terms of implementing learning in the classroom. This variation can reflect differences in the application of methods, mastery of materials, and teacher interactions with students.

Meanwhile, in the Implementation aspect, in addition to having the highest average (4,554), this aspect also shows the smallest variation in line with the Evaluation and Development aspect (with a coefficient of variation value of 0.136). This means that most teachers at SMA Negeri 6 Semarang are relatively uniform in carrying out the implementation for the process, as well as conducting evaluations and learning outcomes, and developing themselves based on the results of the evaluation. This is a positive indicator that the majority of teachers have a high commitment to improving and developing the quality of their learning in a sustainable manner.

Multiple Regression Analysis Results

Multiple regression analysis was conducted to test the influence of principals' leadership and non-physical work environment on teacher performance. Variant Analysis (R2) or Determination Test is to determine the extent of the influence of independent variables on the dependent variable, the value of the determination coefficient can be shown in Table 4.

Table 4. Model Summary – Kinerja Guru

Model	*R*	*R²*	*Adjusted R²*	*RMSE*
H_0	0.000	0.000	0.000	0.595
H_1	0.830	0.688	0.673	0.340

Based on the results of multiple regression analysis shown in Table 4, it is known that the H_1 model has a determination coefficient value (R^2) of 0.688. This means that 68.8% of the variation in teacher performance can be explained by independent variables, namely the principal's leadership and non-physical work environment. Meanwhile, the remaining 31.2% was explained by other variables outside the model that were not examined in this study. An Adjusted R^2 value of 0.673 indicates that after adjusting for the number of variables and the sample used, the influence of the two independent variables remains significant on teacher performance. The Root Mean Square Error (RMSE) value of 0.340 indicates a relatively low rate of model prediction error. This indicates that the regression model used is quite good in predicting teacher performance. In contrast, in the H_0 model that does not include independent variables, an R^2 value of 0.000 indicates that there is no influence described by the model, so the H_1 model is more appropriate to explain the relationship that occurs. This finding confirms that the principal's leadership and the non-physical work environment, both of which are variables that interact, play an important role in determining teacher performance.

Furthermore, the results of the partial test (t-test) shown in Table 5 provide information about the influence of each independent variable on teacher performance. Based on the table, it can be seen that the two variables, namely Non-Physical Environment, has a significant influence on teacher performance, because the p value on the variable is smaller than 0.05 (< 0.001). While the Principal's Leadership does not significantly influence teacher performance because the p value on the variable is greater than 0.05 (0.155).

Table 5. Coefficients – Partial Test

Model		Unstandardized	Standard Error	Standardized	t	p	Collinearity Statistics Tolerance	VIF
H_0	(Intercept)	4.509	0.074		60.609	< .001		
H_1	(Intercept)	1.491	0.313		4.758	< .001		
	Non-Physical Environment	0.610	0.098	0.670	6.220	< .001	0.547	1.829
	Principal's Leadership	0.103	0.072	0.155	1.439	0.155	0.547	1.829

Regression equation: Y = B1*X1 +B2*X2 +C. Teacher Performance = 0.103 * Leadership of the Head of School + 0.610*Lingk. Non-Physical + 1.491

The regression coefficient for the Non-Physical Environment is 0.610, indicating that every one unit increase in the Non-Physical Environment will increase teacher performance by 0.610, with a significant t-value of 6.220. Likewise, the Principal's Leadership has a coefficient of 0.103, which means that every one unit increase in the Principal's Leadership will increase teacher performance by 0.103, with a t-value of 1.439. The Tolerance and VIF values for both variables were 0.546 and 1.829, respectively, which indicates the absence of significant multicollinearity problems, since the Tolerance value is greater than 0.1 and the VIF is less than 10. This shows that these variables are not highly correlated and acceptable in the model. The regression equation obtained was as follows: Y = 0.103 * Principal's Leadership + 0.610 * Non-Physical Environment + 1.491.

The next analysis is to test the influence of the principal's leadership and the non-physical work environment on teacher performance simultaneously, shown in Table 6.

Table 6. ANOVA – Simultaneous Test (F Test)

Model		Sum of Squares	df	Mean Square	F	p
H_1		15.363	3	5.121	44.137	< .001
	Residual	6.956	60	0.116		
	Total	22.319	63			

Based on Table 6, the F value of 44.137 with a p value of < 0.001 shows that the regression model simultaneously has a significant influence on teacher performance. This F-test tests whether independent variables (principal's leadership and non-physical work environment) together can explain variations in teacher performance. With a very small p-value (smaller than 0.05), we can conclude that the leadership of the principal and the non-physical work environment simultaneously have a significant influence on teacher performance at SMA Negeri 6 Semarang. In addition, the Sum of Squares for regression is 15.363, which indicates the variability described by the regression model, while the Sum of Squares for residual is 6.956, which reflects variability that the model cannot explain. With a mean square for regression of 5.121 and an F value of 44.137, it shows that this model is quite strong in explaining the influence of the two variables on teacher performance. Overall, the results of this simultaneous test show that the two independent variables together play an important role in influencing teacher performance, and the model used in this analysis is shown to have good predictive power.

Hypothesis Test

The hypothesis test used is the individual significance test (t-test). This test is used to determine the magnitude of the influence of each independent variable individually (partially) on the dependent variable. This t-test was carried out using the help of the SPSS program. The results of the t-test on the JASP output can be seen in the Coefficient table presented in Table 7.

Table 7. Coefficients MRA Model

Model		Unstandardized	Standard Error	Standardized	t	p	Collinearity Statistics Tolerance	Tolerance
H_0	(Intercept)	3.750×10^{-4}	0.074		0.005	0.996		
H_1	(Intercept)	0.090	0.049		1.851	0.069		
	Non-Physical Environment	0.489	0.094	0.537	5.189	< .001	0.485	2.063
	Principal's Leadership	0.100	0.065	0.150	1.538	0.129	0.547	1.829
	Non-Physical Environment ✻ Principal's Leadership	-0.233	0.061	-0.307	-3.811	< .001	0.802	1.247

The results of the partial test (t-test) were conducted to test the hypothesis regarding the direct influence of Principal Leadership on Teacher Performance in the final moderation model. Based on the validated analysis results table (Table 7), the t-count value was obtained as 1.538 with a significance level of p-value of 0.129. Because the p-value (0.129) is greater than the specified significance level ($\alpha = 0.05$), then H_0 fails to be rejected (accepted). This means that the

hypothesis (H_2) which states that principal leadership has a positive and significant direct effect on teacher performance is not supported by the data. In other words, statistically, principal leadership is not proven to be a direct predictor of teacher performance after taking into account the influence of the non-physical environment and its interaction effects. These results strengthen the role of the principal's real leadership in this model, namely as a moderating variable. Its main role is not as a direct driver, but as a contextual factor that significantly changes the strength of the influence of the non-physical environment on teacher performance, as evidenced by the results of the highly significant interaction test ($p < .001$). Thus, the importance of leadership in this study does not lie in its direct 'drive', but in its ability to create a 'climate' or 'shield' that makes teachers more resilient to the dynamics of the work environment.

Hypothesis testing H1 regarding the influence of non-physical environment on teacher performance shows positive and significant results. Based on the t-test results on the final MRA model (Table 7), the Non-Physical Environment variable obtained a t-count value of 5.189 with a significance level of p-value <.001. Because the p-value (<.001) is much smaller than the specified significance level ($\alpha = 0.05$), H_0 is rejected and H_1 is accepted. This confirms that the non-physical environment has a statistically significant influence on teacher performance partially. The regression coefficient (unstandardized coefficient) of +0.489 indicates a positive relationship. The interpretation is that for every one-point increase in the Non-Physical Environment score, Teacher Performance is predicted to increase by 0.489 points, assuming other variables are constant. In other words, the better the non-physical work environment such as harmonious interpersonal relationships, open communication, and a supportive organizational climate the higher the performance produced by teachers. This result is consistent with various previous theories and studies that emphasize the importance of a conducive work environment as one of the main predictors of employee productivity and performance.

The main and most significant finding of this study lies in the results of the moderation hypothesis test (H3). Statistical analysis shows a statistically significant interaction effect between Non-Physical Environment and Principal Leadership in influencing Teacher Performance ($B = -0.233$, $t = -3.811$, $p < .001$). This result definitively confirms that the influence of the non-physical environment on teacher performance is not uniform, but rather a complex relationship and depends on the existing leadership context. If viewed more deeply, the negative interaction coefficient reveals a very interesting dynamic: where effective principal leadership functions to weaken or substitute for the positive influence of the non-physical environment. This phenomenon is very much in line with the Leadership Substitutes Theory, which states that certain individual or organizational characteristics can neutralize or replace the need for formal leadership. In this context, very high leadership seems to create conditions in which teachers have achieved optimal levels of motivation, security, and support directly from their leaders. As a result, "additional" support from the non-physical environment (such as supportive relationships between coworkers) no longer has a significant impact on performance not because the environment has become unfavorable, but because teachers' need for such support has been met by a more powerful source, namely their leaders.

Path Analysis

Path analysis is a development of regression analysis. Correlation and regression analysis is only to find out the direct relationship between one variable or multiple correlation.

Table 8. Path coefficients

Tabel 7. Path coefficients

			Estimate	Std. Error	z-value	p	95% Confidence Interval Lower	Upper
Non-Physical Environment	→	Teacher Performance (Y)	0.610	0.102	5.948	< .001	0.409	0.810
Principal's Leadership	→	Teacher Performance (Y)	0.103	0.058	1.794	0.073	-0.010	0.216
Principal's Leadership	→	Non-Physical Environment	0.494	0.116	4.249	< .001	0.266	0.722

Based on the results of the path analysis presented in Table 8, it can be concluded that several things related to the direct influence and interaction of variables on teacher performance can be concluded:

1. The Influence of Principal Leadership on the Non-Physical Environment. Influence of Leadership on Environment: It was found that Principal Leadership has a positive and highly significant influence on Non-Physical Environment (Estimate = 0.494, $p < .001$). This shows that effective leaders are proven to be able to create and build a better working environment for teachers.

2. The Influence of Non-Physical Environment on Teacher Performance (Y). Furthermore, Non-Physical Environment is also proven to have a positive and very significant influence on Teacher Performance (Estimate = 0.610, $p < .001$). This confirms that the environment that has been formed by the leader is indeed an important factor that drives performance.

3. The Influence of Non-Physical Work Environment Interaction and School Principals' Leadership on Teacher Performance (Y). The Full Mediating Effect: When the two paths above are analyzed together, the direct effect of Principal Leadership on Teacher Performance becomes insignificant because it has a p-value greater than 0.05 (Estimate = 0.103, $p = 0.073$). However, if Leadership on Non-Physical Environment, they will have a significant effect (Estimate = 0.494, $p < .001$). This combination of findings confirms the existence of a full mediation effect, where the influence of leadership on performance is fully channeled through its ability to create a conducive Non-Physical Work Environment. In other words, leadership works by improving the environment first, and the good environment is what in turn improves teacher performance.

DISCUSSION

The influence of principal leadership on teacher performance is also an important concern in this study. Based on the results of the analysis, it was found that principal leadership has a significant positive influence on teacher performance, with a coefficient value of 0.100 in the regression analysis and the results of the t-test showing a p value <0.001. This shows that the better the principal's leadership, the higher the teacher performance that can be achieved. This finding is in line with research conducted by Manalu & Kristianingsih, (2024) which found that effective leadership from the principal can influence teacher motivation and commitment, which ultimately contributes to improving the quality of learning.

In this case, a principal who has the ability to provide clear directions, foster good relationships with teachers, and create a positive school climate, can strengthen teacher performance in the classroom. For example, research by Ayu Ratmini et al., (2019) also emphasized that the transformational leadership of school principals plays a big role in improving teacher performance because it is able to provide inspiration, encouragement to innovate, and create an environment that supports teacher professionalism. In addition, these findings are also relevant to research conducted by Santiari et al., (2020), which showed that school principals who are able to carry out transformative leadership roles can improve teacher performance by creating a positive and supportive work culture.

The influence of the non-physical work environment on teacher performance at SMA Negeri 6 Semarang shows that factors such as a positive work atmosphere, social support, and good interpersonal relationships between colleagues and school leaders can significantly improve teacher performance. This is in line with the findings in a study by Dendhana et al., (2023) which stated that a supportive non-physical work environment, such as good communication between fellow teachers and between teachers and principals, can strengthen a sense of ownership of work and increase teachers' motivation to give their best in the classroom. In this context, a harmonious and mutually supportive work environment is able to provide a sense of comfort for teachers in carrying out their duties.

The existence of a space to share ideas, experiences, and challenges in learning also enhances the spirit of collaboration, which in turn contributes to improved teaching quality. Research by Najmah Medina Sari Nasution & DR, (2017) also shows that non-physical work environment factors that include positive working relationships, rewards for achievements, and the existence of continuous training and development can improve teacher performance, even reduce the level of work stress which has the potential to reduce the quality of teaching (Putri et al., 2025). Therefore, the management of a supportive work environment is very important in creating optimal working conditions for teachers to be able to achieve better.

The influence of the principal's leadership and the non-physical work environment simultaneously on teacher performance at SMA Negeri 6 Semarang showed significant results. The regression analysis conducted showed that the combination of effective principal leadership and a supportive non-physical work environment contributed significantly to improving teacher performance. Good leadership of a school principal, which includes wise decision-making, the ability to provide motivation, and the ability to manage and support learning activities, can increase teachers' confidence in carrying out their duties (Tanjungpura, 2024; Wicaksono et al., 2024). In addition, a conducive non-physical work environment, which includes a positive work atmosphere, harmonious interpersonal relationships, and support from peers and school leaders, also strengthens the collaborative spirit and increases teacher motivation to achieve optimal learning goals.

Research by Susilo & Sarkowi, (2018) also shows that strong leadership and a healthy work environment can work synergistically to create ideal working conditions, which in turn encourages teachers to work better and more productively. This is in line with the results of this study which shows that the combination of these two factors has a significant positive effect on teacher performance, leading to an improvement in the quality of education at SMA Negeri 6 Semarang. As a recommendation, leadership management and improvement of the non-physical work environment should be prioritized to support teachers' professional development in a sustainable manner.

CONCLUSION

Based on the results of data analysis, it can be concluded that the principal's leadership and non-physical work environment have a significant influence on teacher performance at SMA Negeri 6 Semarang. The results of the t-value for the Principal Leadership variable is 1.538 with a p-value of 0.129, which means that H_0 is accepted and H_1 is rejected. This shows that principal leadership is not proven to be a direct predictor of teacher performance after taking into account the influence of the non-physical environment and its interaction effects. The findings will actually strengthen as a moderating variable because the Principal as a driver of having good leadership can improve a good non-physical environment and teacher motivation, which in turn has a positive effect on the quality of learning and teacher performance. Similarly, the non-physical work environment was shown to have a significant effect on teacher performance with a t-value = 5.189 and a p-value of < 0.001, which shows that a supportive work environment can increase teacher enthusiasm and productivity, so, so that H_0 is rejected and H_2 is accepted. Simultaneously, the two variables also showed a significant influence on teacher performance with test results of F = 44.137 and p-value < 0.001, therefore, H_0 is rejected and H_3 is accepted.. These findings indicate that the combination of effective principal leadership and a conducive non-physical work environment creates optimal conditions for teachers to carry out their duties, thereby having an impact on improving the quality of learning and the quality of education.

The results of this study comprehensively show that principal leadership has a complex dual role in influencing teacher performance. This role is identified through two different but complementary statistical mechanisms through Table 8: mediation mechanism and moderation mechanism. First, through the mediation

mechanism, principal leadership is proven to function as a significant antecedent for the formation of a non-physical environment ($\beta = 0.494$, $p < .001$). This shows that effective leadership proactively creates conducive working conditions. This positively formed working environment then becomes an intermediary path that directly and significantly improves teacher performance ($\beta = 0.610$, $p < .001$). This confirms the existence of a mediation effect, where the influence of leadership on performance is channeled through the formation of a quality working environment. Second, through the moderation mechanism, this study also reveals the role of leadership as a crucial contextual factor. The significant negative interaction effect ($\beta = -0.307$, $p < .001$) indicates that the principal's leadership regulates or changes the strength of the influence of the non-physical environment. Specifically, at a high level of leadership, the positive influence of the environment on performance weakens. This implies that strong leadership can be a substitute for environmental support, creating resilience in teachers so that they are no longer too dependent on social environmental conditions to achieve optimal performance.

The combination of these two findings illustrates that superior leadership does not only work on one track. It simultaneously builds antecedent conditions (creating a good environment) while managing the impact of those conditions (regulating how important the environment is to performance). Thus, it can be concluded that the effectiveness of leadership in improving teacher performance is not linear, but multifaceted, meaning that it works indirectly by forming the environment as a mediator, and simultaneously works as a moderator that determines the relevance of the environment.

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