

Enhancing science teacher performance: The role of interpersonal communication, pedagogical competence, and organizational climate

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Abstract: The purpose of this study in general was to analyze the contribution of interpersonal communication, pedagogical competence and organizational climate to the performance of science subject teachers. Specifically, the objectives of this study are as follows: (1) To analyze the contribution of interpersonal communication, pedagogical competence and organizational climate simultaneously to the performance of science subject teachers; (2) To analyze the contribution of interpersonal communication to the performance of science subject teachers; (3) To analyze the contribution of pedagogic competence to the performance of science subject teachers; and (4) To analyze the contribution of organizational climate to the performance of science subject teachers. The approach of this research was quantitative. The independent variables in this study were interpersonal communication, pedagogic competence, and organizational climate, while the dependent variable was teacher performance. This study was conducted on science teachers at MTs in Purworejo District. The population of this study were all science subject teachers in public and private MTs in Purworejo District, which numbered 38 people. The sample in this study were all science teachers in MTs in Purworejo District, which totaled 38 people. Thus, this study uses saturated samples. Data collection techniques using a questionnaire. The analysis used was multiple linear regression analysis. Based on the results of data analysis, it can be concluded that: (1) Interpersonal communication, pedagogical competence and organizational climate contribute positively to the performance of science subject teachers. (2) Interpersonal communication demonstrated a statistically significant positive contribution to the performance of science subject teachers. (3) Pedagogical competencies contribute positively to the performance of science subject teachers. (4) The organizational climate demonstrated a statistically significant positive contribution to the performance of science subject teachers.

Keyword: interpersonal communication, pedagogic competence, organizational climate, teacher performance

Introduction

Teacher performance is one of the key factors determining the success of the learning process in schools (Kanya, N., et.al., 2021). High-performing teachers are able to manage learning effectively, motivate students and create an atmosphere conducive to learning (Khatoun, M., 2021). In the context of science learning, the role of the teacher becomes even more important because the material taught is conceptual and requires appropriate pedagogical strategies. It is therefore important to identify factors that contribute to improving the performance of science teachers.

Several previous studies have shown that teacher performance is influenced by various internal and external factors. Internal factors include professional, pedagogical and personal competencies, while external factors include organizational support and the working environment (Erkaboeva, N. S., & Musaeva, D. A. K., 2022). One crucial

aspect is interpersonal communication between teachers and their colleagues, learners and school management. Effective communication can enhance collaboration and facilitate constructive exchange of information. In addition, teachers' pedagogical competence is a fundamental skill that must be possessed in order to design, implement and evaluate learning effectively. On the other hand, a supportive school organizational climate can create a working atmosphere that is conducive to teacher productivity and well-being.

Interpersonal communication refers to the process of exchanging information, feelings, and meaning between individuals through verbal and non-verbal messages. According to DeVito (2013), interpersonal communication is a transactional, purposeful, and irreversible process that occurs within a defined context and is shaped by the relationship between the individuals involved. In the context of education, interpersonal communication between teachers and various stakeholders (students, colleagues, administrators) plays a vital role in shaping effective pedagogical interactions and building professional collaboration (McCornack, 2016). Key dimensions of interpersonal communication include clarity, empathy, openness, responsiveness, and feedback, which are all essential for fostering mutual understanding and enhancing teacher performance.

Organizational climate refers to the shared perceptions of organizational policies, practices, and procedures, both formal and informal (Schneider, Ehrhart, & Macey, 2013). It shapes how individuals perceive their work environment and influences motivation, job satisfaction, and performance. In educational institutions, organizational climate encompasses leadership style, communication patterns, professional relationships, and support systems that affect how teachers engage with their roles (Hoy & Miskel, 2008). A positive organizational climate is characterized by trust, collegiality, shared vision, and supportive leadership, all of which contribute to improved teacher morale and instructional effectiveness.

Research on the factors that influence teacher performance has been conducted in different contexts and levels of education. Some previous studies, such as those conducted by Mayasari, I., et.al. (2025) and Saragih, K. W. (2024), showed that interpersonal communication has a positive influence on teacher performance because it can create harmonious relationships in the school environment and strengthen cooperation among teachers. In addition, pedagogical competence as part of teachers' professional competence has been shown to play an important role in designing effective learning strategies that focus on student learning outcomes (Widiyani, T. P., et.al., 2024). Meanwhile, research by Langi, L., et.al. (2023) highlighted the importance of a positive school organizational climate in improving teachers' work motivation and performance. A supportive working environment, an open organizational culture and participative leadership are important elements of a healthy organizational climate.

Based on preliminary studies of science teachers in MTs in Purworejo Regency, it is known that there are still several teachers with less than optimal performance. This is evidenced by the sub-optimal quality of science teaching, such as more teacher-centred learning, lack of teacher innovation in using advanced learning methods, and lack of teacher initiative in improving their pedagogical competence. There is also a lack of mastery of the subject matter by some teachers, resulting in less in-depth coverage of the material. In addition, there are still science teachers who are not good at communicating with colleagues and students, which hampers the work of these teachers. Science teachers in MTs in the region also complained about the less supportive organizational climate in schools, such as headteachers who lacked coaching because they were more focused on supervision, and the lack of collective responsibility for improving the quality of teaching.

Based on the literature review, there is a research gap that has not been widely explored, namely the integration of the analysis of the contribution of interpersonal communication, pedagogical competence and organizational climate to science teacher performance specifically in the context of Madrasah Tsanawiyah. In fact, madrasahs have distinctive institutional characteristics and work culture that have the potential to influence the dynamics of teacher performance. Therefore, this study was conducted to fill the gap and provide a more comprehensive empirical picture of the determinants of science teacher performance in MTs, particularly in Purworejo Regency..

Method

This study employed a quantitative research approach with a descriptive-correlational design, aiming to examine the contribution of interpersonal communication, pedagogical competence, and organizational climate to the performance of science teachers. The research was conducted among science teachers at Madrasah Tsanawiyah (MTs) across Purworejo Regency, with a total population of 38 teachers. Given the manageable number of participants, the study adopted a saturated sampling technique, in which the entire population was used as the sample.

The research procedure began with a preliminary observation at the study site to identify the existing problems faced by science teachers in their professional practice. This was followed by the preparation of a research proposal, securing formal research permissions, and proceeding to data collection. Data were collected using a structured questionnaire distributed directly to all respondents.

Primary data served as the main data source, gathered firsthand from the field. The questionnaire was designed to measure the independent variables—interpersonal communication, pedagogical competence, and organizational climate—as well as the dependent variable, which is teacher performance. The collected data were then

analyzed using multiple linear regression and partial regression techniques to determine the extent to which each independent variable contributes to teacher performance both individually and collectively.

Result and Discussion

Data description

The distribution of interpersonal communication variables is mostly in the medium category (44.74%), followed by low (36.84%), high (7.89%), very low (5.26%) and finally very high (5.26%). The distribution of pedagogical competence variables is mostly in the medium category (34.21%), followed by low (23.68%), very low (21.05%), high (18.42%) and finally very high (2.63%). The distribution of organizational climate variables is mostly in the medium category (44.74%), followed by low (23.68%), very low (15.79%), high (13.16%) and finally very high (2.63%). The distribution of teacher performance variables is mostly in the medium category (31.58%), followed by low (28.95%), very low (21.05%), very high (10.53%) and finally high (7.89%).

Normality Test

Tabel 1. Kolmogorov Smirnov test

Variable	Z	p	Decision
Teacher performance (Y)	0,528	0,943	Normal
Interpersonal communication(X1)	0,575	0,896	Normal
Pedagogical competence(X2)	0,681	0,742	Normal
Organizational climate(X3)	0,784	0,570	Normal

Based on the results of the above calculations (table 1), the p-value for all variables is greater than 0.05, so the data on the four variables, namely interpersonal communication (X1), pedagogical competence (X2), organizational climate (X3) and teacher performance (Y) are normally distributed, which means that the data on the research variables are evenly and randomly distributed.

Linearity test

Tabel 2. Linearity test

Corelation	F	p	decision
Interpersonal communication (X1) and teacher performance (Y)	1,570	0,291	Linear
Pedagogical competence (X2) and teacher performance (Y)	0,590	0,869	Linear
Organizational climate (X3) and teacher performance (Y)	0,760	0,727	Linear

Based on the results of the above calculations (table 2), the p-value in the relationship between interpersonal communication and teacher performance (0.291) is greater than 0.05, so the relationship between these variables is linear. The p-value in the relationship between pedagogical competence and teacher performance (0.869) is greater than 0.05, so the relationship between these variables is linear. The p-value in the relationship between organizational climate and teacher performance (0.727) is greater than 0.05, so the relationship between these variables is linear.

Multicollinearity Test

Tabel 3. Multicollinearity Test

Variabel	Tol	VIF	Decision
Interpersonal communication (X1)	0,701	1,426	No Multicollinearity
Pedagogical competence (X2)	0,637	1,570	No Multicollinearity
Organizational climate (X3)	0,657	1,523	No Multicollinearity

Based on the results of the multicollinearity test above (table 3), it can be seen that the VIF value of the variable interpersonal communication is 1.425 and a tolerance of 0.701, the VIF value of the variable pedagogical competence is 1.570 and a tolerance of 0.637 and the VIF value of the variable organizational climate is 1.523 and a tolerance of 0.657. The three independent variables have a VIF value of less than 10 and a tolerance close to 1, so there is no problem of multicollinearity.

Hypothesis Testing

The results of data analysis also obtained the value of Fhitung = 29.336 with a significance of 0.000 which means p-value Sig. <0.01 so that interpersonal communication, pedagogical competence and organizational climate have a positive or very significant contribution to teachers' performance.

Tabel 5. Multiple Linear Regression Analysis t Test Results

Variabel	r parsial	t test	P
Interpersonal communication (X1)	0,496	3,333	0,002
Pedagogical competence (X2)	0,466	3,073	0,004
Organizational climate (X3)	0,454	2,974	0,005
R Squared	0,271		
F	29,336		
Sig	0,000 ^a		

The first secondary hypothesis is that "Interpersonal communication demonstrated a statistically significant positive contribution to the performance of science teachers in MTs in Purworejo Regency". The results of the analysis obtained that the partial r value is 0.496 and t count is 3.333 with a significance of 0.002 which means the p value (sig.) <0.05. Based on the t value, it shows that the proposed hypothesis is accepted and highly significant, so it can be concluded that interpersonal communication demonstrated a statistically significant positive contribution to the performance of science teachers.

The second hypothesis is "Pedagogical competence demonstrated a statistically significant positive contribution to the performance of science teachers in MTs in Purworejo Regency". The results of the analysis obtained a partial r value of 0.466 and a t-count of 3.073 with a significance of 0.004 which means that the p-value (sig.) <0.01. Thus, the proposed hypothesis is accepted and highly significant, so it can be concluded that pedagogical competence demonstrated a statistically significant positive contribution to the performance of science teachers in MTs in Purworejo Regency.

The third hypothesis which reads "Organizational climate demonstrated a statistically significant positive contribution to the performance of science teachers in MTs in Purworejo Regency". The results of the analysis obtained a partial r value of 0.454 and t count of 2.974 with a significance of 0.005 which means the p value (sig.) <0.05. Thus, the proposed hypothesis is accepted and highly significant, so it can be concluded that the organizational climate demonstrated a statistically significant positive contribution to the performance of science teachers MTs in Purworejo Regency.

The results of multiple linear regression analysis obtained the price $R_y-123 = 0.849$ and the coefficient of determination (R^2) = 0.721. The contribution of the independent variables of interpersonal communication, pedagogical competence and organizational climate together to the dependent variable of teacher performance is $R^2 = 0.721 \times 100\% = 72.1\%$, while the influence outside the variables studied is $100\% - 72.1\% = 27.9\%$. The results of the analysis can be concluded that interpersonal communication, pedagogical competence and organizational climate contribute positively to the performance of science subjects MTs in Purworejo Regency.

To test the main hypothesis that reads "interpersonal communication, pedagogical competence and organizational climate contribute positively to the performance of science subject teachers MTs in Purworejo Regency o", the F-test is performed on multiple linear regression analysis.

Tabel 7. Effective Contribution (SE) and Relative Contribution (SR) of Each Predictor

Variabel	Beta	Zero-order	SE (%)	SR (%)
Interpersonal communication (X1)	0,686	0,360	24,7	34,3
Pedagogical competence (X2)	0,704	0,349	24,5	34,0
Organizational climate (X3)	0,688	0,332	22,9	31,7
Total			72,1	100,0

The effective contribution value is obtained by multiplying beta by zero order in per cent. While the relative contribution is obtained by comparing the effective contribution of each variable to the total effective contribution in per cent. The magnitude of the effective contribution of interpersonal communication to the performance of science teachers in MTs in Purworejo Regency is 24.7% and a relative contribution of 34.3%. The magnitude of the effective contribution of pedagogical competence to the performance of science subject teachers at MTs in Purworejo Regency is 24.5% and a relative contribution of 34.0%. The magnitude of the effective contribution of organizational climate to the performance of science subject teachers at MTs in Purworejo Regency is 22.9% and a relative contribution of 31.7%. The magnitude of the effective contribution of interpersonal communication, pedagogical competence and organizational climate to the performance of science subject teachers at MTs in Purworejo Regency is 72.1% and a relative contribution of 100.0%.

Discussion

The results of this study indicate that effective interpersonal communication significantly enhances teacher performance by not only improving relational dynamics but also strengthening the psychological and professional foundations of teaching. Interpersonal communication in the educational context involves the capacity of teachers to express ideas with clarity, respond with empathy, provide constructive feedback, and engage in meaningful dialogues with students, peers, and administrators. These communicative behaviors foster trust, mutual respect, and emotional safety, which are critical for cultivating a positive classroom and school climate. When teachers are perceived as approachable and communicative, students tend to exhibit greater motivation, cooperation, and academic engagement—factors that directly support instructional effectiveness (Anisaunnafi'ah, R., Syahri, S., & Purnami, A. S., 2024). Furthermore, interpersonal communication is central to professional collaboration, including team teaching, curriculum development, and problem-solving in educational settings, all of which demand high levels of interpersonal responsiveness and clarity. Bardach, L., et.al., (2022) found that strong interpersonal skills contribute not only to teacher satisfaction and cohesion within the school community, but also to reduced burnout and improved teacher retention. Similarly, Karasova, J., & Nehyba, J. (2023) and

Jaedun, A., et.al., (2024) emphasized that teachers who exhibit advanced communication competencies are better positioned to manage diverse student needs, mediate conflict, and sustain a responsive learning environment. In a broader organizational sense, effective communication acts as a bridge between individual teacher competencies and institutional goals, enhancing alignment, coordination, and overall school effectiveness. Therefore, fostering interpersonal communication is not merely a soft skill but a strategic necessity for enhancing teacher performance in increasingly complex educational landscapes.

Pedagogical competence emerges as a critical determinant of teacher performance, encompassing a wide array of knowledge, skills, and attitudes that enable teachers to facilitate effective learning. Teachers with high pedagogical competence demonstrate the ability to align instructional strategies with curriculum objectives, adapt teaching approaches to accommodate students' diverse learning styles and developmental levels, and integrate various instructional media and assessment tools (Pitang, A., & Sunarto, S. 2024). This comprehensive capability not only ensures that the learning process is systematic and goal-oriented but also nurtures an engaging and student-centered classroom atmosphere. Huang, B., et al. (2022) assert that pedagogical competence is a core pillar of teaching effectiveness, as it equips teachers to translate theoretical knowledge into practical instructional design that directly impacts student outcomes. Moreover, pedagogically competent teachers are more likely to reflect on and refine their teaching practices, contributing to continuous professional growth and instructional innovation. Parcerisa, L., et.al., (2022) further highlight that developing pedagogical competence enhances teacher autonomy and decision-making, allowing for more responsive and evidence-based teaching. In the current era of rapid educational change—marked by technological advancement and shifting student expectations—pedagogical competence becomes even more vital as it enables teachers to stay adaptive, reflective, and committed to lifelong learning. Thus, investing in pedagogical development is not only beneficial for individual teacher performance but also for the broader goal of improving educational quality and equity.

A positive organizational climate plays a pivotal role in shaping teacher performance, functioning as an enabling environment that supports both individual and collective effectiveness (Kasih, E. W., et.al., 2024). When the school climate is marked by mutual respect, inclusive decision-making, equitable resource distribution, and transparent leadership, it nurtures a sense of psychological safety and belonging among teachers. These conditions not only reduce work-related stress but also enhance intrinsic motivation, job satisfaction, and professional commitment. Teachers working under a positive climate are more likely to take initiative, collaborate with peers, and implement creative pedagogical strategies—behaviors that contribute directly to improved instructional quality and student outcomes. Ahmed, E. I. (2025) emphasize

that a supportive school climate correlates strongly with teacher productivity and organizational citizenship behavior, suggesting that the work environment can amplify or hinder even the most competent educators. Likewise, Sharma, M. K., & Sharma, S. (2022) argue that organizational culture—closely tied to climate—functions as a social glue that promotes unity of vision, shared values, and collective efficacy. In contexts where educational reform and innovation are emphasized, a constructive organizational climate becomes even more crucial as it underpins adaptive capacity and openness to change. Therefore, improving the organizational climate should be a strategic priority for school leadership aiming to boost teacher performance holistically, sustainably, and equitably.

Conclusion

Based on the results of the study, it can be concluded that interpersonal communication, pedagogical competence, and organizational climate all contribute positively and significantly to the performance of science teachers at Madrasah Tsanawiyah in Purworejo Regency. Among these variables, interpersonal communication demonstrated a particularly notable contribution of 24.7%, indicating that the ability of teachers to communicate effectively with colleagues and school leadership plays a crucial role in enhancing their professional performance. Teachers with strong interpersonal communication skills are more likely to foster productive relationships within the school environment, resulting in improved collaboration, shared understanding, and increased commitment to educational goals.

The findings also suggest that improving pedagogical competence and cultivating a positive organizational climate are essential strategies for enhancing teacher performance. Schools that invest in ongoing professional development and foster a supportive, open, and collaborative work culture are more likely to empower teachers to perform their roles effectively. These results imply that educational stakeholders, particularly school principals and policymakers, should prioritize the development of interpersonal communication training programs and organizational climate improvements as part of school management and teacher development initiatives.

For future research, it is recommended to expand the study to include a broader and more diverse sample from different regions and educational levels. Additionally, incorporating qualitative methods such as interviews or observations could provide deeper insights into how these variables interact in practice. Examining other potential influencing factors such as emotional intelligence, leadership style, or teacher motivation could also enrich the understanding of what contributes to effective teacher performance in different educational contexts.

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