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The Influence of Supervision, Competence, Leadership, and Motivation on Mathematics Teachers Productivity in Bengkulu

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Abstract:

This study examines the impact of academic supervision, professional competence, instructional leadership, and work motivation on work productivity within the framework of the Integrative Model of Organizational Behavior. A quantitative approach, utilizing a survey method, was employed with 60 mathematics teachers. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that professional competence (β = 0.337, p = 0.007), instructional leadership (β = 0.262, p = 0.018), and work motivation (β = 0.363, p = 0.001) have a positive and significant effect on teacher productivity. In contrast, supervision has no direct effect on productivity (β = 0.104, p = 0.138), but it does significantly influence motivation (β = 0.218, p = 0.037). Motivation significantly mediated the relationship between competence and productivity (β = 0.081, p = 0.043), but did not mediate the relationship between supervision or leadership and productivity. This finding underscores the importance of enhancing teacher competence and motivation to enhance productivity. The implications of this study suggest that developing professional competence, instructional leadership, and work motivation should be a primary focus for improving teacher productivity.

Keywords: *Academic Supervision, Professional Competence, Work Productivity*

Abstrak:

Studi ini menyelidiki bagaimana supervisi akademik, kompetensi profesional, kepemimpinan instruksional, dan motivasi kerja mempengaruhi produktivitas kerja mereka dalam Integrative Model of Organizational Behavior. Pendekatan kuantitatif dengan metode survei melibatkan 60 guru matematika. Data dianalisis menggunakan Partial Least Squares Structural Equation Modeling (PLS-SEM). Hasil menunjukkan bahwa kompetensi profesional (β = 0.337, p = 0.007), kepemimpinan instruksional (β = 0.262, p = 0.018), dan motivasi kerja (β = 0.363, p = 0.001) memiliki efek positif dan signifikan terhadap produktivitas guru. Sebaliknya, supervisi tidak memiliki efek langsung pada produktivitas (β = 0.104, p = 0.138) tetapi secara signifikan mempengaruhi motivasi (β = 0.218, p = 0.037). Motivasi secara signifikan memediasi hubungan antara kompetensi dan produktivitas (β = 0,081, p = 0,043), tetapi tidak memediasi antara supervisi atau kepemimpinan dan produktivitas. Temuan ini menyoroti pentingnya memperkuat kompetensi dan motivasi guru untuk meningkatkan produktivitas. Implikasi penelitian ini menunjukkan bahwa pengembangan kompetensi profesional, kepemimpinan instruksional, dan motivasi kerja harus menjadi fokus utama untuk meningkatkan produktivitas guru.

Kata Kunci: *Supervisi Akademik, Kompetensi Profesional, Produktivitas Kerja*

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INTRODUCTION

Improving the quality of education in Indonesia requires a focus on strengthening teacher productivity, particularly in the face of rapid technological advancements and global educational transformations (Hanushek et al., 2020; He et al., 2024; Martinez, 2022). Teachers' effectiveness is a key driver of student achievement and remains a crucial factor in national education reform efforts. Despite regulatory initiatives aimed at enhancing teacher competence, challenges such as low motivation, limited pedagogical innovation, and weak technology integration continue to persist (Mailool et al., 2020; Oknaryana et al., 2025). Increasing teacher productivity is thus a primary requirement for realizing a competitive and sustainable educational transformation in Indonesia.

Teacher work productivity is influenced by a combination of managerial and personal factors, which are central to the ongoing educational reforms in Indonesia. Academic supervision, when implemented as a developmental process, not only improves classroom performance but also aligns with the government's agenda to enhance teacher accountability and reflective practice (Muttaqin et al., 2023). Professional competence, particularly mastery of pedagogy and digital skills, is increasingly emphasized in national policies promoting technology-enhanced learning. Instructional leadership, through clear goal-setting and fostering a supportive school culture, plays a pivotal role in strengthening teacher commitment and innovation, aligning with the Ministry of Education's vision of quality learning (Akram et al., 2022; Leithwood et al., 2020). Additionally, intrinsic motivation is a decisive factor in teachers' willingness to adopt new practices, directly supporting the national reform agenda aimed at fostering professional autonomy and continuous improvement (Dahlan et al., 2025; Damanik & Widodo, 2024).

Practical evidence from field observations underscores the urgency of this research. At MAN 2 North Bengkulu and MAN 1 Lebong, pre-observation with school leaders revealed persistent patterns of low teacher motivation, irregular attendance, inadequate lesson preparation, and a general reliance on outdated, teacher-centered instructional strategies. Many mathematics teachers failed to align their lesson plans with current curriculum standards, rarely utilized instructional media, and struggled with digital literacy, despite the availability of technological resources such as projectors and computers. These weaknesses highlight broader systemic issues stemming from weak academic supervision, insufficient professional development, a lack of instructional leadership, and deficiencies in intrinsic motivation. The interaction of these factors calls for a holistic and integrated approach to understanding how teacher productivity can be enhanced.

This study adopts the Integrative Model of Organizational Behavior by Colquitt (2015), which emphasizes that individual performance is shaped by both personal attributes (e.g., motivation, competence) and contextual variables (e.g., leadership, supervision, work environment) (Strah et al., 2024). In this

framework, academic supervision is viewed not only as an evaluative tool but also as a developmental process that strengthens teacher reflection and continuous improvement. Professional competence, encompassing mastery of subject matter, curriculum design, teaching strategies, and technology integration, remains a critical foundation for 21st-century teaching effectiveness (Nombo, 2022; Shermukhammadov, 2022). Instructional leadership, when consistently practiced, fosters a culture of collaboration and high expectations, which supports teacher commitment and innovation (Munna, 2023; Suyudi et al., 2022). Moreover, intrinsic and extrinsic motivation significantly mediate teachers' responsiveness to their professional responsibilities, influencing productivity and willingness to innovate.

Recent research further suggests that teacher productivity in madrasahs is not only about efficiency but also the ability to innovate, adapt, and sustain professional growth. Evidence shows that effective teachers integrate pedagogical expertise, creativity, and motivation, directly enhancing student learning outcomes (Aditya et al., 2024). Academic supervision, however, did not directly impact productivity in this study, supporting prior research that suggests supervision in Indonesia is often administrative and compliance-oriented (Awe et al., 2022; Moulida et al., 2022). Its role is more developmental when it strengthens teachers' motivation, thus indicating the need for a shift toward collaborative and reflective supervision practices.

This study aims to examine the significant effects of academic supervision, professional competence, instructional leadership, and work motivation on the work productivity of mathematics teachers in State Islamic Senior High Schools (MAN) in Bengkulu Province. It specifically investigates the direct effects of these four variables on productivity as well as the mediating role of work motivation in these relationships. The research hypothesizes that academic supervision, professional competence, instructional leadership, and work motivation each have a significant impact on teacher productivity. Furthermore, it is hypothesized that work motivation mediates the relationships between academic supervision, professional competence, instructional leadership, and teacher productivity. The originality of this research lies in its focus on mathematics teachers within the context of MAN schools in Bengkulu. This region has received little attention in previous educational management studies, providing both theoretical and practical contributions to strengthening teacher performance management strategies.

RESEARCH METHOD

This study employed a quantitative approach, utilizing a survey method, to analyze the causal relationships between variables affecting the productivity of mathematics teachers in State Islamic Senior High Schools (MAN) in Bengkulu Province, Indonesia. A causal-comparative design, supported by path analysis, was employed to identify direct and indirect effects among the variables. Data were collected through online questionnaires via Google Forms, enabling efficient and secure response management. The total sampling technique was employed, involving all 60 active mathematics teachers in the province, as the population was manageable in size (Gürbüz, 2017). This method ensured

comprehensive data coverage, thereby enhancing internal validity; however, the findings may not be fully generalizable to other educational contexts.

The study focused on variables such as academic supervision (X1), professional competence (X2), instructional leadership (X3), work motivation (X4), and work productivity (Y). Operational definitions were based on validated indicators, where academic supervision included planning, implementation, and follow-up, and work productivity encompassed competence, self-development, work outcomes, and efficiency. The selection of mathematics teachers, specifically from various MAN schools in Bengkulu, such as MAN 1 Bengkulu City, MAN 2 Kepahiang, and MAN 1 Lebong, added novelty to the study, as mathematics instruction presents unique cognitive and pedagogical challenges (Hirose & Creswell, 2023).

The researchers developed a questionnaire using a Likert scale, tested for validity and reliability with 32 mathematics teachers from State Islamic Senior High Schools in West Sumatra. Key indicators included academic supervision, professional competence, instructional leadership, work motivation, and work productivity. Validity was assessed using Pearson's correlation, and reliability with Cronbach's alpha, retaining items with a correlation ≥ 0.30 and Cronbach's alpha ≥ 0.70 (Schrepp, 2020; Hair et al., 2019).

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS due to its suitability for small sample sizes and complex models. The analysis included both the measurement model (evaluating validity and reliability) and the structural model (assessing R-squared, effect size, and Goodness of Fit). Hypothesis testing used bootstrapping to assess path coefficients, with mediation effects confirmed if the t-value exceeded 1.65 and p-value was less than 0.05 (Ogbeibu & Gaskin, 2023).

RESULT AND DISCUSSION

Result

This study examines the impact of academic supervision, professional competence, instructional leadership, and work motivation on the productivity of mathematics teachers at State Islamic Senior High Schools in Bengkulu Province, Indonesia. Using Structural Equation Modeling with Partial Least Squares (SEM-PLS) and data from 60 teachers, the study found that instructional leadership and professional competence have a significant effect on productivity, while academic supervision does not.

Descriptive analysis revealed that most teachers rated academic supervision as "moderate," while professional competence and instructional leadership were rated as "good." Work motivation was rated as "very good" by half of the teachers. Despite these positive ratings, academic supervision had the lowest score, indicating its limited impact on teacher productivity. Instructional leadership scored the highest, suggesting strong leadership support is crucial for teacher performance.

The structural model analysis further confirmed that instructional leadership and professional competence significantly influenced work productivity ($\beta = 0.337$, $p = 0.007$). However, work motivation did not mediate the relationship between academic supervision and productivity. These findings

emphasize the need to shift academic supervision from a formal, administrative approach to a more reflective, collaborative model that aligns with professional development goals.

Table 1. Loading Factor Value

Variables	Indicators	Outer Loading	Description	Variables	Indicators	Outer Loading	Description
Academic Supervision (X_1)	AS1	0.950	Valid		IL11	0.881	Valid
	AS2	0.907	Valid		IL12	0.769	Valid
	AS3	0.915	Valid		IL13	0.917	Valid
	AS4	0.851	Valid		IL14	0.905	Valid
	AS5	0.886	Valid		IL15	0.815	Valid
	AS6	0.899	Valid		IL16	0.931	Valid
	AS7	0.895	Valid		IL17	0.882	Valid
	AS8	0.890	Valid		IL18	0.817	Valid
	AS9	0.877	Valid		IL19	0.830	Valid
	AS10	0.938	Valid		IL20	0.877	Valid
	AS11	0.960	Valid	Work Motivation (X4)	WM1	0.927	Valid
	AS12	0.865	Valid		WM 2	0.907	Valid
	AS13	0.895	Valid		WM 3	0.719	Valid
	AS14	0.971	Valid		WM 4	0.739	Valid
	AS15	0.911	Valid		WM 5	0.916	Valid
	AS16	0.951	Valid		WM6	0.898	Valid
	AS17	0.909	Valid		WM7	0.726	Valid
Professional Competence (X_2)	PC1	0.825	Valid		WM8	0.917	Valid
	PC2	0.910	Valid		WM9	0.908	Valid
	PC3	0.875	Valid		WM10	0.726	Valid
	PC4	0.878	Valid		WM11	0.723	Valid
	PC5	0.820	Valid		WM12	0.900	Valid
	PC6	0.802	Valid		WM13	0.900	Valid
	PC7	0.812	Valid		WM14	0.709	Valid
	PC8	0.805	Valid		WM15	0.732	Valid
	PC9	0.809	Valid		WM16	0.766	Valid
	PC10	0.818	Valid		WM17	0.922	Valid
	PC11	0.936	Valid		WM18	0.907	Valid
	PC12	0.882	Valid		WM19	0.730	Valid
	PC13	0.885	Valid	Work Productivity (Y)	WP1	0.771	Valid
	PC14	0.812	Valid		WP2	0.846	Valid
	PC15	0.752	Valid		WP3	0.802	Valid
	PC16	0.834	Valid		WP4	0.831	Valid
	PC17	0.797	Valid		WP5	0.845	Valid
	PC18	0.825	Valid		WP6	0.767	Valid
Instructional Leader	IL1	0.845	Valid		WP7	0.807	Valid
	IL2	0.837	Valid		WP8	0.878	Valid

ship (X_3)	IL3	0.864	Valid	WP9	0.784	Valid
	IL4	0.848	Valid	WP10	0.836	Valid
	IL5	0.846	Valid	WP11	0.911	Valid
	IL6	0.894	Valid	WP12	0.753	Valid
	IL7	0.861	Valid	WP13	0.814	Valid
	IL8	0.853	Valid	WP14	0.873	Valid
	IL9	0.903	Valid	WP15	0.779	Valid
	IL10	0.879	Valid	WP16	0.828	Valid
				WP17	0.876	Valid

In Table 1 above, the measurement model test (outer model) indicates that all constructs — academic supervision, professional competence, instructional leadership, work motivation, and teacher work productivity — demonstrate strong convergent validity. Each indicator has a loading factor exceeding the recommended threshold of 0.70, which indicates that it adequately reflects its respective latent construct. Next, to determine whether the variables possess adequate discriminant validity, discriminant values were used. In this study, the method for assessing discriminant validity was cross-loading, as presented in Table 2.

Table 2. Cross Loading Values

	IL	PC	WM	WP	AS		IL	PC	WM	WP	AS
IL1	0.845	-0.004	0.145	0.215	0.020	WM16	0.001	0.193	0.766	0.291	0.283
IL10	0.879	-0.067	0.152	0.297	0.107	WM17	0.242	0.300	0.922	0.541	0.313
IL11	0.881	-0.062	0.009	0.249	-0.023	WM18	0.212	0.210	0.907	0.494	0.275
IL12	0.769	-0.084	0.026	0.140	-0.082	WM19	0.053	0.188	0.730	0.266	0.271
IL13	0.917	-0.038	0.233	0.355	0.102	WM2	0.259	0.286	0.907	0.583	0.306
IL14	0.905	-0.061	0.168	0.337	0.077	WM3	0.071	0.259	0.719	0.308	0.300
IL15	0.815	-0.059	0.133	0.188	0.044	WM4	0.019	0.264	0.739	0.347	0.311
IL16	0.931	-0.070	0.134	0.232	0.005	WM5	0.230	0.341	0.916	0.566	0.254
IL17	0.882	-0.032	0.030	0.270	0.015	WM6	0.291	0.262	0.898	0.601	0.304
IL18	0.817	-0.058	-0.052	0.201	-0.060	WM7	0.011	0.234	0.726	0.286	0.242
IL19	0.830	-0.087	0.064	0.176	0.017	WM8	0.230	0.312	0.917	0.578	0.254
IL2	0.837	-0.024	0.103	0.146	-0.031	WM9	0.231	0.292	0.908	0.577	0.292
IL20	0.877	-0.046	0.065	0.209	-0.045	WP1	0.311	0.304	0.386	0.771	0.412
IL3	0.864	-0.055	0.338	0.318	0.107	WP10	0.334	0.372	0.375	0.836	0.315
IL4	0.848	-0.028	0.401	0.328	0.131	WP11	0.294	0.406	0.456	0.911	0.343
IL5	0.846	-0.042	0.183	0.341	0.036	WP12	0.192	0.410	0.534	0.753	0.343
IL6	0.894	-0.036	0.081	0.269	0.004	WP13	0.324	0.252	0.599	0.814	0.242
IL7	0.861	-0.058	0.188	0.220	-0.006	WP14	0.343	0.382	0.407	0.873	0.279
IL8	0.853	-0.113	0.053	0.200	0.027	WP15	0.209	0.467	0.529	0.779	0.420
IL9	0.903	-0.055	0.255	0.391	0.110	WP16	0.306	0.346	0.486	0.828	0.213
PC1	-0.079	0.825	0.229	0.349	0.426	WP17	0.241	0.393	0.512	0.876	0.309
PC10	-0.085	0.818	0.115	0.338	0.399	WP2	0.284	0.374	0.313	0.846	0.313
PC11	-0.156	0.936	0.294	0.409	0.369	WP3	0.222	0.479	0.426	0.802	0.449
PC12	0.030	0.882	0.356	0.491	0.389	WP4	0.265	0.436	0.471	0.831	0.320
PC13	0.013	0.885	0.315	0.476	0.465	WP5	0.261	0.367	0.424	0.845	0.219
PC14	-0.045	0.812	0.098	0.353	0.396	WP6	0.202	0.440	0.497	0.767	0.328
PC15	0.004	0.752	0.067	0.426	0.380	WP7	0.269	0.325	0.504	0.807	0.305

PC16	-0.148	0.834	0.130	0.283	0.398	WP8	0.236	0.478	0.361	0.878	0.305
PC17	-0.105	0.797	0.122	0.301	0.358	WP9	0.213	0.517	0.438	0.784	0.455
PC18	-0.036	0.825	0.302	0.480	0.375	AS1	0.056	0.464	0.397	0.361	0.950
PC2	-0.146	0.910	0.353	0.402	0.377	AS10	0.013	0.490	0.351	0.341	0.938
PC3	0.030	0.875	0.478	0.489	0.419	AS11	0.009	0.464	0.241	0.324	0.960
PC4	0.014	0.878	0.443	0.475	0.490	AS12	0.018	0.424	0.190	0.362	0.865
PC5	-0.041	0.820	0.211	0.364	0.424	AS13	0.133	0.452	0.342	0.388	0.895
PC6	0.007	0.802	0.267	0.456	0.445	AS14	0.059	0.450	0.293	0.359	0.971
PC7	-0.019	0.812	0.074	0.331	0.390	AS15	0.108	0.411	0.291	0.434	0.911
PC8	-0.098	0.805	0.234	0.314	0.388	AS16	0.061	0.477	0.399	0.375	0.951
PC9	-0.196	0.809	0.185	0.348	0.285	AS17	0.058	0.364	0.371	0.264	0.909
WM1	0.239	0.345	0.927	0.588	0.305	AS2	0.070	0.407	0.306	0.415	0.907
WM10	0.014	0.257	0.726	0.287	0.281	AS3	-0.024	0.465	0.341	0.355	0.915
WM11	-0.015	0.250	0.723	0.324	0.277	AS4	-0.025	0.367	0.181	0.269	0.851
WM12	0.253	0.276	0.900	0.558	0.278	AS5	0.107	0.387	0.230	0.420	0.886
WM13	0.232	0.248	0.900	0.529	0.299	AS6	0.053	0.535	0.386	0.441	0.899
WM14	0.017	0.169	0.709	0.243	0.254	AS7	-0.032	0.393	0.253	0.275	0.895
WM15	0.017	0.182	0.732	0.244	0.264	AS8	-0.075	0.414	0.200	0.256	0.890
						AS9	0.146	0.368	0.270	0.439	0.877

The cross-loading analysis confirmed good discriminant validity, as each indicator loaded highest on its respective construct, with values generally exceeding 0.70. For example, instructional leadership (IL) indicators ranged from 0.769 to 0.931, professional competence (PC) from 0.752 to 0.936, and work motivation (WM) from 0.709 to 0.927. The loadings for all indicators on their intended constructs were higher than on other constructs, with values for cross-loadings mostly below 0.40 and some even negative. These results indicate that the constructs are clearly distinguishable, with no significant overlap, reinforcing the validity of the measurement model.

To further assess convergent validity and construct reliability, Average Variance Extracted (AVE), Cronbach's Alpha, and Composite Reliability (rho_c) values were examined. All constructs met the criteria for convergent validity, with AVE values of 0.50 or greater and loading factors of 0.70 or greater. Additionally, Cronbach's Alpha and Composite Reliability values ≥ 0.70 indicated good internal reliability. These findings confirm that the indicators are both valid and reliable, supporting the robustness of the measurement model in this study. A summary of the test results is presented in Table 3 below.

Table 3. Nilai AVE, Cronbach's Alpha and Composite Reliability

Construct	Avarage Variance Extracted (AVE)	Cronbach's Alpha	Composite Reliability (rho_c)
Academic Supervision	0.829	0.987	0.988
Professional Competence	0.704	0.976	0.977
Instructional Leadership	0.746	0.983	0.983
Work Motivation	0.689	0.976	0.976
Work Productivity	0.680	0.970	0.973

The convergent validity of the constructs was supported by their AVE values, which exceeded the threshold of 0.50. Academic supervision showed the highest AVE of 0.829, indicating that the indicators explain 82.9% of its variance.

Professional competence, instructional leadership, work motivation, and work productivity also demonstrated good convergent validity with AVEs of 0.704, 0.746, 0.689, and 0.680, respectively. These values confirm that all five constructs are sufficiently represented by their indicators, ensuring the robustness of the measurement model.

Reliability analysis revealed high internal consistency across all constructs. Cronbach's Alpha values ranged from 0.970 to 0.987, indicating very high reliability. Composite reliability (CR) values for all constructs were well above the 0.70 threshold, confirming good internal consistency. However, the high values for constructs like academic supervision (α = 0.987, CR = 0.973) suggest potential item redundancy, where indicators measure highly similar aspects. This finding underscores the importance of striking a balance between comprehensiveness and efficiency in instrument design, thereby avoiding redundancy while maintaining measurement quality.

Discriminant validity was confirmed through both cross-loading analysis and the Fornell-Larcker test, demonstrating that the constructs are distinct from each other. The Cronbach's Alpha and Composite Reliability values for all variables exceeded 0.97, and the AVE scores ranged from 0.680 to 0.829, confirming strong internal consistency and measurement validity. Furthermore, the Fornell-Larcker criterion showed that the square root of AVE for each construct was greater than its correlations with other constructs, reinforcing the validity of the measurement model for structural analysis.

Table 4. Fornell-Larcker Test Results

Variable	Instructional Leadership	Professional Competence	Work Motivation	Work Productivity	Academic Supervision
Instructional Leadership	**0.864**				
Professional Competence	-0.059	**0.839**			
Work Motivation	0.198	0.315	**0.830**		
Work Productivity	0.320	0.485	0.555	**0.825**	
Academic Supervision	0.055	0.477	0.335	0.401	**0.911**

Table 4 above is satisfactory if the square root of the AVE for each construct is higher than the correlation between that construct and other latent variables. The values along the diagonal boxes represent the square roots of the AVE, while the other values indicate the correlations between constructs. The square root of AVE for the instructional leadership construct is 0.864, which is higher than its correlations with professional competence (-0.059), work motivation (0.198), work productivity (0.320), and academic supervision (0.055). Similarly, the √ AVE values for professional competence, work motivation, work productivity, and academic supervision are 0.839, 0.830, 0.825, and 0.911, respectively.

The next stage in testing the structural model involves examining the values of R^2 (R-Square), F^2 (effect size), and the Goodness of Fit Index (GoF). The structural model analysis (inner model) shows that the adjusted R-Square value for teacher work productivity is 0.453, indicating that the combination of academic supervision, professional competence, instructional leadership, and work motivation explains 45.3% of the variance in work productivity.

Meanwhile, work motivation itself is predicted by the other three variables with a lower adjusted R-Square value of 0.139, suggesting that additional unmeasured factors play a significant role in shaping teacher motivation. The Goodness of Fit (GoF) index was calculated to be 0.4647, exceeding the threshold for a good model (>0.36), indicating satisfactory overall model quality.

Table 5. R Square Test Results

Variable	R Square	R Square Adjusted
Work Productivity	0.490	0.453
Work Motivation	0.182	0.139

Table 5 above, it can be seen that the adjusted R-square value for the work productivity construct in this study is 0.453, indicating that the exogenous variables explain 45.3% of the variance in Y. This means that the ability of academic supervision (X1), professional competence (X2), and instructional leadership (X3) to explain work productivity (Y) is 45.3%. In comparison, the remaining 54.7% is influenced by other independent variables not measured in this study. The R-squared value of 0.490 suggests that the variation in work productivity can be explained by the independent variables that affect it.

For the work motivation construct, the adjusted R-square value is 0.139, indicating that the exogenous variables explain 13.9% of the variance in Y. This means that the ability of academic supervision (X1), professional competence (X2), and instructional leadership (X3) to explain work motivation (X4) is 13.9%. In comparison, the remaining 86.1% is influenced by other independent variables not measured in this study. The R-square value of 0.182 indicates that only 18.2% of the variation in work motivation can be explained by the independent variables influencing it.

Table 6. Effect Size (F^2) Values

Variable	F^2 (Effect Size)
Academic Supervision	0.016
Professional Competence	0.162
Instructional Leadership	0.127
Work Motivation	0.211
Academic Supervision → Work Motivation → Work Productivity	0.0062
Professional Competence → Work Motivation → Work Productivity	0.0064
Instructional Leadership → Work Motivation → Work Productivity	0.0052

The effect size (F^2) test results presented in Table 6 indicate that the mediating influence of work motivation falls into the low category. The F^2 effect size results reveal that work motivation has a low mediating effect ($F^2 = 0.016$). However, this small effect still holds practical significance in the context of education, particularly in state madrasahs where long-term behavioral changes are key. Professional competence ($F^2 = 0.162$) and instructional leadership ($F^2 = 0.127$) exhibit moderate and minor effects, respectively, underscoring the significance of these factors in teacher performance. Work motivation ($F^2 = 0.211$) emerges as the strongest driver of productivity, confirming its critical role in this context. However, the minor mediation effects of academic supervision, professional competence, and instructional leadership on productivity through

work motivation suggest that these variables may not interact significantly, pointing to the need for additional mediating factors, such as organizational climate or job satisfaction.

The Goodness of Fit (GoF) index for the model is 0.4647, exceeding the threshold of 0.36, which indicates a good fit and confirms the model's suitability for analyzing the relationships among variables. This robust fit further supports the idea that the model adequately represents the data, ensuring that the findings can be reliably used to understand the dynamics between academic supervision, professional competence, instructional leadership, work motivation, and teacher productivity. Future research could explore more complex mediation paths to enhance the model's explanatory power.

The next step is to examine the significance of the independent constructs' influence on the dependent construct and to test the proposed hypotheses. Hypothesis testing is assessed using the t-statistic and p-value. In this study, hypothesis testing was conducted by processing the data using a one-tailed bootstrapping procedure with 5,000 resamples, as implemented in SmartPLS 4, as shown in Figure 1.

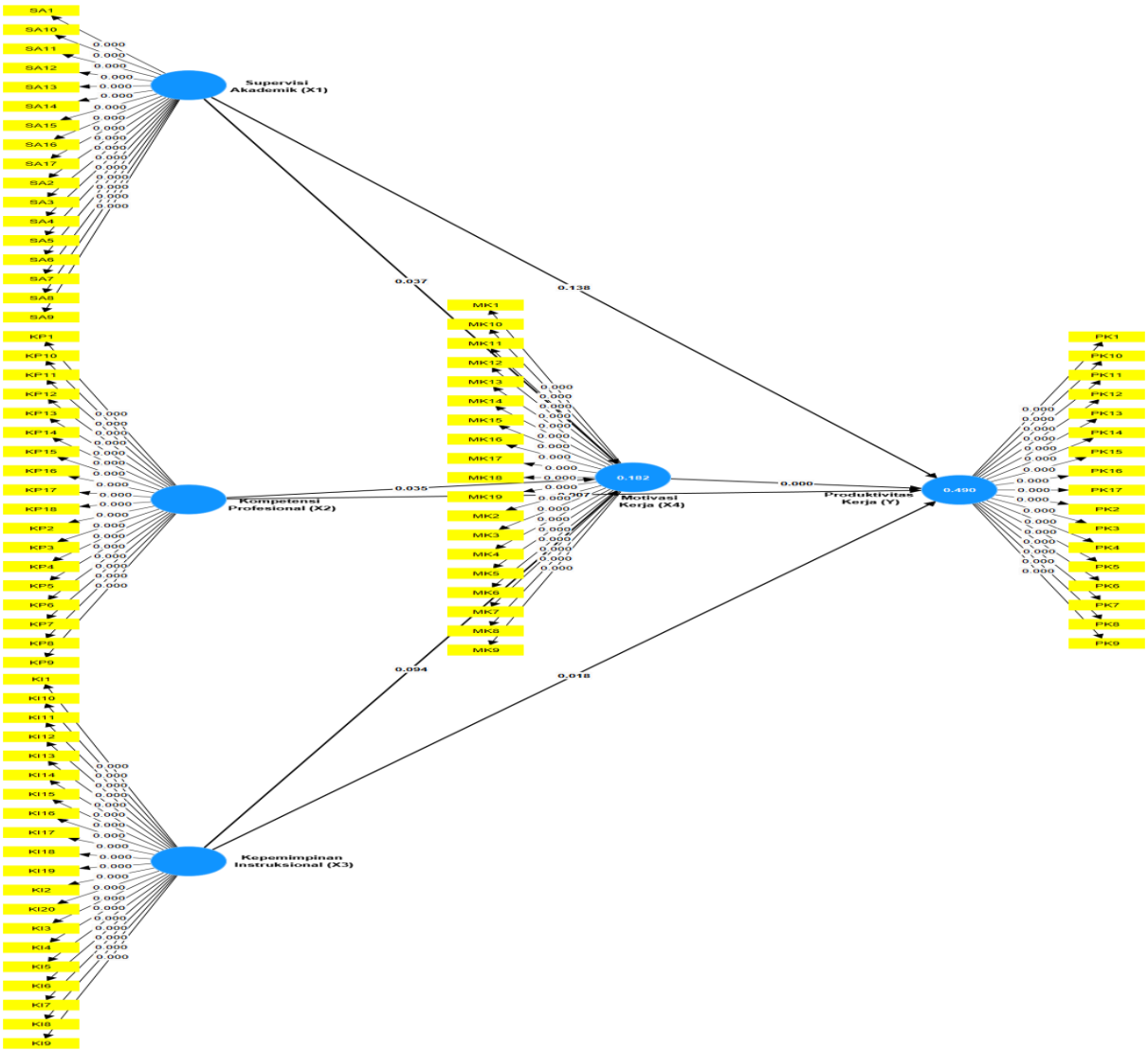

Figure 1. PLS Bootstrapping Model

The coefficient values of the parameters can be observed from the original sample values. The standard error, t-statistic values, and p-values are presented in Table 7.

Table 7. Results of Direct and Indirect Hypothesis Testing

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Instructional Leadership → Work Motivation	0.199	0.210	0.152	1.314	0.094
Instructional Leadership → Work Productivity	0.262	0.254	0.125	2.092	0.018
Professional Competence → Work Motivation	0.222	0.270	0.123	1.811	0.035
Professional Competence → Work Productivity	0.337	0.336	0.136	2.466	0.007
Work Motivation → Work Productivity	0.363	0.360	0.094	3.867	0.000
Academic Supervision → Work Motivation	0.218	0.190	0.122	1.792	0.037
Academic Supervision → Work Productivity	0.104	0.096	0.096	1.090	0.138
Instructional Leadership → Work Motivation → Work Productivity	0.072	0.076	0.060	1.207	0.114
Professional Competence → Work Motivation → Work Productivity	0.081	0.093	0.047	1.722	0.043
Academic Supervision → Work Motivation → Work Productivity	0.079	0.071	0.053	1.503	0.066

The results of both direct and indirect hypothesis testing in Table 7 above show that the direct effect of academic supervision on work productivity is not statistically significant ($\beta = 0.104$, $p = 0.138$). This indicates that supervision, in its current form, is not a reliable factor for enhancing work productivity. Conversely, professional competence has a statistically significant and positive effect on work productivity ($\beta = 0.337$, $p = 0.007$), confirming the theoretical assumption that mastery of subject matter and pedagogical expertise are essential factors in teacher performance. Instructional leadership, characterized by goal setting, instructional supervision, and the development of a learning climate, also significantly influences work productivity ($\beta = 0.262$, $p = 0.018$). Meanwhile, motivation emerges as the strongest direct predictor of work productivity ($\beta = 0.363$, $p < 0.001$). These results are consistent with studies showing that intrinsically motivated teachers are more likely to demonstrate perseverance, initiative, and commitment in their teaching practices.

The analysis results indicate that work motivation significantly mediates the relationship between professional competence and teacher work productivity ($\beta = 0.081$, $p = 0.043$). This suggests that teachers with higher professional competence tend to be more motivated in their work, which ultimately has a positive impact on their productivity. These findings are consistent with

McClelland's need theory, which emphasizes that achieving competence can enhance an individual's achievement motivation. This is further supported by Robbins and Judge, who demonstrated that increased personal capacity has a positive impact on both motivation and performance. However, work motivation does not mediate the relationship between academic supervision and work productivity ($\beta = 0.079$, $p = 0.066$), nor the relationship between instructional leadership and work productivity ($\beta = 0.072$, $p = 0.114$). Two possibilities can explain this non-significance. The interaction of supervision and leadership in madrasahs tends to focus on administrative and formal aspects, thus insufficiently addressing the affective domain of teachers that stimulates intrinsic work motivation.

Discussion

The findings of this study highlight the need to reconceptualize academic supervision not merely as an evaluative function, but as a developmental and collaborative process that empowers teachers. Madrasah leaders should prioritize teacher competency development and foster a motivational climate through authentic leadership practices. While supervision is important, it must be enhanced with consistent follow-up, meaningful feedback, and alignment with professional development goals. The study also found that academic supervision has no direct impact on the work productivity of mathematics teachers at State Islamic Senior High Schools (MAN) in Bengkulu, which tends to be administrative and formalistic, aligning with the findings of Sulhan and Hakim (2023) and Agustina et al. (2020).

In contrast, professional competence has been shown to have a positive and significant impact on teacher productivity, which is consistent with the theory of teacher professionalism (Sahlin, 2025; Sutarman et al., 2024). Teachers who master the curriculum, utilize ICT, and innovate in teaching tend to demonstrate better classroom management, greater enthusiasm for teaching, and significant contributions to student learning outcomes (Masykuroh et al., 2024; Otaya et al., 2023). These results underscore the importance of establishing clear competency standards and providing training programs such as lesson study, problem-based supervision, and the use of interactive digital media to support mathematics learning.

The analysis also found that instructional leadership has a positive and significant direct impact on teacher productivity, which aligns with the findings of Naz and Rashid (2021). School principals can enhance teacher performance by setting clear learning objectives, effectively managing instructional programs, and creating a positive learning environment. Despite the absence of a significant mediating effect of work motivation, the direct influence of instructional leadership on teacher performance remains strong. Professional support and guidance can have a significant impact on productivity, even when motivational factors are not fully optimized.

Work motivation, as an intrinsic factor, plays a crucial role in enhancing teacher productivity. Teachers with high needs for achievement, affiliation, and power tend to demonstrate greater enthusiasm for teaching, higher job

satisfaction, and more active engagement in their professional development. Research by Smith et al. (2022) supports this finding, confirming that motivation acts as a catalyst for improving productivity. Madrasah human resource development strategies should consider this motivation by providing performance rewards, career opportunities, and fostering a collaborative work environment.

The mediation analysis revealed that academic supervision has a positive impact on work motivation, indicating that teachers tend to be more motivated when supervision is planned, supportive, and provides constructive feedback (Ataman et al., 2024; Megasari et al., 2022). Likewise, professional competence has a positive influence on work motivation. However, instructional leadership and work motivation do not significantly affect productivity, in line with the findings of Dami et al. (2022), which suggest that overly technical and administrative leadership may fail to address teachers' psychological needs, resulting in a lack of intrinsic motivation.

These findings reinforce and challenge previous research on teacher productivity. While professional competence, instructional leadership, and work motivation have significant effects on productivity, the lack of a direct effect of academic supervision challenges prior assumptions that emphasize supervision as a key determinant of performance. The unique context of Bengkulu Province, with its structural limitations and resource constraints, may explain this divergence. Therefore, the results emphasize the need for context-sensitive approaches to teacher development policies, highlighting the importance of a comprehensive educational management approach that focuses on empowering teachers and fostering collaboration through transformative leadership and reformed supervision practices.

CONCLUSION

This study demonstrates that professional competence, instructional leadership, and work motivation significantly enhance the work productivity of mathematics teachers in State Islamic Senior High Schools (MAN) across Bengkulu Province. At the same time, academic supervision does not show a direct effect. Specifically, academic supervision and professional competence enhance teachers' work motivation; however, the mediation effect test reveals that work motivation does not mediate the relationship between academic supervision and instructional leadership with teacher productivity. These findings suggest that strengthening teacher competence and leadership practices, accompanied by a supportive motivational climate, is more effective in improving teacher productivity than supervision.

For future research, additional mediating variables, such as organizational climate, job satisfaction, and interpersonal trust, should be examined, as these may provide a stronger explanatory framework for teacher productivity. Expanding the scope to private madrasahs or different regions would also generate more generalizable insights. Moreover, adopting mixed-methods approaches, including interviews and observations, could capture richer contextual and psychological dimensions of teacher performance that are not fully reflected in survey data.

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