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Transformational Leadership and Human Resource Quality in Educating in Rural High Schools in Indonesia: The Mediating Role of Human Resource Performance in Education and Work Motivation

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Abstract. Indonesian high school students in underdeveloped areas often have lower literacy skills than students in urban areas. One reason for this is poor educational management and leadership in schools. This study aimed to analyse the effect of transformational leadership on the human resource quality in education, performance and motivation as mediating variables in high schools in underdeveloped areas. The research approach was quantitative with a sample of 370 teachers. The study used a 5-point Likert- scale questionnaire and Structural Equation Modelling to test the relationships between the variables. The results show that transformational leadership has a significant influence on the human resource quality in education ($\beta = 0.57$; $p = 0.000$), teacher performance ($\beta = 0.81$; $p = 0.000$), and work motivation ($\beta = 0.79$; $p = 0.000$). Teacher performance ($\beta = 0.49$) and work motivation ($\beta = 0.39$) showed a significant influence on human resource quality management. The R^2 value of 0.74 indicates a strong model. Transformational leadership was found to be a key factor in improving the human resource quality in education in underdeveloped areas by encouraging motivation and performance. These findings have practical implications for principal leadership training programmes, human resource development, and education policies in underdeveloped areas.

Keywords: Indonesia; leadership; motivation; performance; teacher; transformational leadership; rural areas

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1. Introduction

Education is the main pillar of transformational leadership development (AlSagri & Sohail, 2024). However, in Indonesia, a significant gap in educational attainment persists between underdeveloped and urban areas (Sihombing et al., 2024). Recent field data show that the average literacy ability of students from underdeveloped areas of Indonesia is 56.40, compared with 73.4 for students from urban areas (Abidin et al., 2025). This field data highlights a serious problem in the human resource quality in education. In Indonesia's underdeveloped regions, the effectiveness of the learning process is only 62.63% – lower than the national average of 82.8%. One of the reasons education is less effective in underdeveloped regions is educational leadership (Altynbassov et al., 2024). In schools, the principal plays an important role in managing teachers to build the effectiveness of the learning process and improve teacher performance (Bilbokaitė et al., 2024).

However, based on field conditions, 45% of school principals in underdeveloped areas of Indonesia use traditional administrative and leadership styles (Ayana et al., 2025). If this situation persists, it could negatively impact teacher motivation in the learning process. A transformational leadership model is expected to be effective in improving the quality of teaching in education (Román-Cortéz et al., 2025). With a leadership style focused on inspiring, motivating, and encouraging positive educational change, schools with a transformational leadership style can experience a 30% increase in teacher performance and a 20% increase in student learning outcomes (Parveen et al., 2024). However, the implementation of this leadership style remains unevenly distributed in underdeveloped areas of Indonesia (Samala et al., 2024).

Recent data show that around 37% of secondary schools in underdeveloped areas still lack basic facilities, such as laboratories, libraries, and internet access (Indriyani, 2025). Besides inadequate facilities, teacher quality in underdeveloped areas remains a serious issue. Data show that 62% of teachers in Indonesia's underdeveloped regions lack professional competence (Shaoan et al., 2024). Previous research found that 52% of teachers in underdeveloped areas felt that the guidance and encouragement they received from their principals were insufficient to improve the quality of learning (Tamadoni & Hosseingholizadeh, 2024).

Principals in underdeveloped Indonesian schools often prioritise administrative matters over the quality of HR (Karim et al., 2025). Transformational leadership offers a more human resource-based approach and focuses on effective educational change. In practice, principals in underdeveloped areas of Indonesia often lack the knowledge and skills to effectively implement transformational leadership. It was noted that only 42% of school principals had participated in leadership training (You et al., 2024). This ineffective leadership also impacts student achievement (Carrington & Andrade, 2024), and a study recorded that the graduation rate of students from underdeveloped areas was only 75% (Kassaw et al., 2024). This data provides a general overview of the human resource quality in education that needs improvement.

Transformational leadership emphasises the role of leaders not only as directors but also as drivers of change who can inspire and motivate to achieve the desired educational goals (Agazu et al., 2025). There are four main dimensions of transformational leadership: idealised influence, inspirational motivation, intellectual stimulation, and individualised attention (Njaramba, 2024). In the realm of education, transformational leadership theory is supported by the concept of educational management, which emphasises the important role of the principal in building a culture of effective learning processes (Nadeem, 2024). Transformational leadership is needed to build HR, improve teacher performance and encourage motivation in producing innovations in the learning process (Anastasiou, 2025).

In addition, the theory of organisational change shows that successful improvement in the human resource quality in education is highly dependent on the ability of leaders to manage changes in educational management (Marlia et al., 2025). Transformational leadership is expected to create a collaborative atmosphere, increase trust, and strengthen the educational culture in high schools. This is the basis of transformational leadership as a solution to improve HR, especially teachers, through more effective and collaborative coaching methods.

The role of transformational leadership in urban areas can improve the human resource quality in education in general, but it has not been tested in underdeveloped areas (Tran et al., 2025). Other research shows that transformational leadership can improve educational services and school culture, as well as motivation and collaboration in urban areas (Alviz & Opina, 2024). A case study in an Islamic values-based secondary school showed increased teacher motivation and innovation in learning through transformational leadership (Warisno, 2025). Other studies also show the importance of transformational leadership in building a culture of educational innovation; however, these are only literature reviews and have not empirically tested the causal relationship in underdeveloped areas.

A gap in this research is clearly evident in the field of transformational leadership in education in underdeveloped regions. Most previous studies have focused on urban schools, without considering the broader relationship with human resource quality in education. Much of this prior research still focuses on the causal relationship between transformational leadership and improving human resource quality in education. Therefore, this research is urgently needed to analyse the real conditions in underdeveloped regions, which still face various challenges, including a lack of facilities, human resources, and school management.

If this situation is not addressed immediately, the gap in human resource quality in education will widen, impacting the divide between human resources in schools in urban and underdeveloped regions. The novelty of this research lies in its attempt to comprehensively examine the influence of transformational leadership on human resource quality in education by integrating several important variables, such as teacher performance, work motivation in underdeveloped regions.

The objectives of this study are: 1) to analyse the influence of transformational leadership on the quality of human resources in high schools in underdeveloped areas, 2) Test the influence of transformational leadership on teacher performance and work motivation, 3) Identify the role of teacher performance and work motivation as mediating variables in improving human resource quality in education, 4) Measure the direct and indirect influence of transformational leadership on student learning outcomes and 5) Develop an effective transformational leadership model in underdeveloped areas.

Therefore, the formulation of this study is: 1) Does transformational leadership affect the human resource quality in education in high schools in underdeveloped areas? 2) Does transformational leadership affect teacher performance in high schools in underdeveloped areas? 3) Does transformational leadership affect teacher work motivation? 4) Do teacher performance and work motivation act as mediating variables in improving human resource quality in education? and 5) Are there direct and indirect influences of transformational leadership on student learning outcomes?

2. Literature Review

2.1 Transformational Leadership Theory

Transformational leadership theory emphasises that a leader has the responsibility to manage administrative affairs and act as a role model, inspire, motivate, provide training, and develop human resource potential (Bijaksana et al., 2024). Transformational educational leaders create an innovative and collaborative learning environment that is oriented towards improving the quality of global education (Bilbokaitė et al., 2024). Transformational leadership has four dimensions: idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration. Idealised influence describes the principal as a role model with high integrity and commitment.

Inspirational motivation relates to the leader's ability to provide vision and motivation to teachers. Intellectual stimulation, which emphasises the principal's abilities, encourages creativity and innovation in the learning process. Individualised consideration demonstrates the principal's attention to the needs and development of human resources. Transformational leadership theory is used in this study to explain how principal behaviour can affect the human resource quality in education by improving teacher performance and work motivation. Principals must create a positive school culture, increase teacher engagement, and strengthen collaboration within the school (Deliarte-Ramos, 2025).

2.2 Teacher Performance Theory

Teacher performance theory explains that the human resource quality in educational outcomes is influenced by teachers' abilities to carry out their professional duties (Nawas et al., 2025). Teacher performance demonstrates teachers' success in planning, implementing, and executing learning effectively (Abdulkadir et al., 2025). According to educational competency theory, teacher performance is not only determined by academic ability but also influenced by pedagogical, professional, social, and personality competencies (Arciniegas-

Romero et al., 2025). Competent teachers can create active, innovative, and student-centred learning. Pedagogical competency relates to teachers' ability to understand student characteristics, develop learning strategies, and conduct learning evaluations (Hajirasouli & Banihashemi, 2022). Professional competency reflects mastery of material and the ability to continuously develop knowledge (Blanco-García et al., 2025). Social competency relates to the ability to build effective communication and interaction with students, colleagues, and the school community (Gad et al., 2025).

Personal competency reflects teachers' integrity, discipline, and exemplary behaviour in the educational environment (Yu, 2024). Teacher performance theory is used to improve the human resource quality in education. Principals who implement transformational leadership can improve teacher performance through training, motivation, and professional support. High-performing teachers are more effective in managing learning and have a direct impact on improving student learning outcomes.

2.3 Work Motivation Theory

Work motivation theory is the theory that individual behaviour and work are influenced by internal and external needs, expectations, and drives (Satwika et al., 2025). Humans have five levels of needs: physiological, safety, social, esteem, and self-actualisation (Hajipour et al., 2025). Teachers whose basic needs are met are more motivated to perform optimally (Setyaningrum & Rahmania, 2025). The two-factor theory explains that work motivation is influenced by motivating factors and hygiene factors (Ay, 2025). Motivating factors include recognition, achievement, and career development, while hygiene factors include the work environment, job security, and social relationships. If these two factors are met, teachers will demonstrate high performance and be committed to providing good education for students at school. Work motivation theory is used to explain how principal leadership can increase teacher motivation in carrying out their duties as educators.

2.4 Human resource quality in education Theory

Human resource quality in education theory is the result of a learning process involving input, process, and output (AlSagri & Sohail, 2024). Human resource quality in education management emphasises that school quality is measured by student academic outcomes and the effectiveness of learning management (Tran et al., 2025). Educational inputs include teacher quality, infrastructure, curriculum, and school management support (Han et al., 2025). The educational process encompasses the implementation of learning, teacher-student interactions, and the use of effective learning methods. Educational outputs are reflected in student achievement, student competency, and graduation rates (Suherman et al., 2023). In education, quality is greatly influenced by the leadership of the principal (Mifsud, 2024). An effective principal is able to create a culture of mutual respect, enhance teacher professionalism, and ensure the learning process runs smoothly.

The following are the research hypotheses.

H1: The effect of transformational leadership on improving the quality of human resources in secondary schools in underdeveloped areas.

H2: The effect of transformational leadership on teacher performance in secondary schools in underdeveloped areas.

H3: The effect of transformational leadership on the motivation of human resources in underdeveloped areas.

H4: The effect of transformational leadership on teacher enthusiasm in improving student learning outcomes in secondary schools in underdeveloped areas.

3. Methodology

3.1 Research Approach and Stages

The approach in this research is quantitative, using Structural Equation Modeling (SEM) (Kineber et al., 2024). This method was chosen because the focus of this research was on analysing the influence of transformational leadership on teacher performance, work motivation, and the quality of human resources in education. The SEM method was chosen based on its advantages in analysing complex relationships between variables simultaneously, including direct and indirect (mediation) relationships. SEM is also capable of comprehensively assessing models. Furthermore, SEM supports construct validity and reliability testing through measurement models, as well as assessing relationships between variables using structural models. This research considers this method most appropriate for analysing the impact of transformational leadership on human resource quality in education.

The steps in this research were: Problem formulation and development of a conceptual framework based on theoretical studies and previous research. Next, research instruments were developed and validity and reliability were tested. Data were collected by distributing questionnaires to respondents. The data were then processed and analysed using SEM based on Partial Least Squares (PLS) with the assistance of software such as SmartPLS. At this stage, the external model was tested to assess the validity and reliability of the constructs, and the internal model was tested to analyse relationships between variables and test the research hypotheses. Finally, the analysis results were interpreted by answering the research questions and testing the established hypotheses. Conclusions were drawn and recommendations were developed.

3.2 Respondents

The study's population was all teachers in high schools in underdeveloped areas of Indonesia. The sample consisted of 370 teachers from Pontianak, West Kalimantan, Indonesia. The sampling technique used in this study was Bert's stratified proportional random sampling. This method was chosen to ensure that each teacher had an equal opportunity to be a respondent and to take into account differences in school characteristics, such as location in underdeveloped areas, school status, teachers' experience in teaching, and direct experience with the principal's leadership. There were 200 female teachers and 170 male teachers. All of these teachers had teaching experience in underdeveloped areas for between four and 10 years. This sample size is considered adequate for SEM analysis, as it

meets the minimum number of respondents, which is five to 10 times the number of indicators in the research model. With this number, the analysis results are expected to have a good level of reliability and generalisability.

3.3 Data Collection Technique

The data collection technique in this study was a survey questionnaire. The questionnaire was chosen because it can reach a large number of respondents and allows for measurable and organised measurement of variables. This research questionnaire was based on indicators for each variable, such as dimensions of transformational leadership, teacher performance, work motivation, and human resource quality in education. Before the questionnaire was distributed to respondents, a pilot test was conducted with several respondents with characteristics similar to the chosen sample. The pilot test aimed to test the validity and consistency of the measurement instrument. Validity was used to ensure each question could measure the desired concept, while reliability measured the consistency of respondents' answers. Items that did not meet the criteria were removed to ensure a high-quality measurement instrument.

The questionnaire was distributed directly to respondents in areas with limited internet access; distribution was carried out manually with the assistance of school officials. Meanwhile, in areas with existing, smooth technology access, the questionnaire was distributed via a Google Forms link. This aimed to increase the response rate and simplify data processing, making it easier for respondents to assess the questionnaire in their free time. The questionnaire was scored using a five-point Likert scale, ranging from strongly disagree (Point 1) to strongly agree (Point 5). This scale was chosen because it was easy for respondents to understand and could more clearly represent the level of perception and attitude in the assessment rubric.

In addition to questionnaires, the data were also supported by documentary evidence. Documentary data were collected from official sources such as school reports, student learning outcomes, and related documents on teacher performance and school management. This data served as a complement to strengthen the analysis and provide a more objective picture of the education situation in underdeveloped areas. During data collection, researchers also ensured that respondents understood the research objectives and provided honest, unpressured responses.

Table 1: Measurement Instruments

Variable	Indicator	Measurement Items
Transformational Leadership (X).	Ideal influence	1. The principal is a role model in the workplace.
		2. The school principal shows high integrity.
		3. The principal is consistent in words and actions.
		4. The principal is respected by the teachers.
		5. The principal has a strong commitment to school development.
		6. The school principal makes decisions fairly and objectively.

Variable	Indicator	Measurement Items
	Motivational and Inspirational	7. The principal shows good leadership ethics.
		1. The principal encourages teachers to think creatively.
		2. The principal opens up space for teachers to discuss issues.
		3. The principal welcomes new ideas from teachers.
		4. The principal supports innovation in classroom learning.
		5. The principal encourages teachers to solve problems.
		6. The principal provides teachers with opportunities to experiment.
	Fair and Objective Person	7. The principal encourages teachers to think critically.
		1. The principal understands the teachers' needs.
		2. The principal pays attention to teachers.
		3. The principal acts as a mentor and facilitator for teachers.
		4. The principal provides feedback.
		5. The principal respects teachers' differing opinions.
		6. The principal provides emotional support to teachers.
Teacher Performance (M1)	Pedagogical Competence	7. The principal recognizes teachers' achievements.
		1. Teachers develop effective lesson plans.
		2. Teachers use a variety of learning models and methods.
		3. Teachers manage their classes practically and effectively.
		4. Teachers adapt their methods to the students' initial conditions.
		5. Teachers assess and evaluate learning.
		6. Teachers use media as a learning aid.
	Social Competence	7. Teachers understand the characteristics of the students they teach.
		1. Teachers master the material through training.
		2. Teachers keep abreast of global scientific developments.
		3. Teachers develop teaching materials.
		4. Teachers are able to explain the material clearly and correctly.
		5. Teachers use references that are easily accessible to students.
		6. Teachers improve their own competencies.
	Personality Competence	7. Teachers are able to connect theory with practice.
		1. The teacher is disciplined in his work.
		2. The teacher is responsible within the school.
		3. The teacher is a role model for students.
		4. The teacher has good ethics.
		5. The teacher is consistent in carrying out his duties.
		6. The teacher has integrity.
Work Motivation (M2)	Self-Esteem Needs	7. The teacher demonstrates professionalism.
		1. Teachers feel safe in the school environment.
		2. Teachers feel comfortable teaching.
		3. Teachers are provided with supportive work facilities.
		4. Teachers have a conducive work environment.

Variable	Indicator	Measurement Items
		5. Teachers feel stable in their jobs.
		6. Teachers feel protected from harassment.
		7. Teachers are not worried about losing their jobs.
	Self-Actualisation	1. Teachers feel accepted in the school environment.
		2. Teachers have good relationships with leaders and other teachers.
		3. Teachers feel a part of the school.
		4. Teachers actively interact at school.
		5. Teachers receive support from their colleagues.
		6. Teachers feel socially valued.
		7. Teachers are involved in collaborative activities at school.
	Physiological and Comfort	1. Teachers receive recognition.
		2. Teachers are appreciated by the principal.
		3. Teachers are proud of their work.
		4. Teachers feel respected.
		5. Teachers receive appreciation.
		6. Teachers are confident.
		7. Teachers feel recognized for their achievements.
	Social Needs	1. Teachers have opportunities for development.
		2. Teachers participate in training.
		3. Teachers strive to achieve goals.
		4. Teachers innovate in learning.
		5. Teachers have career goals.
		6. Teachers improve their skills.
		7. Teachers are motivated to succeed.
Human resource quality in education (Y)	Educational Input	1. Adequate infrastructure.
		2. Teachers have good competencies.
		3. Books and learning resources are available.
		4. A supportive school environment.
		5. A sufficient number of teachers.
		6. Learning facilities are available.
		7. Good school management support.
	Learning Process	1. Effective learning.
		2. Active teacher-student interaction.
		3. Diverse learning models and methods.
		4. Engaging learning.
		5. Use of active learning media.
		6. Regular learning assessment and evaluation.
		7. Students are actively involved in learning.
	Educational Output	1. Students' understanding and grades improve.
		2. Student graduation rates are high.
		3. Student achievement improves.
		4. Students have strong competencies.
		5. Students are ready to pursue higher education.
		6. Students have strong skills.
		7. Students demonstrate optimal learning outcomes in their learning.

Table 1 shows the research instrument structured around transformational leadership, teacher performance, work motivation, and human resource quality in education. Each variable is operationalised into measurable indicators. Transformational leadership encompasses the dimensions of idealised influence, inspirational motivation, and individualised attention, each consisting of several statements. This demonstrates that the variable measurements were conducted carefully, not simply in general terms. Meanwhile, the variables of teacher performance and work motivation were also broken down into competency, needs, and self-actualisation aspects. Human resource quality in education was measured from input, output, and process perspectives.

3.4 Data Analysis

The data analysis technique in this study used Partial Least Squares Structural Equation Modeling (PLS-SEM) using Smart Partial Least Squares (SmartPLS). Data collected through a Likert-scale questionnaire underwent an initial editing process to ensure all respondents' responses were complete. After that, coding was carried out by assigning a numeric code to each response to facilitate statistical analysis. The data were then entered into SmartPLS analysis software for further analysis. The initial analysis was used to describe the characteristics of the respondents, the distribution of the research data, the measurement of the average (mean), standard deviation, minimum value, maximum value, and frequency distribution. The analysis provided an overall picture of respondents' perceptions of the variables studied, such as transformational leadership, teacher performance, work motivation, and human resource quality in education.

Then, instrument quality testing was conducted, including validity and reliability testing. Validity testing ensures that each indicator measures the intended construct by examining the factor loading values (>0.70) and Average Variance Extracted (AVE >0.50) (Gaonkar & Sukthankar, 2025). Then, reliability testing was carried out by checking the Cronbach's Alpha and Composite Reliability values (CR > 0.70), ensuring that the instrument had good internal consistency (Yoshihara et al., 2025). Next, a structural model analysis was conducted using SEM based on PLS. This analysis includes two main stages: the outer model and the inner model.

The outer model is used to evaluate the validity and reliability of the construct, while the inner model is used to examine the relationship between variables and test the research hypothesis. In testing the inner model, several indicators of the coefficient of determination (R^2) are used to assess the ability of the independent variables to explain the dependent variable; the path coefficient value determines the direction and strength of the interaction, and the significance test is through the t statistic or p value. In addition, the analysis also includes testing the direct and indirect effects (mediation), especially on the variables of teacher performance and work motivation as intervening variables. All results in tabular form are interpreted.

4. Results and Findings

The research results below are the result of an analysis of data collected from respondents. All data below were analysed through a series of stages, including careful coding and processing.

Table 2: Results of Initial Respondent Data Processing

Description	Total
Number of questionnaires distributed	370
Questions returned	362
Valid questionnaires (can be processed)	355
Invalid questionnaires	7
Response rate (%)	95.7%

Table 2 shows that 370 questionnaires were distributed and 362 were successfully returned by respondents to the researchers. Of the 362, only 355 were declared valid and usable for analysis, while seven questionnaires did not meet the specified requirements. A total of 95.7% indicates excellent respondent participation in this study. This high response rate also strengthens the accuracy of the data obtained by reducing non-response bias. The number of valid data, namely 355 respondents, meets the standards for SEM analysis, so the research results can be considered representative.

Table 3: Descriptive Analysis Results

Variables	Mean	Standard Deviation	Min	Max	Category
Transformational Leadership (X)	4.12	0.56	2.80	5.00	High
Teacher Performance (M1)	4.05	0.60	2.70	5.00	High
Work Motivation (M2)	4.08	0.58	2.90	5.00	High
Human resource quality in education (Y)	4.10	0.55	3.00	5.00	High

Table 3 shows that all variables studied have a mean value above 4.00, indicating a high level of teacher performance. Transformational leadership showed a mean of 4.12, followed by human resource quality in education at 4.10, work motivation at 4.08, and teacher performance at 4.05. The relatively small standard deviation value of 0.55-0.60 indicates that respondents' answers tended to be uniform, and there was no variation. The lowest and highest values also indicated that all scales had been used by respondents, although most were in the high category. Transformational leadership was found to have been well implemented and had a positive impact on teacher performance, work motivation, and human resource quality in education.

Table 4: Validity Test Results (Outer Loading)

Variables	Loading Factor Range	Description
Transformational Leadership	0.72 – 0.89	Valid
Teacher Performance	0.70 – 0.87	Valid
Work Motivation	0.71 – 0.88	Valid
Human resource quality in education	0.73 – 0.90	Valid

Table 4 shows that all indicators for each variable have factor values exceeding 0.70, ranging from 0.70 to 0.90. This value meets convergent validity standards, indicating that each indicator accurately measures the construct. There were no indicators with loading values below the threshold. High loading values indicate a strong relationship between the indicator and the measured latent variable. The instrument accurately reflects the concepts of transformational leadership, teacher performance, work motivation, and human resource quality in education.

Table 5: Reliability Test Results

Variables	Cronbach's Alpha	Composite Reliability	AVE
Transformational Leadership	0.94	0.95	0.68
Teacher Performance	0.93	0.94	0.65
Work Motivation	0.92	0.94	0.66
Human resource quality in education	0.94	0.95	0.69

Table 5 shows that all variables have Cronbach's Alpha and Composite Reliability values exceeding 0.90 and are categorised as very high. The instrument exhibits excellent internal consistency. The Average Variance Extracted (AVE) values for all variables are also greater than 0.50, meaning the variables can explain more than half of the variance in their indicators. The combination of reliability and AVE values indicates that the instrument is consistent and has strong convergent validity.

Table 6: Discriminant Validity Test

Variabel	Transformational Leadership	Teacher Performance	Work Motivation	Human resource quality in education
Transformational Leadership	0.892			
Teacher Performance	0.811	0.806		
Work Motivation	0.745	0.692	0.812	
Human resource quality in education	0.798	0.734	0.701	0.831

Table 6 shows that all the square root values of the Average Variance Extracted $\sqrt{AVE}$ on the main diagonal are greater than the correlation values between other constructs. The $\sqrt{AVE}$ value of transformational leadership, at 0.892, is higher than its correlation with other constructs. Similarly, teacher performance (0.806), work motivation (0.812), and Human resource quality in education (0.831) also have the highest diagonal values. These results prove that each construct has good

discrimination capabilities and is able to explain its own indicators more strongly than other constructs.

Table 7: Discriminant Validity Test (HTMT)

Variable	$X \leftrightarrow M1$	$X \leftrightarrow M2$	$X \leftrightarrow Y$	$M1 \leftrightarrow M2$	$M1 \leftrightarrow Y$	$M2 \leftrightarrow Y$
HTMT Value	0.842	0.801	0.856	0.788	0.824	0.811

In Table 7, the discriminant validity test using the Heterotrait-Monotrait Ratio (HTMT) method shows that all HTMT values are below the tolerance limit of 0.90. The highest value is found in the relationship between transformational leadership and Human resource quality in education at 0.856, while the lowest value is found in the relationship between teacher performance and work motivation at 0.788. These results indicate that each construct in the model has an adequate level of differentiation and there is no multicollinearity problem between latent variables.

Table 8: Results of the Variance Inflation Factor (VIF) Multicollinearity Test

Relationship between variables	VIF value	Criteria	Description
$X \rightarrow M1$	2,145	< 5.00	No multicollinearity occurs
$X \rightarrow M2$	2,231	< 5.00	No multicollinearity occurs
$X \rightarrow Y$	2,487	< 5.00	No multicollinearity occurs
$M1 \rightarrow Y$	2,318	< 5.00	No multicollinearity occurs
$M2 \rightarrow Y$	2,104	< 5.00	No multicollinearity occurs

In Table 8, the results of the multicollinearity test using the Variance Inflation Factor (VIF) show that all VIF values are below the maximum limit of 5.00. The highest VIF value is found in the relationship between transformational leadership and Human resource quality in education at 2.487, while the lowest value is found in the relationship between work motivation and human resource quality in education at 2.104. Each independent variable is able to explain the dependent construct without excessive correlation between predictor variables. The internal SEM-PLS model is declared stable, valid, and suitable for use in testing causal relationships and further testing research hypotheses.

Table 9: Structural Model Test Results (R²)

Dependent Variables	R Square (R ²)	Category
Teacher Performance (M1)	0.62	Strong
Work Motivation (M2)	0.58	Moderate
Human resource quality in education (Y)	0.74	Strong

Table 9 shows the R² values for teacher performance at 0.62, work motivation at 0.58, and human resource quality in education at 0.74. These findings indicate that transformational leadership can explain 62% of the variation in teacher performance, 58% of the variation in work motivation, and 71% of the variation in human resource quality in education. The R² value of 0.74 for human resource quality in education is considered strong, indicating that this model has good predictive power. The R² value for work motivation is in the moderately strong category. Transformational leadership was found to have a significant influence on these variables. The higher the R² value, the better the model's ability to explain the relationships between variables.

Table 10: Hypothesis Test Results (Path Coefficient)

Variable Relationships	Coefficient	t-statistic	p-value	Description
X → Y	0.57	5.87	0,000	Significant
X → M1	0.81	12.45	0,000	Significant
X → M2	0.79	11.32	0,000	Significant
M1 → Y	0.49	4.21	0,000	Significant
M2 → Y	0.39	3.98	0,000	Significant

Table 10 shows that each correlation between variables has a p-value of approximately $0.000 < 0.05$, indicating statistical significance. The highest coefficient was found in the relationship between transformational leadership and teacher performance (0.81), indicating a very strong impact. Furthermore, transformational leadership had a significant impact on work motivation (0.79) and human resource quality in education (0.57). This positive impact on human resource quality in education is also positively influenced by teacher performance and motivation. The high t-statistical value for each correlation indicates that the results are statistically very strong. Transformational leadership is a major factor influencing teacher productivity and work motivation, which ultimately affects human resource quality in education. All research hypotheses can be tested using this method.

Table 11: Mediation Test Results (Indirect Effect)

Mediation Relationship	Coefficient	t-statistic	p-value	Description
$X \rightarrow M1 \rightarrow Y$	0.37	3.86	0.000	Significant mediation
$X \rightarrow M2 \rightarrow Y$	0.31	3.45	0.001	Significant mediation

Table 11 shows that teacher performance and motivation are mediators in the relationship between transformational leadership and human resource quality in education. The indirect effect coefficients are approximately 0.37 for the pathway through teacher performance and 0.31 for work motivation, indicating a significant impact. This is supported by a t-statistic greater than 1.96 and a p-value below 0.05. These results indicate that transformative leadership has a direct impact on human resource quality in education and increases teacher productivity and motivation. Effective principal leadership in enhancing teacher motivation improves teacher work performance. This has a direct impact on improving human resource quality in education.

5. Discussion

This study found that transformational leadership has a significant impact on the human resource quality in education in secondary schools in underdeveloped areas of West Kalimantan, Indonesia. The path coefficient indicates a positive and significant relationship. Principals who practice transformational leadership will produce better human resource quality in education. The impact of transformational leadership on teacher performance was found to be a key factor. Principals who can provide inspiration, motivation, and attention have been shown to improve teacher performance. Teachers can see this in their improved pedagogical, professional, social, and personal competencies.

Transformational leadership was also found to significantly influence teacher work motivation. The principal's leadership role is crucial in increasing teacher motivation in underdeveloped areas facing numerous limitations. High levels of work motivation are evident in teachers' increased sense of responsibility, commitment, and desire to continuously develop and innovate the learning process. Teacher motivation and performance were found to have a positive impact on human resource quality in education. This confirms that human resource quality in education is not only directly influenced by leadership but also by improved teacher performance and motivation as connecting factors.

The mediation analysis results indicate that teacher performance has an indirect effect. Meanwhile, work motivation influences the relationship between transformational leadership and human resource quality in education. Teacher performance was found to be a stronger mediator than work motivation. This confirms that improvements in human resource quality in education are influenced more by teacher performance driven by transformational leadership. The human resource quality in education variable indicates that this research model can explain variations in human resource quality in education. This means that changes in human resource quality in education can be explained by transformational leadership, teacher performance, and work motivation.

The findings in this study are in line with transformational leadership theory, that transformational leaders can inspire, motivate, and change teacher behaviour to achieve better performance (Deliarte-Ramos, 2025). Four dimensions, namely idealised influence, inspirational motivation, intellectual stimulation, and individual consideration, have been proven to help improve teacher performance and motivation (Xun & Barkhuizen, 2025). The findings of this study support educational management theory and emphasise the principal's primary role in creating a positive learning environment (Bijaksana et al., 2024). Transformational leadership has been proven to improve the quality of the learning process and student learning outcomes.

Motivational theories such as Herzberg's hierarchy of needs and two-factor theory are also related to the findings of this study (Khalfan et al., 2025). The increase in teachers' work motivation shows that psychological, social, and self-esteem needs can be met through good leadership (Anastasiou, 2025). An impact on improving performance and learning quality was found. These findings are also consistent with previous research showing that transformational leadership has a positive influence on teacher performance and human resource quality in education (Luo et al., 2024). Previous research is consistent with these findings, transformational leadership increases teacher motivation and cooperation (Karakose, 2024).

Theoretical implications for developing transformational leadership in the education sector, particularly in secondary schools in underdeveloped areas. The research findings strengthen the argument of transformational leadership theory that leaders capable of providing inspiration, intellectual stimulation, idealized influence, and individualized attention are able to drive organizational behavioural change more effectively. This study not only confirms a direct relationship between transformational leadership and human resource quality in education but also shows that this relationship operates through mediating mechanisms such as teacher performance and work motivation. This expands the conceptual model of educational leadership, which previously positioned human resource quality in education as a direct outcome without considering psychological processes and organizational behaviour at the school level.

Human resource quality in education is not solely determined by structural factors such as facilities, technology, or administrative policies, but is strongly influenced by the leadership's capacity to build a productive work culture. The high path coefficient between transformational leadership and teacher performance indicates that teachers are central actors determining the effectiveness of leadership implementation in schools. Furthermore, the resulting empirical model enriches the SEM-PLS literature in educational management by comprehensively examining the direct and indirect relationships between constructs simultaneously.

Meanwhile, practical implications, improving the human resource quality in education in underdeveloped areas can be achieved through the development of physical infrastructure, and education policies need to be directed at

strengthening the leadership capacity of school principals through transformational leadership training oriented towards developing interpersonal competencies, motivational skills, change management, and ongoing teacher development. Principals must be positioned not merely as educational administrators, but as agents of change capable of creating an innovative and collaborative academic culture. Improving teacher motivation and performance is a key strategy in improving the quality of learning. Schools need to establish reward systems, professional support, academic supervision, and a conducive work environment to strengthen teacher commitment. Local governments and education policymakers also need to make transformational leadership indicators a key part of evaluating school principal performance.

This study's limitations include its limited implementation in secondary schools in underdeveloped areas of Kalimantan province, so the results may not be applicable to urban areas. Data were obtained through a perception questionnaire, which can lead to subjectivity in respondents' assessments. This study only used transformational leadership, teacher performance, work motivation, and human resource quality in education as variables. Other factors, such as organizational culture, government support, and socioeconomic conditions, can influence human resource quality in education. Fourth, this study used a cross-sectional approach, making it impossible to examine longitudinal changes.

Research recommendations include expanding the scope of the study to include urban and regional areas with different characteristics. Future research could also include other variables, such as school culture, job satisfaction, and organisational support, to obtain a more comprehensive model. Furthermore, a longitudinal approach is recommended to examine changes in the influence of transformational leadership over time. Mixed research methods can also be used to gain a deeper understanding through a combination of quantitative and qualitative data. Future research is also expected to examine the implementation of educational policies related to principal leadership development, thereby making broader contributions to national and global education.

6. Conclusion

In conclusion, transformational leadership impacts the quality of human resources in education in secondary schools in underdeveloped regions of Indonesia. Success in improving the human resource quality in education is influenced by the principal's leadership approach and infrastructure facilities. Leadership can provide inspiration, motivation, and personal attention to teachers, which can maximise their performance and pedagogical, professional, social, and personal competencies.

Motivation to work through moral support, recognition, and opportunities for self-development can be provided by the principal. Performance and motivation serve as links between transformational leadership and human resource quality in education, with teacher performance having a stronger mediating effect on improving human resource quality in education. This study confirms that

transformational leadership is an effective strategy for improving the human resource quality in education, especially in underdeveloped regions. Without transformation in school leadership, the gap in educational quality between regions in Indonesia has the potential to widen and hinder transformational leadership in the future.

7. Conflict of Interest

In writing this article, there was no conflict of interest between the authors and any other authors or parties. We also thank the respondents who provided data for this study.

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In editing this article, we used AI as an aid. However, the use of AI was minimal, as we manually rewrote the text to refine the language. All content was thoroughly analysed and interpreted by the author, leading to a conclusion.

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