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Explaining Teacher Adaptability in Primary Education

A Social Cognitive Perspective on Leadership, Professional Culture, and Digital Self-Efficacy

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ABSTRACT

The increasing complexity of educational change requires teachers to develop adaptive capabilities. However, the organisational and psychological mechanisms associated with teacher adaptability in rural schools remain insufficiently understood. This study examines the relationships between transformational leadership, positive professional culture, digital teaching self-efficacy, and teacher adaptive performance, with particular attention to the mediating roles of positive professional culture and digital teaching self-efficacy. A quantitative cross-sectional survey was conducted with 150 teachers from 15 public elementary schools across three rural subdistricts of Grobogan Regency, Indonesia. Data were analysed using partial least squares structural equation modelling (PLS-SEM). The findings indicate that transformational leadership is positively associated with positive professional culture ($\beta = 0.795$, $p < 0.001$), digital teaching self-efficacy ($\beta = 0.418$, $p < 0.001$), and teacher adaptive performance ($\beta = 0.279$, $p = 0.001$). Positive professional culture ($\beta = 0.450$, $p < 0.001$) and digital teaching self-efficacy ($\beta = 0.291$, $p < 0.001$) are also positively associated with teacher adaptive performance. Both indirect relationships are statistically significant, with a stronger indirect association through positive professional culture ($\beta = 0.357$, $p < 0.001$) than through digital teaching self-efficacy ($\beta = 0.121$, $p < 0.001$). These findings highlight the complementary organisational and psychological pathways associated with teacher

adaptability in rural schools. Given the cross-sectional design, the results indicate statistical associations rather than causal relationships. The study offers contextual evidence for understanding teacher adaptability through the combined perspectives of transformational leadership and social cognitive theory.

Keywords
Digital Teaching Self-Efficacy
Positive Professional Culture
Rural Schools
Teacher Adaptive Performance
Transformational Leadership

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Introduction

Rapid changes in the global educational landscape have transformed how schools understand the meaning of quality, sustainability, and professionalism [1]–[3]. Digital transformation, advancements in learning technologies, demands for 21st-century competencies, and the increasing complexity of students' needs present new pressures for educational institutions across the globe [4]–[6]. Schools are no longer merely expected to produce high academic achievements but must also build adaptive capacities that enable the entire school community to survive, learn, and thrive amid ongoing change [7]–[8]. In this context, teachers occupy a highly strategic position because the success of various educational transformation agendas ultimately depends on their ability to translate policy changes, technological developments, and student needs into daily teaching practices [9]–[11]. Teacher adaptability is consequently an important dimension of professional practice, particularly in educational environments characterised by changing instructional demands and limited resources [12]–[13].

Amid these changes, school leadership has garnered increasing attention in the international educational literature [3], [11]. Various theoretical perspectives indicate that an educational organisation's ability to adapt is influenced not only by the resources it possesses but also by the quality of leadership guiding the change process [14]–[15]. Transformational Leadership Theory positions leaders as figures capable of building a shared vision, fostering collective motivation, encouraging innovation, and creating an environment that supports individual development [16]–[17]. Meanwhile, Social Cognitive Theory explains that an individual's professional behaviour develops through the interaction between environmental and personal factors [18]–[19]. In the school context, transformational leadership can be understood as an environmental factor that shapes teachers' beliefs, motivation, and behavior. In contrast, self-efficacy is a personal factor that influences how teachers respond to various

professional demands [20]–[23]. Taken together, these perspectives provide a theoretical basis for examining teacher adaptability through the interaction of organisational and individual factors rather than treating it solely as an individual competency.

Previous research on transformational leadership in education has examined its relationships with organisational effectiveness, teacher commitment, job satisfaction, instructional innovation, and educational performance [10]–[11], [24]. Studies have also highlighted the relevance of leadership practices for professional collaboration, teacher development, and organisational readiness to respond to curricular and technological changes [3], [25]–[27]. Alongside this literature, research on professional culture has emphasised collegial trust, collaborative practices, psychological safety, reflective communication, and collective efficacy as important features of supportive school environments [28]–[31]. Research on digital teaching self-efficacy, meanwhile, has examined teachers' confidence in using educational technologies and its association with technology integration, pedagogical innovation, and readiness for digital learning [4]–[6], [18]. Although these research strands offer complementary explanations of teachers' professional behaviour, further empirical examination is warranted to understand how organisational culture and digital teaching self-efficacy jointly relate to teacher adaptive performance within the same analytical model [20], [32]–[33].

This issue is particularly relevant in rural schools, where access to professional development, digital infrastructure, and educational resources may vary considerably [34]–[35]. At the same time, close interpersonal relationships and community ties may provide social resources for professional collaboration and collective learning [34]. These contextual characteristics make rural schools an important setting for examining the relationships among leadership, professional culture, digital teaching self-efficacy, and teacher adaptability. However, the extent to which organisational and individual pathways are associated with teacher adaptive performance in rural elementary schools requires further context-specific empirical evidence [4], [18], [36]. Examining these pathways together may help clarify whether the organisational environment and teachers' confidence in their digital teaching capabilities represent distinct but complementary correlates of adaptive professional behaviour.

Against this background, this study examines the relationships between Transformational Leadership, Positive Professional Culture, Digital Teaching Self-Efficacy, and Teacher Adaptive Performance in public elementary schools across three rural subdistricts of Grobogan Regency, Indonesia. Specifically, it investigates the direct relationships between transformational leadership and the three focal constructs, the relationships of positive professional culture and digital teaching self-efficacy with teacher adaptive performance, and the indirect relationships between transformational leadership and teacher adaptive

performance through the two proposed mediators. By examining these organisational and individual pathways simultaneously, the study seeks to provide context-specific empirical evidence that connects Transformational Leadership Theory with Social Cognitive Theory in the study of teacher adaptability. The study does not propose a new standalone theory. Instead, it examines how established theoretical perspectives can inform an integrated understanding of teacher adaptive performance in rural elementary education. Given the cross-sectional survey design, the findings are interpreted as evidence of statistical relationships and indirect associations, rather than proof of temporal or causal mechanisms.

Literature Review

A. Transformational Leadership as a Driver of Teacher Adaptability in Rural Schools

Educational change in the 21st century unfolds like a current that never truly stops. Curricula evolve, technology advances rapidly, student profiles change, and the demands on teacher professionalism grow increasingly complex. In this ever-shifting landscape, schools need not only administrators capable of maintaining organisational stability but also leaders capable of driving change. This is where transformational leadership gains its relevance.

Bass and Riggio [16] explain that transformational leadership is a leader's ability to influence individuals through idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration. This type of leadership does not operate solely through control and instruction, but rather through inspiration, setting an example, and creating a collective vision that provides meaning for all members of the organisation. In the context of education, a transformational principal is not merely an administrator of an institution but an architect of change who fosters optimism and self-confidence among teachers as they navigate the dynamics of education.

Previous research has associated transformational school leadership with school effectiveness, organisational commitment, professional development, and instructional improvement [3], [11], [24]. These relationships are particularly relevant to rural schools, where access to professional development, digital infrastructure, and educational resources may vary across institutions [25]–[27]. Under such conditions, leadership practices that encourage collaboration, professional learning, and innovation may provide important organisational resources for teachers navigating educational change. Nevertheless, the extent to which these leadership practices are associated with teacher adaptive performance requires further examination within specific rural educational contexts.

Social Cognitive Theory provides an additional perspective for understanding these relationships. Bandura [18]–[19] explains that human functioning involves reciprocal interactions among personal factors, behaviour, and environmental conditions. From this perspective, school leadership represents an organisational condition that may be associated

with teachers' professional beliefs and behaviour. Transformational leadership can therefore be examined in relation to both the professional environment and teachers' individual confidence in responding to instructional demands. These considerations underpin the following hypotheses:

H1: Transformational Leadership is positively associated with Positive Professional Culture.
H2: Transformational Leadership is positively associated with Digital Teaching Self-Efficacy.
H3: Transformational Leadership is positively associated with Teacher Adaptive Performance.

B. Positive Professional Culture as an Organisational Mechanism for Developing Adaptive Teachers

School culture encompasses the shared assumptions, values, and practices that shape organisational members' interpretations and actions. Schein [29] explains that organisational culture develops through shared assumptions that guide how members perceive, understand, and respond to their organisational environment. In educational settings, professional culture is reflected in the quality of relationships among teachers, the extent of collaboration, and the opportunities available for collective learning.

Positive Professional Culture in this study refers to a professional environment characterised by collegial trust, a collaborative climate, psychological safety, reflective communication, and collective efficacy. These dimensions capture organisational conditions that may support teachers in discussing instructional challenges, exchanging professional knowledge, and considering alternative approaches to teaching.

Psychological safety is particularly relevant to professional learning. Edmondson [37]–[38] highlights the importance of an environment in which individuals feel able to express concerns, seek feedback, and discuss mistakes without undue fear of negative interpersonal consequences. In schools, such conditions may facilitate reflective dialogue and collaborative experimentation. Teachers who experience professional trust and collegial support may have greater opportunities to learn from their colleagues and consider different responses to changing classroom demands.

Previous research has linked supportive professional environments with teacher well-being, collaboration, professional development, and school effectiveness [28]–[31], [39]. Fullan [40] also emphasises the importance of organisational conditions in educational change. Taken together, these perspectives suggest that Positive Professional Culture may constitute an organisational pathway through which transformational leadership is associated with teacher adaptive performance. A supportive culture does not necessarily guarantee adaptive behaviour, but it provides social conditions within which teachers can exchange knowledge, reflect on their practice, and respond to professional challenges. Accordingly, the following hypothesis is proposed:

H4: Positive Professional Culture is positively associated with Teacher Adaptive Performance.

C. Digital Teaching Self-Efficacy as a Personal Mechanism in the Era of Digital Transformation

Digital transformation has changed the way teachers teach, interact, and manage learning. The use of technology is no longer an optional add-on but an integral part of modern educational practice. However, the success of technology integration is determined not only by the availability of devices or infrastructure but also by teachers' belief in their ability to use technology effectively.

Bandura [18] defines self-efficacy as an individual's belief in their capability to organise and execute the actions required to attain particular goals. In this study, Digital Teaching Self-Efficacy refers to teachers' confidence in their ability to plan, implement, and assess technology-supported learning. It represents a task-specific belief rather than a direct measure of digital competence or actual teaching performance.

Research on educational technology has examined the relationships among teacher readiness, technological knowledge, and the integration of digital tools into teaching [4]–[6]. More recent studies have continued to investigate the conditions associated with teachers' readiness for digital instruction and the development of their technological capabilities [41]–[42]. These perspectives suggest that teachers' confidence in using digital technologies may be relevant to their willingness to explore instructional alternatives and respond to changing pedagogical requirements.

Within Social Cognitive Theory, self-efficacy is understood in relation to personal agency and the environmental conditions in which behaviour occurs [18]–[19]. Teachers' digital teaching self-efficacy may therefore represent an individual-level pathway associated with adaptive performance, while remaining distinct from their actual technological skills and the resources available in their schools. This distinction is important in rural settings, where teachers' confidence and their opportunities to use digital technologies may not always develop under equivalent conditions. The following hypothesis is proposed:

H5: Digital Teaching Self-Efficacy is positively associated with Teacher Adaptive Performance.

D. The Mediating Role of Positive Professional Culture in the Relationship Between Transformational Leadership and Teacher Adaptive Performance

The relationship between leadership and teacher behaviour may involve organisational processes rather than being limited to a direct association. Transformational leaders articulate shared goals, encourage professional dialogue, and provide support for individual and collective development [14], [16]. These practices may be associated with the development of a professional environment in which teachers can collaborate, exchange knowledge, and reflect on their instructional practices.

Research on school leadership and organisational change highlights the relevance of professional culture in supporting collective learning and educational improvement [3], [10], [40], [43]. From this perspective, Positive Professional Culture provides a theoretically plausible indirect pathway linking Transformational Leadership with Teacher Adaptive Performance. Leadership may be associated with a more supportive professional environment, which, in turn, may be associated with teachers' capacity to respond to instructional challenges.

This proposed pathway is consistent with the organisational emphasis of transformational leadership theory and the environmental dimension of Social Cognitive Theory [16], [18]. However, the existence and strength of the indirect relationship require empirical testing rather than being assumed from the theoretical argument alone. Accordingly, the following hypothesis is proposed:

H6: Positive Professional Culture mediates the relationship between Transformational Leadership and Teacher Adaptive Performance.

E. The Mediating Role of Digital Teaching Self-Efficacy in the Relationship Between Transformational Leadership and Teacher Adaptive Performance

In addition to organisational conditions, teachers' personal beliefs may be relevant to understanding how leadership relates to adaptive professional behaviour. Transformational leadership practices that provide encouragement, recognise individual development, and support professional learning may be associated with teachers' confidence in using digital technologies [16], [18]. Such confidence may be particularly relevant when teachers encounter unfamiliar instructional tools or need to adjust their teaching practices in response to changing educational demands.

Studies examining self-efficacy and professional behaviour have highlighted the relevance of personal confidence in relation to innovation, engagement, and adaptation to work demands [33], [41]. Research on digital teaching has also examined the relationships between teachers' self-efficacy, technological knowledge, and school support [4], [42]. These studies provide a basis for considering digital teaching self-efficacy as an individual-level mechanism within the relationship between leadership and teacher adaptive performance.

Integrating these perspectives suggests that Digital Teaching Self-Efficacy may account for part of the indirect relationship between Transformational Leadership and Teacher Adaptive Performance. Nevertheless, this proposed mechanism should be interpreted as a theoretically specified indirect association. A cross-sectional survey cannot establish whether leadership precedes changes in teachers' self-efficacy or whether these relationships evolve in the proposed temporal sequence. The final hypothesis is therefore formulated as follows:

H7: Digital Teaching Self-Efficacy mediates the relationship between Transformational Leadership and Teacher Adaptive Performance

F. Rural School Theory as the Research Context

Rural schools provide an important context for examining the relationships proposed in this study. Differences in access to educational resources, professional development, and digital infrastructure may shape the conditions under which teachers respond to educational change [34]–[35]. At the same time, close interpersonal relationships and community ties may provide opportunities for collaboration and collective support. These characteristics should not be assumed to apply uniformly to all rural schools, but they identify contextual conditions that warrant empirical investigation.

Research on rural education has emphasised the importance of understanding schools in relation to their social, geographical, and organisational contexts [34], [44]. For rural elementary schools, examining leadership, professional culture, and digital teaching self-efficacy within a single analytical framework may help clarify how organisational and individual factors are associated with teacher adaptive performance. This approach does not assume that rural schools operate differently in every respect from urban schools. Rather, it recognises that the relationships among these constructs need to be examined within the particular conditions of the research setting.

Building on Transformational Leadership Theory and Social Cognitive Theory, this study examines seven hypothesised relationships involving Transformational Leadership, Positive Professional Culture, Digital Teaching Self-Efficacy, and Teacher Adaptive Performance. The proposed framework distinguishes between an organisational pathway through Positive Professional Culture and an individual pathway through Digital Teaching Self-Efficacy. By examining both pathways simultaneously in public elementary schools across three rural subdistricts of Grobogan Regency, Indonesia, the study seeks to provide context-specific evidence concerning their respective associations with teacher adaptive performance. The framework extends the empirical application of established theoretical perspectives to a rural educational context without claiming to establish a new standalone theory.

Material and Methods

A. Research Design

This study employed a quantitative cross-sectional survey design [45]. It examined the relationships among Transformational Leadership, Positive Professional Culture, Digital Teaching Self-Efficacy, and Teacher Adaptive Performance. The conceptual framework was informed by Transformational Leadership Theory [14], [16] and Social Cognitive Theory [18]–[19]. Given the cross-sectional design, the analysis examined direct and indirect statistical relationships without establishing temporal or causal effects.

B. Research Setting and Context

The study was conducted in 15 public elementary schools across three rural subdistricts of Grobogan Regency, Central Java, Indonesia: Penawangan, Karangrayung, and Tawangharjo. Each subdistrict contributed five schools. Schools were selected based on three criteria: public elementary school status, location in a rural area, and a principal with at least two years of service.

Table 1. Distribution of Research Locations

Subdistrict	Number of Schools	Number of Respondents
Penawangan	5 Elementary Schools	50 Teachers
Karangrayung	5 Elementary Schools	50 Teachers
Tawangharjo	5 Elementary Schools	50 Teachers
Total	**15 Elementary Schools**	**150 Teachers**

C. Participants and Data Sources

The study involved 150 teachers selected from an initially reported population of 215–240 active teachers across the 15 schools. Proportional stratified random sampling was used to represent teachers across the participating schools and subdistricts [46]–[47]. The sample comprised 50 teachers from each subdistrict. Eligible participants were active teachers with at least two years of teaching experience who participated in regular instructional activities and voluntarily agreed to participate. Teachers on extended leave and those with less than two years of service were excluded.

The final sampling frame, school-level population counts, number of teachers invited, number of valid responses, and response rate must be reported from the original sampling records. The sample size of 150 must also be justified using an appropriate PLS-SEM procedure, such as statistical power analysis or the inverse square root method [48], rather than model complexity alone.

Table 2. Respondent Characteristics

Characteristics	Category
Gender	Male and Female
Age	Under 30, 31–40, 41–50, Over 50
Years of Service	2–5 years, 6–10 years, >10 years
Employment Status	Civil Servant and Non-Civil Servant
Position	Classroom Teachers and Subject Teachers

D. Data Collection Procedures

Data were collected from January to April 2026 using a structured questionnaire with a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) [49]–[50]. The instrument was reviewed by two educational management experts and one quantitative research methodology expert to assess item clarity, content relevance, and contextual appropriateness. Limited school observations and document reviews provided supplementary contextual information.

Table 3. Research Instruments

Variable	Dimension	Number of Items
Transformational Leadership	Inspirational Motivation, Intellectual Stimulation, Individualised Consideration, Idealised Influence	16
Positive Professional Culture	Collegial Trust, Collaborative Climate, Psychological Safety, Reflective Communication, Collective Efficacy	20
Digital Teaching Self-Efficacy	Digital Planning, Digital Instruction, Digital Assessment	12
Teacher Adaptive Performance	Instructional Adaptability, Pedagogical Responsiveness, Collaborative Professionalism, Emotional Resilience, Innovative Teaching Behaviour	20

E. Data Analysis

Data were analysed using SmartPLS and partial least squares structural equation modelling (PLS-SEM) [48], [51]. The analysis examined the measurement model, structural relationships, predictive performance, and indirect effects. Measurement-model assessment included outer loadings, Cronbach's alpha, rho_A, composite reliability, average variance extracted (AVE), and the heterotrait–monotrait ratio (HTMT). Structural-model assessment included variance inflation factors (VIF), path coefficients, coefficients of determination (R^2), and effect sizes (f^2). Hypotheses were tested using bootstrapping with 5,000 subsamples.

The measurement specification must explicitly identify whether each construct was modelled reflectively, formatively, or as a higher-order construct. The specification should follow the theoretical meaning of the indicators and the model actually estimated in SmartPLS. Potential common method bias must be assessed because all four constructs were measured using the same questionnaire completed by the same respondents. The diagnostic procedure and its results should be reported only after the relevant tests have been conducted.

Predictive assessment should distinguish between blindfolding-based (Q^2) and out-of-sample prediction using PLSpredict. If PLSpredict is retained as part of the analytical procedure, its prediction errors and comparisons with the relevant benchmark model must be reported. Model-fit indices, including d_ULS and d_G, should not be interpreted as evidence of adequate fit without the corresponding bootstrap reference values. Indirect effects were assessed through bootstrapping. Their confidence intervals must be reported, and the mediation type must be determined from the estimated direct and indirect effects and their confidence intervals. All statistical interpretations were based on the verified analytical outputs.

Results

A. Measurement Model Evaluation

The measurement model was assessed by examining indicator reliability, internal consistency reliability, convergent validity, and discriminant validity following the guidelines proposed by Hair et al.

1. Indicator Reliability

Indicator reliability was evaluated using outer loadings. As shown in Table 4, all retained indicators exceeded the recommended threshold of 0.70, with loadings ranging from 0.700 to 0.854. These results indicate that all indicators contributed substantially to their respective latent constructs and adequately represented the underlying theoretical dimensions.

Table 4. Outer Loadings of Measurement Items

Construct	Loading Range
Transformational Leadership (TL)	0.760 – 0.854
Positive Professional Culture (PPC)	0.713 – 0.791
Digital Teaching Self-Efficacy (DTSE)	0.706 – 0.763
Teacher Adaptive Performance (TAP)	0.700 – 0.785

Table 4 demonstrates that all retained indicators met or reached the minimum loading criterion of 0.70, indicating satisfactory indicator reliability. Transformational Leadership exhibited the highest loading range (0.760–0.854), suggesting that its indicators most consistently represented the underlying construct. The remaining constructs—Positive Professional Culture, Digital Teaching Self-Efficacy, and Teacher Adaptive Performance—also showed acceptable loading ranges, with the lowest retained loading equal to the minimum recommended criterion. Overall, these results confirm that every indicator contributed meaningfully to its respective latent construct, providing adequate empirical support for the measurement model and justifying the retention of all indicators for subsequent structural analysis.

2. Internal Consistency, Reliability, and Convergent Validity

Internal consistency reliability was assessed using Cronbach's Alpha, rho_A, and Composite Reliability (CR), while convergent validity was evaluated using Average Variance Extracted (AVE).

Table 5. Reliability and Convergent Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	AVE
DTSE	0.860	0.863	0.893	0.543
PPC	0.958	0.959	0.962	0.573
TAP	0.950	0.951	0.955	0.542
TL	0.965	0.966	0.968	0.655

Table 5 confirms that All constructs exceeded the recommended thresholds for internal consistency reliability and convergent validity. Cronbach's Alpha, rho_A, and Composite Reliability values consistently exceeded the threshold of 0.70, indicating high levels of measurement reliability across all constructs. Likewise, the Average Variance Extracted (AVE) values were greater than 0.50, demonstrating that each construct explained more than half of the variance of its respective indicators. Among the constructs,

Transformational Leadership exhibited the strongest convergent validity, whereas Positive Professional Culture showed exceptionally high internal consistency. Collectively, these findings indicate that the measurement instrument possesses robust psychometric properties and adequately captures the theoretical dimensions underlying each construct.

3. Discriminant Validity

Discriminant validity was assessed using the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT).

Table 6. Fornell–Larcker Criterion

Construct	DTSE	PPC	TAP	TL
DTSE	0.737			
PPC	0.281	0.757		
TAP	0.533	0.753	0.737	
TL	0.418	0.795	0.757	0.809

The Fornell–Larcker results indicate that the square root of AVE exceeded the corresponding interconstruct correlations for each construct. However, the correlation between Positive Professional Culture and Teacher Adaptive Performance (0.753) was close to the square root of AVE for Teacher Adaptive Performance (0.737). This pattern warrants careful interpretation and should be considered alongside the HTMT results.

Table 7. HTMT Ratios

Construct	DTSE	PPC	TAP	TL
DTSE	–			
PPC	0.303	–		
TAP	0.584	0.781	–	
TL	0.450	0.823	0.784	–

All reported HTMT values were below 0.90. The highest value was observed between Transformational Leadership and Positive Professional Culture (0.823), followed by Transformational Leadership and Teacher Adaptive Performance (0.784). Together, the HTMT and Fornell–Larcker results provide preliminary support for discriminant validity, although the relatively high association between Positive Professional Culture and Teacher Adaptive Performance merits further scrutiny.

B. Structural Model Evaluation

The structural model was evaluated using the coefficients of determination (R^2), effect sizes (f^2), model-fit indices, and path coefficients. The results are interpreted as statistical relationships rather than causal effects because the study used a cross-sectional survey design.

Coefficient of Determination (R^2)

Table 8. Coefficient of Determination

Endogenous Construct	R^2	Adjusted R^2
DTSE	0.175	0.169
PPC	0.631	0.629
TAP	0.704	0.698

Table 8 indicates that the model accounted for 17.5% of the variance in Digital Teaching Self-Efficacy, 63.1% in Positive Professional Culture, and 70.4% in Teacher Adaptive Performance. Teacher Adaptive Performance had the highest explained variance, followed by Positive Professional Culture. These values describe the explanatory capacity of the estimated model within the study sample; they do not establish causal explanations or guarantee predictive performance in new observations.

1. Effect Size (f^2)

Table 9. Effect Size

Relationship	f^2
TL → DTSE	0.212
TL → PPC	1.712
TL → TAP	0.086
DTSE → TAP	0.234
PPC → TAP	0.250

The largest reported effect size was for Transformational Leadership → Positive Professional Culture (f^2 = 1.712)). The effect sizes for Digital Teaching Self-Efficacy → Teacher Adaptive Performance and Positive Professional Culture → Teacher Adaptive Performance were 0.234 and 0.250, respectively. The direct relationship between Transformational Leadership and Teacher Adaptive Performance had a smaller effect size (f^2 = 0.086)). These values indicate differences in the relative contribution of the predictors to the endogenous constructs within the estimated model.

2. Model Fit

Table 10. Model Fit Indices

Index	Estimated Model
SRMR	0.056
d_ULS	5.692
d_G	3.341
NFI	0.729

The SRMR value was 0.056, below the commonly used reference value of 0.08. The NFI was 0.729. The d_ULS and d_G values cannot be interpreted as evidence of adequate model fit without their corresponding bootstrap-based reference values, such as HI95 or HI99. Accordingly, the available indices do not justify an unqualified conclusion that the overall model fit is satisfactory.

C. Predictive Assessment

The predictive relevance of the model was evaluated using the blindfolding procedure.

Table 11. Predictive Relevance (Q^2)

Construct	Q^2
DTSE	0.089
PPC	0.352
TAP	0.372

All endogenous constructs had positive Q^2 values. Teacher Adaptive Performance had the highest value (0.372), followed by Positive Professional Culture (0.352) and Digital Teaching Self-Efficacy (0.089). These results indicate predictive relevance under the blindfolding assessment. They should not be interpreted as evidence of out-of-sample predictive performance.

Although the original analytical procedure also specified PLSpredict, its prediction errors and benchmark comparisons are not reported in the available results. Consequently, the out-of-sample predictive performance of the model cannot yet be established. The PLSpredict results, including the relevant prediction errors and comparisons with the linear-model benchmark, should be added once the corresponding output has been verified.

D. Hypothesis Testing

Hypotheses were evaluated using bootstrapping with 5,000 subsamples.

1. Direct Effects

Table 12. Direct Effects

Hypothesis	Path	β	t-value	p-value	Result
H1	TL → PPC	0.795	27.658	<0.001	Supported
H2	TL → DTSE	0.418	5.627	<0.001	Supported
H3	TL → TAP	0.279	3.388	0.001	Supported
H4	PPC → TAP	0.450	5.687	<0.001	Supported
H5	DTSE → TAP	0.291	6.312	<0.001	Supported

All five hypothesised direct relationships were statistically significant and positive. Transformational Leadership had the strongest reported relationship with Positive Professional Culture (β = 0.795), (t = 27.658), (p < 0.001)). It was also positively associated with Digital Teaching Self-Efficacy ((β = 0.418), (t = 5.627), (p < 0.001)) and Teacher Adaptive Performance (β = 0.279), (t = 3.388), (p = 0.001)).

Positive Professional Culture (β = 0.450), (t = 5.687), (p < 0.001)) and Digital Teaching Self-Efficacy (β = 0.291), (t = 6.312), (p < 0.001)) were also positively associated with Teacher Adaptive Performance. Among the two predictors, Positive Professional Culture had the larger standardised path coefficient. These findings support H1–H5 within the estimated structural model, without establishing temporal or causal effects.

2. Indirect Effects

Table 13. Mediation Effects

Hypothesis	Path	β	t-value	p-value	Result
H6	TL → PPC → TAP	0.357	5.445	<0.001	Supported
H7	TL → DTSE → TAP	0.121	4.744	<0.001	Supported

Table 13 presents the results of the mediation analysis and demonstrates that both proposed indirect effects were statistically significant. The indirect effect of Transformational Leadership on Teacher Adaptive Performance through Positive

Professional Culture was significant (β = 0.357, t = 5.445, p < 0.001), providing support for Hypothesis 6. Likewise, Digital Teaching Self-Efficacy significantly mediated the relationship between Transformational Leadership and Teacher Adaptive Performance (β = 0.121, t = 4.744, p < 0.001), supporting Hypothesis 7. A comparison of the standardized indirect coefficients indicates that the mediating effect of Positive Professional Culture was substantially stronger than that of Digital Teaching Self-Efficacy. These results suggest that the influence of transformational leadership on teachers' adaptive performance is transmitted through both organizational and psychological pathways, with organizational culture serving as the more influential mediating mechanism within the proposed structural model.

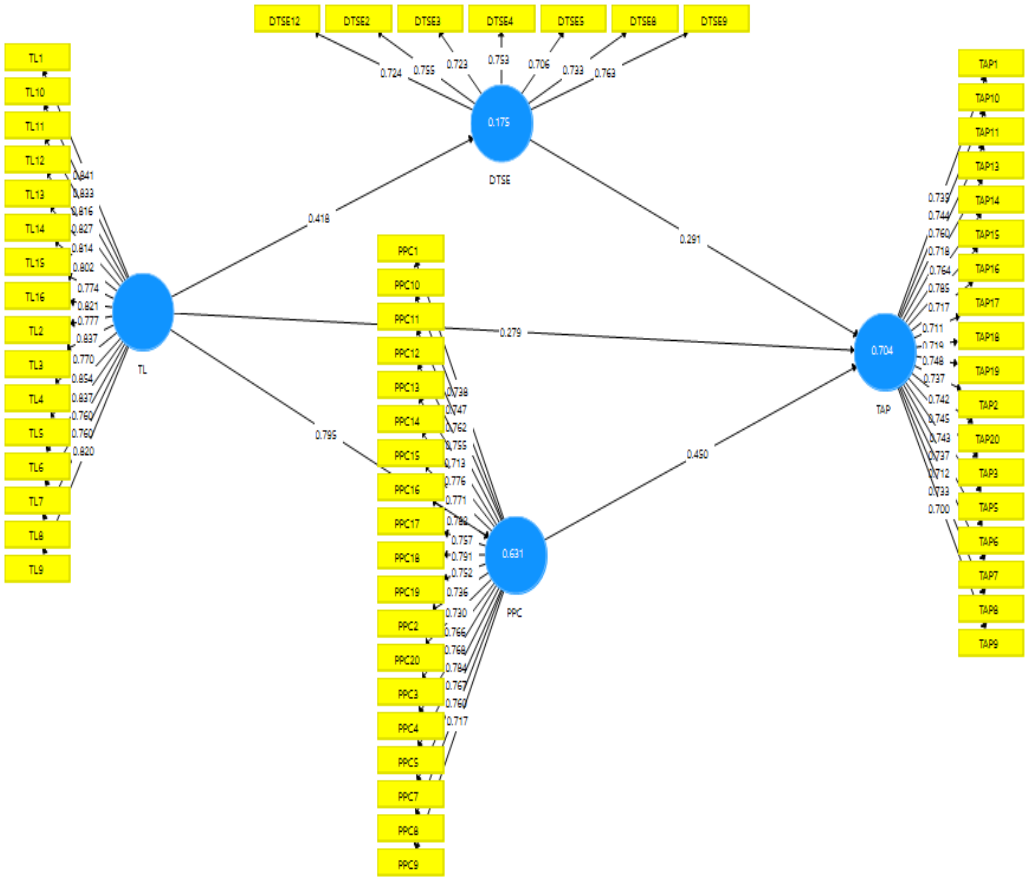


Fig. 1. Structural model

Discussion

Teachers' adaptive capabilities in rural elementary schools do not develop as a standalone individual response but rather emerge through the interrelated interactions among school leadership, the organisation's professional culture, and teachers' beliefs regarding their digital capabilities. Of all the relationships tested, the influence of Transformational Leadership on Positive Professional Culture emerged as the strongest relationship. At the same time, both Positive Professional Culture and Digital Teaching Self-Efficacy demonstrated positive

influences on Teacher Adaptive Performance. The mediation results show that positive professional culture serves as a more dominant pathway than digital self-efficacy, explaining how transformational leadership shapes teachers' adaptive capabilities. Thus, these findings indicate that teachers' adaptability in rural schools is largely built through the strengthening of a healthy professional environment before being translated into individual capacities.

From the perspective of Social Cognitive Theory [18]–[19], these results suggest that teachers' professional behaviour is a consequence of the reciprocal interaction between environmental and personal factors. Transformational leadership functions as an environmental factor that shapes the work climate, interaction patterns, and teachers' professional beliefs. When school principals are able to present a clear vision, provide professional support, and encourage collective participation, teachers gain greater scope to develop adaptive behaviours. These findings confirm that changes in professional behaviour depend not only on individual competencies but also on the quality of the social environment in which the individual works. In the context of rural schools, the social environment appears to have an even stronger influence than individual factors because collective culture remains a defining characteristic of school organisational life.

The strong influence of transformational leadership on positive professional culture demonstrates that leadership is not merely about managing organisational activities, but rather about shaping the collective meaning that permeates the daily life of the school. The very high coefficient value for this relationship indicates that teachers view the principal as a central figure who determines the direction of the professional culture. This finding aligns with the perspective of Bass and Riggio [14], [16] that transformational leaders bring about change through inspiration, exemplary behaviour, and intellectual stimulation. These results also expand upon the discussions developed by Hallinger [9], [24] and Leithwood et al. [43], [52] regarding the importance of leadership in building school capacity. However, in the context of this study, this influence appears stronger because it occurs in rural schools, which have a higher level of social closeness compared to more complex educational organisations in urban areas. In other words, leadership not only guides the organisation but also serves as a source for the formation of the school's collective identity.

The next finding indicates that Positive Professional Culture has a positive effect on Teacher Adaptive Performance. These results suggest that teachers' ability to adapt to changes in the curriculum, technology, and student needs develops more effectively when the school fosters a collaborative culture, mutual trust, reflective communication, and a high level of psychological safety. This finding aligns with Schein's [29] perspective on organisational culture as a system of meaning that guides the actions of organisational members. In a supportive environment, teachers do not feel alone when facing change. They have the space

to discuss, share experiences, and learn from their peers. The results of this study also confirm the findings of Skaalvik and Skaalvik [39] and Wang et al. [28], which show that a positive professional culture is closely associated with professional well-being, pedagogical innovation, and school effectiveness. However, this study expands upon previous literature by demonstrating that professional culture is not merely a factor supporting performance but also a key mechanism explaining the development of teachers' adaptability.

Digital Teaching Self-Efficacy also shows a positive influence on Teacher Adaptive Performance. These findings indicate that teachers who have high confidence in their ability to use technology tend to be better prepared to face changes in learning. They are more confident in trying new approaches, utilising digital tools, and adapting learning strategies to the evolving needs of students. These results are consistent with Social Cognitive Theory, which positions self-efficacy as a primary determinant of individual behavior [18]. These findings also confirm various recent studies showing that digital self-efficacy is associated with technological readiness, instructional innovation, and pedagogical transformation [41]–[42], [53]. However, this study demonstrates that the influence of digital self-efficacy is not isolated. Teachers' digital capacity develops within a supportive organisational environment; therefore, strengthening digital competencies must be understood as part of a comprehensive school development strategy.

One of the most intriguing findings is the presence of two significant mediation pathways. Both Positive Professional Culture and Digital Teaching Self-Efficacy mediate the relationship between Transformational Leadership and Teacher Adaptive Performance. However, the mediation pathway through Positive Professional Culture demonstrates a far greater influence compared to the Digital Teaching Self-Efficacy pathway. These findings provide a deeper understanding of how leadership operates within educational organisations. Leadership does not directly produce adaptive teachers. Rather, leadership first fosters a healthy professional environment, which in turn encourages the emergence of adaptive behaviours. In this context, organisational culture acts as the primary mechanism, while digital self-efficacy serves as a complementary mechanism that strengthens individual capacity.

From the perspective of novelty, this study demonstrates that the relationship between leadership and teacher adaptability cannot be adequately explained through either an organisational or a psychological approach alone. These findings expand the literature on educational leadership by highlighting the existence of dual mechanisms that operate simultaneously. Epistemologically, the resulting model indicates that the process of teacher adaptation develops through two complementary layers. The first layer is collective in nature and manifests through the school's professional culture. The second layer is individual in nature and manifests through digital self-efficacy. Thus, this study does not introduce a new

concept separate from existing theories but rather expands our understanding of how transformational leadership theory and Social Cognitive Theory interact in the context of rural schools.

The theoretical implications of this study lie in reinforcing the argument that organisational culture and personal beliefs are inseparable when explaining teachers' professional behaviour. The results show that the model of teacher adaptability becomes more comprehensive when both mechanisms are analysed simultaneously. On the practical side, these findings indicate that efforts to enhance teachers' adaptive abilities are insufficient if limited to technical training or the improvement of digital competencies alone. Strengthening the school's professional culture must be a top priority, as it has proven to be the most powerful pathway in shaping adaptive behaviour. School principals need to create a collaborative, psychologically safe, and open work environment that fosters shared learning. On the other hand, teacher professional development programs should also be directed toward strengthening teachers' digital confidence so that they are better prepared to face the ever-evolving educational transformation.

Nevertheless, the results of this study must be understood within certain limitations. The study employed a cross-sectional survey design; thus, the relationships identified reflect conditions at a single point in time and do not capture the dynamics of change over time. Additionally, the study focused on public elementary schools in rural areas of Grobogan Regency, meaning that specific social and cultural contexts may influence the patterns of relationships observed. Therefore, future research could expand the context to include different educational levels, more diverse geographic regions, or employ a longitudinal design to understand changes in teachers' adaptability over time. Further research could also explore other variables, such as collective teacher efficacy, organisational learning, digital leadership, or teacher well-being, to enrich our understanding of the factors that shape teachers' adaptive capabilities in the face of increasingly complex educational changes.

Conclusion

This study shows that Teacher Adaptive Performance in rural elementary schools is positively associated with Transformational Leadership, Positive Professional Culture, and Digital Teaching Self-Efficacy. Both Positive Professional Culture and Digital Teaching Self-Efficacy demonstrate significant indirect relationships between Transformational Leadership and Teacher Adaptive Performance, with a stronger indirect association through Positive Professional Culture. These findings highlight the relevance of organisational and personal mechanisms for understanding teacher adaptability within the studied rural context. Rather than proposing a new theory, this study integrates transformational leadership and Social Cognitive Theory to examine these relationships simultaneously.

Practically, the findings suggest that school improvement efforts should strengthen professional trust, collaboration, reflective communication, psychological safety, and teachers' digital confidence. However, the cross-sectional design and the focus on 150 teachers from 15 public elementary schools in three rural subdistricts of Grobogan Regency, Indonesia, limit causal interpretation and generalisability. Future research should employ longitudinal designs, include more diverse educational settings, and examine additional factors such as collective teacher efficacy, organisational learning, digital leadership, and teacher well-being.

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Conflict of Interest

The authors declare no conflict of interest.

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