

Principal leadership and primary student achievement: a mixed-methods case study of a primary school in Jiangsu province, China

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Abstract. Despite a substantial global literature on principal leadership and student achievement, the mechanisms through which leadership operates in the Chinese primary school context remain empirically underdeveloped. Drawing on Hallinger and Heck's indirect-effect model and integrated perspectives on transformational and distributed leadership, this study employs a concurrent mixed-methods design to examine how principal leadership shapes student achievement at a primary school in Jiangsu Province, China. Data were generated through semi-structured interviews with the principal and two teachers, supplemented by questionnaire surveys administered to 30 teachers. Thematic analysis of qualitative data and descriptive analysis of survey responses converge on three central findings. First, the principal exerts influence on student achievement principally through two mediating mechanisms: systematic enhancement of teacher professional competence and deliberate cultivation of a positive school culture. Second, the principal's combined distributed and transformational leadership style produces a demonstrable and sustained effect on student learning outcomes by fostering collaborative decision-making, teacher creativity, and a shared institutional vision. Third, active parental engagement, facilitated and institutionalised by principal leadership, functions as a significant positive moderator of student academic performance. These findings have important theoretical implications for leadership models and practical implications for principal preparation programmes in China and comparable high-stakes testing educational contexts.

Keywords: principal leadership, student achievement, transformational leadership, distributed leadership, school culture

1. Introduction

The quality of school leadership ranks second only to classroom instruction among the school-based factors that influence student learning [1]. Within this broad consensus, the principal occupies a uniquely consequential position: as the institutional leader responsible for goal-setting, resource allocation, personnel development, and cultural stewardship, the principal exerts influence on student achievement through a complex web of direct and indirect pathways [2, 3]. Decades of international research have produced robust

evidence that effective principal leadership can raise average student attainment by the equivalent of two additional months of learning per school year, while ineffective leadership can produce equivalent losses [4].

China presents a particularly instructive context in which to examine these dynamics. Its education system is profoundly shaped by a high-stakes examination culture, in which school performance functions as a proxy for institutional quality [5]. The widely circulated assertion that "A good principal makes a good school" has acquired quasi-official status, catalysing substantial investment in principal training programmes. Yet despite this policy salience, empirical research on the specific mechanisms through which principal leadership influences student achievement in Chinese primary schools remains sparse [6]. Most existing domestic studies are conceptual or descriptive in character; mixed-methods investigations that triangulate quantitative survey data with qualitative interview evidence are especially rare at the primary school level.

This study addresses this gap by conducting a concurrent mixed-methods case study at a primary school in Jiangsu Province—one of China's highest-performing provinces in terms of educational attainment—to examine three research questions: (1) How do principals influence student achievement? (2) To what extent does the principal's leadership style shape student learning outcomes? (3) What is the relationship between principals' engagement with parents and student achievement? By integrating semi-structured interview data with questionnaire survey responses from 30 teachers, the study contributes empirically grounded, contextually situated evidence to an international literature that has hitherto been dominated by Western school settings.

2. Theoretical framework and literature review

2.1. Models of principal leadership effects

Two conceptual models organise the existing literature on how principal leadership translates into student outcomes. The direct-effect model holds that principal actions—instructional guidance, goal-setting, and personnel decisions—bear immediate consequences for student achievement, treating the principal's influence as unmediated by intermediate conditions [7]. Empirical support for this model is evident in Branch et al.'s [4] large-scale econometric analysis of American principals and Silva et al.'s [8] experimental finding that principal-student academic conversations produced significant reading gains ($d = 0.71$).

The indirect-effect model, articulated most influentially by Hallinger and Heck [9], argues that principal leadership operates primarily through mediating school conditions—teacher quality, school culture, instructional coherence, and professional community—rather than through direct contact with students. This perspective has attracted considerably broader empirical support and theoretical elaboration. Leithwood, Patten, and Jantzi [10] identified four mediating pathways: a rational pathway (curriculum and instruction knowledge), an emotional pathway (belonging, self-actualisation, and trust), an organisational pathway (structural and resource conditions), and a family pathway (community and parental engagement). Their four-pathway model accounted for 43% of the variance in student performance across schools. The present study operationalises the indirect-effect model as its primary theoretical lens, while acknowledging that direct effects may operate concurrently.

2.2. Dominant leadership styles and their educational effects

2.2.1. *Instructional leadership*

Instructional leadership, which emerged in the accountability-driven educational climate of the 1980s, places the principal at the centre of curriculum, pedagogy, and assessment improvement [11]. Hallinger and Murphy's [12] seminal three-component framework—defining the school's mission, managing the instructional

programme, and promoting a supportive learning climate—has remained the dominant operational definition. Meta-analytic evidence demonstrates that instructional leadership exerts a larger effect on student achievement ($ES = 0.42$) than other leadership models [13]. Critically, Cotton [14] established that principals who actively participated in and possessed a deep understanding of the instructional programme achieved systematically stronger student outcomes than those whose involvement was primarily administrative.

2.2.2. Transformational leadership

Transformational leadership, theorised by Burns [15] and operationalised in educational settings by Bass [16] and Leithwood [17], describes a style in which leaders elevate followers' motivations, capacities, and commitments through idealised influence, inspirational motivation, individualised consideration, and intellectual stimulation. Valentine and Prater [18] demonstrated that these behaviours manifest in school settings as role modelling, collective goal ownership, personalised support, and high-performance expectations. The effect of transformational leadership on student achievement is characterised in the literature as predominantly indirect, mediated by enhanced teacher engagement, school culture, and professional community [19]. Sun and Leithwood's [20] meta-analysis of 79 studies found a modest but significant correlation ($r = 0.09$) between transformational principal leadership and student outcomes, with collaborative structures and individualised consideration identified as the most potent mediating mechanisms. Robinson et al.'s [13] comparative meta-analysis, however, found that instructional leadership outperformed transformational leadership in effect size (0.42 versus 0.11), suggesting that the two styles are complementary rather than interchangeable.

2.2.3. Distributed leadership

Distributed leadership reconceptualises school leadership not as the property of a single actor but of the wider leadership system, dispersed across multiple agents and their interactions with the school environment [21]. Empirical research consistently associates distributed leadership with increased teacher collaborative efficacy [22], academic optimism [23], and professional learning community development [24]. Leithwood and Mascall [25] found that group leadership increased teacher motivation in ways that produced measurable improvements in student reading and mathematics attainment. Hallinger et al.'s longitudinal research on 190 American schools further established that distributed leadership exerts significant indirect effects on student achievement growth through shared school governance, collaborative decision-making, and broad engagement with academic improvement initiatives [26]. Crucially for the present study, the combination of distributed and transformational leadership has been theorised as particularly effective in stimulating teacher creativity, innovation, and commitment [17], suggesting that the two approaches may have synergistic effects when implemented in concert.

2.3. Parental involvement as a leadership-mediated variable

Epstein's [27] partnership model frames school-family-community relationships as a structured domain of school effectiveness rather than an incidental feature of school life. Within this framework, the principal's role in institutionalising parental engagement is central: Grolnick and Slowiaczek [28] demonstrated that proactive family participation improves children's intrinsic motivation and self-directed learning, while Desforges and Abouchaar's [29] comprehensive literature review found that the quality of at-home parental involvement is among the strongest predictors of pupil attainment at all ages. The present study [10] treats parental involvement not merely as a background variable but as a leadership-mediated outcome—one that reflects the extent to which the principal has successfully established the family pathway identified by Leithwood et al.

3. Methodology

3.1. Research design

A concurrent mixed-methods case study design was adopted, enabling the simultaneous collection and integration of quantitative survey data and qualitative interview evidence [30]. The mixed-methods approach was selected because the research questions require both the breadth provided by quantitative data—measuring the prevalence and direction of perceived leadership effects across the teacher population—and the depth afforded by qualitative inquiry—illuminating the mechanisms, meanings, and processes that underlie those effects [31]. Case study methodology was chosen because the research phenomenon (principal leadership and its impact on student achievement) is inextricably embedded in the specific institutional context of a single school; the case study approach permits the holistic, contextualised investigation that such a phenomenon requires [32].

The study was conducted at a public primary school in Jiangsu Province, China. Jiangsu Province is an educationally significant research site: as one of China's highest-performing provinces on national standardised assessments, it represents a context in which the relationship between leadership quality and academic outcomes is subject to acute institutional and policy scrutiny.

3.2. Participants and sampling

Purposive sampling was employed to select three key informants for semi-structured interviews: the school principal and two experienced classroom teachers (designated Teacher A and Teacher B), selected on the basis of their direct and sustained engagement with the school's leadership practices and instructional programmes. Survey questionnaires were administered to all 30 teachers currently employed at the school, achieving a 100% response rate. Voluntary participation, anonymity, and the right to withdraw at any stage were assured in accordance with the University of Nottingham's research ethics protocols, and all participants provided written informed consent.

3.3. Data collection instruments

Semi-structured interviews were conducted with each participant individually, guided by a protocol developed from the theoretical framework and aligned with the three research questions. Teacher interview questions addressed: key qualities of effective principal leadership; observable examples of principal influence on student achievement; mechanisms supporting teacher professional development; home-school communication practices; and perceptions of school culture. Principal interview questions explored: institutional leadership responsibilities; strategies for enhancing teacher standards; school culture development; leadership style and its perceived impact; and home-school partnership approaches. Interviews were audio-recorded with participants' consent, transcribed verbatim, and subsequently verified by participants.

The questionnaire instrument comprised six Likert-type items operationalising the study's key constructs: frequency of principal-provided professional development opportunities; extent of positive school culture promotion; perceived contribution of school culture to student achievement; frequency of required home-school contact; perceived helpfulness of home-school connections; and the overall extent to which the principal's leadership style was perceived to affect student achievement. Items were pilot-tested and refined before administration.

3.4. Data analysis

Qualitative interview data were analysed using reflexive thematic analysis [33], a systematic approach involving iterative cycles of data familiarisation, initial coding, theme development, and interpretive refinement. Thematic categories were generated inductively from the data and then mapped deductively onto the theoretical framework to assess convergence and divergence. Three macro-themes emerged from this process: (1) leadership-mediated teacher professional development, (2) principal cultivation of school culture, and (3) home-school partnership institutionalisation. Quantitative survey data were analysed descriptively, and findings from both strands were integrated during interpretation to enable triangulation and to assess the degree of convergence, complementarity, or divergence.

4. Findings

4.1. Research question 1: mechanisms of principal influence on student achievement

4.1.1. Leadership-mediated enhancement of teacher professional competence

Both interview participants and survey respondents converged on teacher professional development as the primary pathway through which the principal shapes student achievement. The principal articulated a systematic approach to this pathway, encompassing the organisation of teaching research activities, collaborative inquiry into classroom pedagogical paradigms, cross-campus sharing of high-quality instructional resources, and reform of assignment design and assessment administration. Teacher A provided corroborating testimony, noting that the principal's active promotion of teacher training and encouragement of innovative pedagogical methods produced observable improvements in both instructional quality and student learning motivation, ultimately yielding measurable gains in student performance.

These qualitative accounts were strongly corroborated by survey data. All 30 respondents indicated that the principal provided professional development opportunities either "Often" ($n = 14$) or "Always" ($n = 16$), with no respondents selecting "Sometimes" or "Rarely or never" (Table 1). This unanimous response is notable and suggests that professional development provision has been institutionalised as a routine feature of leadership practice rather than an occasional or discretionary activity.

Table 1. Frequency of principal provision of professional development opportunities ($n = 30$)

Response option	<i>n</i>
Rarely or never	0
Sometimes	0
Often	14
Always	16
Total	30

These findings resonate with an established strand of the international leadership literature. Smith et al. [34] and Fullan's [35] transformational leadership scholarship both foreground the principal's role in cultivating ongoing professional learning as a structural precondition for instructional improvement. Louis et al. [36] provided empirical corroboration, demonstrating that principals who systematically support teacher professional development produce cascading benefits: well-prepared teachers implement more differentiated instructional strategies, better address diverse learning needs, and generate more engaged and academically successful students. The present findings extend this body of evidence to the Chinese primary school context,

where the pressures of high-stakes examination culture render the systematic management of teacher professional competence a particularly consequential leadership function.

4.1.2. *Cultivation of a positive school culture*

A second, interrelated mechanism through which the principal was found to shape student achievement is the deliberate construction of a positive school culture. The principal described a multi-dimensional approach, encompassing the building of positive teacher-student relationships, encouraging teachers to serve as role models and mentors, guiding staff in creating an encouraging and dynamic learning environment, and organising culturally enriching academic activities to cultivate student engagement and teamwork. Teacher A observed that this approach fostered positive learning attitudes and intellectual risk-taking, while Teacher B noted the creation of an atmosphere of exploration and active learning through academic competitions and innovative projects that stimulated students' interest and motivation.

Survey responses affirmed the potency of school culture as a perceived determinant of student achievement. Regarding the extent to which the principal promoted a positive and inclusive school culture, all respondents selected either "To some extent" ($n = 15$) or "To a large extent" ($n = 15$), with no respondents indicating minimal or no promotion (Table 2).

Table 2. Principal promotion of positive and inclusive school culture ($n = 30$)

Response option	n
Not	0
To a small extent	0
To some extent	15
To a large extent	15
Total	30

When asked whether a positive school culture contributes to student achievement, 20 respondents selected "Helps a lot" and 10 selected "More obvious help", with no respondents indicating that culture was unhelpful (Table 3). The absence of any sceptical responses is theoretically significant: it suggests that within this school community, a culture of high expectations, teacher-student relational trust, and collective academic engagement has been sufficiently consolidated to be universally perceived as consequential.

Table 3. Perceived contribution of positive school culture to student achievement ($n = 30$)

Response option	n
Completely not helpful	0
A little helpful	0
More obviously helpful	10
Helps a lot	20
Total	30

These findings accord with Hoy and Miskel's [37] theoretical proposition that school culture significantly mediates the relationship between leadership and student learning, and with Waters et al.'s [38] meta-analytic finding that culture-shaping is among the leadership responsibilities most strongly associated with student achievement. Louis et al. [36] further demonstrated that a positive school culture provides a supportive emotional and motivational context that raises student engagement and academic self-concept—mechanisms

that are especially relevant in the Chinese context, where examination anxiety and academic pressure can suppress intrinsic motivation.

4.2. Research question 2: leadership style and its sustained influence on student outcomes

The second research question examined the extent to which the principal's leadership style shapes student achievement. The principal characterised his style as explicitly distributed and transformational, describing a governance approach in which goals, plans, and implementation measures are developed collaboratively through brainstorming and democratic discussion with the management team. This process was described as generating scientifically rigorous and pedagogically innovative institutional strategies that stimulate teacher creativity and team cohesion—effects that, the principal argued, permeate classroom practice and compound over time to produce lasting gains in student learning outcomes.

Teacher survey responses indicated broad agreement with the principal's self-assessment. Fifteen respondents believed the leadership style affects student achievement "To a large extent", 13 "To some extent", and only 2 "To a small extent". Critically, no respondents indicated that leadership style exerts no influence (Table 4).

Table 4. Perceived extent of principal leadership style influence on student achievement ($n = 30$)

Response option	<i>n</i>
Not at all	0
To a small extent	2
To some extent	13
To a large extent	15
Total	30

Teacher A described the principal as relatively democratic in orientation, characterising this style as creating a positive learning environment that stimulates student motivation and academic engagement. Teacher B elaborated on the specific manifestations of this style: encouragement of teacher innovation, provision of adequate resource support, and systematic attention to home-school communication—all identified as contributors to improved student learning motivation and outcomes.

The combined distributed-transformational style observed here bears theoretical coherence. In distributed leadership theory, the dispersal of decision-making authority across the management team functions to increase the breadth of professional expertise engaged in institutional problem-solving, while simultaneously strengthening teachers' sense of agency and ownership over school improvement [21]. In transformational leadership theory, the principal's role in articulating a compelling vision and inspiring followers to transcend self-interest in pursuit of collective goals operates through motivational and cultural pathways [16, 17].

Deployed together, these two approaches arguably address complementary limitations: distributed leadership compensates for the risk that transformational leadership may concentrate charismatic authority in a single figure, while transformational leadership provides the inspirational vision that distributed governance alone may lack. Gumus et al. [6] and Robinson et al.'s [13] comparative analyses both suggest that the most educationally effective leadership configurations are those that integrate instructional focus with relational and distributed dimensions—a combination consistent with the profile identified in the present case.

4.3. Research question 3: principal-facilitated parental involvement and student achievement

The third research question examined the relationship between principal engagement with parents and student achievement. The school's approach to home-school contact was emphatically proactive: 21 respondents reported that their school "Always" required home-school contact, and 9 reported "Often", with no respondents indicating that contact was rarely or never required (Table 5). This near-universal frequency reflects an institutionalised rather than ad hoc approach to family engagement.

Table 5. Frequency of home-school contact requirements ($n = 30$)

Response option	<i>n</i>
Rarely or never	0
Sometimes	0
Often	9
Always	21
Total	30

The principal articulated a multi-channel engagement strategy encompassing regular parent-teacher meetings and home visits for face-to-face communication; telephone, email, and the school website for timely information sharing; and structured opportunities for parents to participate in school decision-making and school activities. The principal's rationale—that parents, as children's first teachers, possess unique knowledge of their children's learning behaviours, motivational states, and emotional needs—reflects a theoretically sophisticated understanding of the complementary and indispensable role of parents in the educational process.

Teacher A corroborated the principal's account, identifying parental engagement as a mechanism for creating a supportive and consistent learning environment spanning both school and home settings. The survey findings strongly reinforced these perceptions: 17 respondents selected "Helps a lot", while 13 selected "More obviously helpful" when asked whether home-school connections benefit student achievement, with no respondents selecting either of the two negative options (Table 6).

Table 6. Perceived contribution of home-school connections to student achievement ($n = 30$)

Response option	<i>n</i>
Completely not helpful	0
A little helpful	0
More obviously helpful	13
Helps a lot	17
Total	30

These findings are consistent with Epstein's [27] theoretical framework, which identifies parental involvement as a dimension of school effectiveness that is directly amenable to principal influence, and with Desforges and Abouchaar's [29] empirical literature review, which established parental involvement as a strong predictor of pupil attainment independent of socioeconomic status. Grolnick and Slowiaczek [28] further found that proactive family participation fosters children's intrinsic motivation and self-directedness—outcomes of particular salience in a Chinese educational context where external achievement pressures may otherwise crowd out intrinsic engagement. Importantly, the present findings suggest that it is the principal's

deliberate institutionalisation of home-school channels—rather than spontaneous parental initiative—that activates this pathway, positioning parental engagement as a measurable output of leadership practice.

5. Discussion

5.1. Theoretical contributions

The present study makes several contributions to the theoretical literature on principal leadership and student achievement. First, and most fundamentally, the findings provide contextually embedded support for the indirect-effect model [9] in the Chinese primary school setting. The two mediating mechanisms identified—teacher professional development and school culture—correspond closely to the rational and emotional pathways theorised by Leithwood et al. [10], and their prominence in the data confirms that the indirect-effect model's explanatory architecture retains validity across cultural and systemic contexts significantly different from those in which it was originally developed.

Second, the study contributes to emerging scholarship on leadership style integration. The principal's combined distributed-transformational orientation produced perceptible and, by the principal's account, cumulative effects on institutional culture and teaching quality—effects that the individual application of either style might not have generated. This finding is consistent with the call by Shatzer et al. [39] for leaders to develop hybrid repertoires that combine the instructional focus of one tradition with the cultural and relational strengths of another, and suggests that style integration may be a particularly productive strategy in examination-oriented systems where both technical instructional quality and motivational culture are consequential for student outcomes.

Third, the study extends Epstein's [27] partnership model by empirically demonstrating that parental engagement in the Chinese primary school context is substantially principal-mediated: it is the principal's active institutionalisation of home-school communication that determines whether the family pathway [10] is activated. This finding implies that parental involvement, rather than being treated as an exogenous variable in leadership research, should be conceptualised as an endogenous outcome of leadership practice—one that principal behaviour can systematically expand or constrain.

5.2. Practical and policy implications

The findings carry several practical implications for school leaders and educational policymakers, particularly in China and comparable high-stakes testing contexts. For school principals, the study underscores the importance of systematic rather than episodic professional development provision. The unanimity of survey responses regarding the frequency of development opportunities suggests that institutionalisation—embedding professional learning into the routine structures of school life—is a more powerful driver of instructional quality than occasional training events. Principals should also attend to the cultural dimension of their leadership, recognising that the affective and relational environment they create shapes not only teacher engagement but also students' motivational orientation, willingness to take academic risks, and sense of academic belonging.

For educational policymakers, the study suggests that principal preparation and continuing professional development programmes should explicitly address three competency domains: facilitation of teacher professional learning communities, deliberate school culture development, and strategic management of home-school partnerships. Current principal training in China tends to prioritise administrative competence and curriculum knowledge; the present findings argue for a rebalancing toward relational, cultural, and community-engagement skills. Policy frameworks should also consider establishing structured evaluation

mechanisms for the quality of home-school partnerships, recognising parental engagement as a measurable indicator of leadership effectiveness rather than a peripheral school activity.

6. Conclusion

This mixed-methods case study has examined the mechanisms through which principal leadership shapes primary school students' achievement in Jiangsu Province, China. Three findings of theoretical and practical significance emerge. First, the principal influences student achievement indirectly, principally through the systematic enhancement of teacher professional competence and the deliberate cultivation of a positive school culture—findings consistent with Hallinger and Heck's [9] indirect-effect model and Leithwood et al.'s [10] four-pathway framework. Second, a combined distributed-transformational leadership orientation produces a sustained positive influence on student learning by fostering collaborative institutional decision-making, teacher creativity, and a shared commitment to academic excellence. Third, the principal's active institutionalisation of home-school partnerships functions as a consequential mediator of student achievement, positioning parental engagement as an endogenous output of leadership practice rather than an exogenous contextual factor.

Several limitations qualify these conclusions and indicate directions for future research. The single-school case design, while appropriate for the depth of investigation pursued, restricts generalisation: the findings are analytically rather than statistically generalisable. The interview data, collected from three participants, are subject to social desirability bias, and the cross-sectional design precludes causal inference. Moreover, potentially confounding variables—student socioeconomic background, family educational capital, and class-level instructional quality—were not controlled for. Future research should pursue multi-school comparative designs that enable systematic cross-contextual analysis, adopt longitudinal approaches to capture the cumulative effects of leadership style over time, and employ structural equation modelling to test the mediating pathways theorised here. Comparative studies examining leadership effects across China's substantial regional variation in educational resources and educational culture would be especially valuable for advancing the contextual specification of existing leadership models.

Notwithstanding these limitations, the study provides rare empirically grounded evidence of principal leadership mechanisms in the Chinese primary school context, and offers a theoretically coherent framework for understanding how leadership quality translates—through teachers, culture, and family engagement—into the student achievement outcomes that Chinese educational policy so urgently prioritises.

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