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## Strategic leadership behaviours in Chinese schools: a Rasch model analysis

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### ABSTRACT

This study examines the strategic leadership behaviours of secondary school principals in China, where centralized governance and cultural traditions shape leadership practices. Drawing on a cross-sectional survey of 895 principals, this research adopts Pisapia's theory of strategic leadership, which delineates five core leadership influence actions, transforming, managing, bonding, bridging, and bartering, to investigate how school leaders navigate complex educational challenges. Using the Strategic Leadership Questionnaire (SLQ) and applying the Rasch Measurement Model, this study provides a rigorous psychometric evaluation of these leadership behaviours. Findings reveal that transforming, bonding, and bartering emerge as the most dominant behaviours, highlighting the importance of proactive change, relationship-building, and negotiation in school leadership. Conversely, managing and bridging behaviours were less frequently observed, suggesting a shift away from traditional hierarchical administration towards adaptive leadership strategies emphasizing operational stability and stakeholder engagement. This study advances existing scholarship by addressing geographical and methodological gaps. While prior research in China has predominantly focused on instructional leadership, this study systematically measures strategic leadership behaviours through Rasch-based psychometric validation. The findings offer new insights into culturally responsive leadership practices and provide evidence-based recommendations to improve leadership assessments, thereby strengthening the global discourse on effective school leadership in diverse educational contexts.

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## Introduction

In recent years, school principals worldwide have encountered unprecedented challenges that have reshaped leadership practice and expanded expectations of school governance. The COVID-19 pandemic required principals to navigate crisis management, digital transformation, community well-being, and equity-oriented decision-making alongside instructional continuity (Brown et al., 2023; Netolicky, 2020; Torrance et al., 2023). These conditions exposed the limitations of leadership models that are narrowly focused on pedagogy or motivation and underscored the need for leadership approaches capable of addressing uncertainty, complexity, and multi-level coordination (Bush, 2023; McLeod & Dulsky, 2021).

As education systems transition into the post-pandemic era, the heightened demands placed on principals have not receded; rather, they have evolved. School leaders are now expected to integrate digital technologies, respond to diverse stakeholder needs, and enact equity-focused reforms within increasingly complex policy environments (Jackson, 2024). These developments have amplified the relevance of strategic leadership, particularly in systems characterized by centralized governance and strong cultural embeddedness.

This study examines the strategic leadership behaviours of secondary school principals in China, where hierarchical administrative structures and longstanding cultural traditions shape leadership practice. Specifically, it investigates how principals enact five strategic leadership influence actions, transforming, managing, bonding, bridging, and bartering, to balance policy mandates, cultural expectations, and school-level development. By focusing on these behaviours, the study offers empirical evidence about how Chinese principals navigate both immediate challenges and long-term educational reform within a highly centralized system.

Although instructional and transformational leadership have dominated much of the international school leadership literature, their explanatory scope is limited in contexts where principals must operate within tightly regulated policy frameworks and negotiate across multiple organizational levels (Hallinger, 2011; Walker & Qian, 2015). Instructional leadership prioritizes teaching and learning, while transformational leadership emphasizes vision and motivation; neither fully captures the strategic, relational, and political work required of principals in centralized systems (Tian & Huber, 2021). Strategic leadership, as conceptualized by Pisapia (2009), offers a broader analytical framework by integrating environmental scanning, resource alignment, relationship management, and negotiation.

Pisapia's strategic leadership framework delineates five influence actions, transforming, managing, bonding, bridging, and bartering, that describe how leaders initiate change, maintain organizational stability, cultivate internal and external relationships, and secure resources through negotiation (Pisapia, 2009; Pisapia et al., 2005). Although developed earlier, the framework remains influential and has been refined in subsequent research, demonstrating its continued relevance across diverse educational contexts.

Alternative leadership frameworks rooted in East Asian traditions, including moral leadership, paternalistic leadership, and harmony-oriented leadership, provide important insight into value orientations and relational authority (Dimmock & Walker, 2005; Ke et al., 2025). However, these approaches place less emphasis on strategic processes such as

environmental scanning, cross-sector coordination, and resource negotiation, processes that are central to leadership practice in highly centralized education systems. Strategic leadership, therefore, offers a complementary and contextually appropriate lens for examining how Chinese principals respond to structural, cultural, and policy-driven pressures.

In the Chinese context, strategic leadership is particularly salient because principals must simultaneously enact top-down policy directives, navigate cultural expectations of harmony and collective responsibility, and mobilize resources across administrative boundaries. Empirical research indicates that Chinese principals frequently rely on interpersonal networks and negotiated relationships to foster innovation and secure institutional support, reflecting leadership practices that extend beyond instructional or transformational models (Qian et al., 2023; Zheng et al., 2024). Within this context, strategic leadership provides a comprehensive framework for understanding how principals adapt to systemic complexity and pursue sustainable school development within a centralized, culturally embedded governance system.

### ***Evolving paradigm of China's school leadership***

School leadership in China is shaped by centralized bureaucratic governance and enduring cultural traditions rooted in Confucian, Daoist, and Buddhist philosophies (Lin, 2025; Pisapia & Pang, 2013). These traditions, which emphasize hierarchical authority, moral responsibility, and collective orientation, continue to shape the enactment of leadership in schools. Within this context, principals exercise substantial formal authority while remaining accountable to centralized policy mandates and culturally embedded expectations (Lee, 2025).

Historically, principals functioned primarily as administrative managers responsible for implementing national policies and maintaining organizational stability within tightly regulated systems (Na et al., 2020; Qian et al., 2017). Over time, policy reforms and socio-political change have expanded principals' roles beyond compliance-oriented management. This change was especially clear during the COVID-19 pandemic, when principals had to coordinate remote instruction, fairly distribute resources, and be flexible in meeting students' academic and well-being needs as conditions changed quickly (Ding et al., 2024; Xue et al., 2020).

Recent scholarship, therefore, points to increasing expectations for Chinese principals to adopt more adaptive and equity-oriented leadership approaches, even within a highly centralized system (Acton, 2021; Trinidad, 2021; Walker & Qian, 2015). Rather than relying solely on hierarchical authority, principals increasingly engage in relational work, collaborative problem-solving, and context-sensitive decision-making. These developments signal an evolving leadership paradigm in which strategic judgement, rather than procedural compliance alone, has become central to effective school leadership.

Situated within this context, the present study applies Pisapia's (2009) strategic leadership framework to examine how Chinese secondary school principals enact five leadership influence actions: transforming, managing, bonding, bridging, and bartering. By focusing on these behaviours, the study highlights how principals integrate traditional governance structures with adaptive leadership strategies to promote school development, equity, and organizational resilience, illustrating the value of contextually responsive leadership in centralized and culturally distinct education systems.

### ***Strategic leadership behavioural model***

Strategic leadership offers a framework for understanding how leaders navigate complexity, uncertainty, and organizational change in dynamic educational environments (Tian & Huber, 2021). Rather than focusing solely on instructional practice or vision-setting, strategic leadership emphasizes aligning long-term goals, decision-making processes, and adaptive actions in response to evolving contextual demands (Carvalho et al., 2021).

Pisapia's (2009) strategic leadership framework defines leadership as five interconnected influence actions: transforming, managing, bonding, bridging, and bartering. Transforming focuses on initiating change and fostering innovation, while managing emphasizes organizational stability and operational effectiveness. Together, these actions address the dual imperatives of change and continuity inherent in school leadership.

The remaining influential actions, bonding, bridging, and bartering, capture the relational and political dimensions of leadership practice. Bonding means building trust and commitment within the organization; bridging means building relationships with people outside the organization; and bartering means negotiating with leaders to get resources, support, and alignment to help the organization reach its goals. Collectively, these actions illustrate how leaders mobilize both internal and external capacity to respond strategically to complex environments.

The Strategic Leadership Questionnaire (SLQ), developed by Pisapia and Reyes-Guerra (2009), operationalizes these five influence actions and provides an empirically grounded tool for examining leadership behaviour. Applying this framework, the present study investigates how Chinese secondary school principals enact strategic leadership in practice, offering a structured lens for analysing leadership behaviours within a centralized and culturally embedded education system.

### **Methodology**

This study adopted a cross-sectional quantitative research design to examine how secondary school principals' strategic leadership behaviours align with essential leadership capabilities in China's unique socio-cultural context. Given the necessity for broad participation and data accuracy, an online questionnaire was utilized to efficiently collect responses from a wide range of school principals, ensuring a comprehensive assessment of their leadership practices.

### **Instrumentation**

The study utilized the Strategic Leadership Questionnaire (SLQ), a 35-item instrument adapted from Pisapia's (2009) original framework, which evaluates five core strategic leadership influence actions: transforming, managing, bonding, bridging, and bartering. The SLQ was translated into Mandarin to ensure clarity and linguistic accuracy for Chinese respondents. Subsequently, a back-translation into English was conducted to verify semantic equivalence, following established validation protocols. The instrument employs a 5-point frequency scale ranging from (1) "almost never" to (5) "almost always", allowing for a structured assessment of leadership behaviours. Each of the five constructions represents a unique yet interconnected dimension of strategic leadership:

- Transforming (8 items): Emphasizes innovation, continuous learning, and vision-driven leadership.
- Managing (7 items): Focuses on operational stability, consistency, efficiency, and effectiveness.
- Bonding (8 items): Evaluates relationship-building within the school.
- Bridging (6 items): Assesses engagement with external stakeholders
- Bartering (6 items): Examines negotiation skills, resource acquisition strategies and alliance-building.

### ***Sampling and data collection***

Data were collected through an online questionnaire administered to secondary school principals across mainland China. A voluntary, convenience-based sampling strategy was employed, consistent with common practice in educational leadership research where access to administrators often relies on professional development networks (Creswell & Creswell, 2017; Fraenkel et al., 2012). The research team collaborated with the National Principal Training Center at a university in China, which conducts large-scale training programmes for principals nationwide. With approval from programme coordinators, the survey link was distributed through official WeChat groups used for training-related communication, and participants were informed of the study's purpose and participation conditions.

The sampling frame included currently serving secondary school principals from eastern, central, and western regions of China. Deputy principals and other administrative staff were excluded to ensure that responses reflected principals' strategic leadership roles. Participation was voluntary and anonymous. This study was approved by the Shangrao Normal University Human Subjects Protection Committee (Certificate No. SRNU20211006). All procedures were conducted in accordance with relevant ethical guidelines and regulations. Electronic informed consent was obtained from all participants prior to survey completion.

There were 921 responses in all. Following established procedures for identifying low-quality or patterned responses in online surveys (Meade & Craig, 2012), incomplete cases were excluded, yielding a final sample of 895 valid responses. This sample surpasses the recommended thresholds for robust Rasch analysis and encompasses a variety of school types and regions, thereby enhancing the study's analytical rigour (Bond et al., 2020). Recruitment through a national leadership training network also reflects international research practices in educational leadership studies (Irby et al., 2023). Table 1 summarizes the demographic characteristics of the final sample.

### ***Rasch analysis***

Rasch analysis was employed to evaluate the psychometric properties of the Strategic Leadership Questionnaire (SLQ) and to ensure precise measurement of principals' strategic leadership behaviours. Using Winsteps software (version 3.73), Likert-type ordinal responses were turned into interval-level logit measures. This made it possible to put both item difficulty and respondent ability on the same linear scale (Boone & Noltemeyer,

**Table 1.** Demographic data of secondary school principals ( $N = 895$ ).

Demographics	Frequency	Percentage
Gender		
Male	689	77%
Female	206	23%
Age		
Below 40 years	32	4%
40–49 years old	320	40%
More than 49 years	543	56%
Education		
Diploma	18	2%
Undergraduate	616	69%
Postgraduate	261	29%
Experience as Principals		
Less than 4 years	147	16%
4–8 years	225	25%
More than 8 years	523	59%
School Location		
Rural	215	24%
Urban	680	76%

2017). This transformation enhances measurement precision and supports meaningful comparison across respondents and items.

The Rasch model was selected because it provides detailed item-level diagnostics, including category functioning, item – person alignment, and fit statistics, which are particularly valuable for scale validation in culturally diverse contexts (Bond & Fox, 2013). Unlike confirmatory factor analysis (CFA), which primarily assesses construct-level model fit, Rasch analysis allows for direct examination of how individual items function across the measurement continuum (Byrne, 2012; Boone et al., 2014a). Recent methodological studies further support the use of Rasch models for categorical data, demonstrating their capacity to identify item-functioning issues and assess measurement invariance across subgroups (Boluarte-Carbajal et al., 2023; D’Urso et al., 2022).

An additional advantage of Rasch modelling is parameter invariance, whereby item difficulty estimates are independent of the specific sample and person measures are independent of the item set (Andrich, 1978). This property is especially important in the present study, which draws principals from diverse regions and school contexts across China. Together, these features make Rasch analysis well-suited for examining strategic leadership behaviours within a centralized yet heterogeneous education system.

Although Pisapia’s (2009) framework comprises five distinct influence actions, these behaviours can be conceptualized as first-order dimensions of a broader strategic leadership construct. The Rasch analysis examined whether the SLQ items function coherently as a unidimensional measure, consistent with prior leadership research that treats multiple leadership behaviours as manifestations of an overarching capability (Marks & Printy, 2003; Sun & Leithwood, 2012). The results support this higher-order interpretation, indicating that the five influence actions collectively reflect principals’ overall strategic leadership capacity.

**Table 2.** Summary statistics of person and items.

	Person	Item
<i>N</i>	895	35
Measure (logit)		
Mean	2.07	0.00
Standard Deviation, SD	0.95	1.28
Standard Error, SE	0.03	0.22
Reliability	0.87	1.00
Separation	2.58	20.36
Outfit Mean Square		
Mean	0.98	0.98
SD	0.34	0.25
Outfit ZSTD		
Mean	-0.1	-0.4
SD	1.2	3.6
Alpha Cronbach		0.89
Chi-square ( $\chi^2$ )		49,347**
Raw variance explained by measure		49.7%

### Psychometric validation of the SLQ

Table 2 summarizes key fit and reliability statistics supporting the psychometric adequacy of the SLQ. The person's mean logit value (+2.07) relative to the fixed-item mean (0.00) indicates appropriate instrument targeting to the sample. High person reliability (0.87) and item reliability (1.00) demonstrate strong internal consistency and item stability, while Cronbach's alpha (0.89) further confirms the scale's overall reliability (Andrich & Marais, 2019; Sumintono & Widhiarso, 2014). Collectively, these indices indicate that the SLQ measures strategic leadership behaviours with precision and consistency.

### Separation and fit statistics

To ensure a well-represented and widely distributed dataset, separation indices were calculated to assess the spread of both items and respondents. The item separation index of 20.36 and the person separation index of 2.58 indicate a well-balanced range of items and participant abilities, ensuring the SLQ's applicability across diverse respondent groups. Additional fit statistics, including mean square (MNSQ = 0.98) and z-standardized (ZSTD = 0) indices, confirm alignment with the Rasch Model, as they fall within the recommended MNSQ range of 0.6 to 1.4 (Bond & Fox, 2013). These values confirm an adequate fit with the Rasch model, underscoring the robustness of the analysis. Similarly, Z-Std values close to 0 indicate a strong data-model fit, reinforcing the robustness of the Rasch analysis.

### Unidimensionality and rating scale functionality

Unidimensionality, a core principle of Rasch analysis, was verified by demonstrating that 49.1% of the variance was explained by the primary construct, exceeding the 40% threshold for construct validity (Boone et al., 2014b; Bond & Fox, 2013). Additionally, the chi-square item-trait interaction statistic indicated satisfactory item hierarchy invariance across traits, providing further evidence of the model's fit (Engelhard & Wang, 2024).

**Table 3.** Rating scale analysis.

Rating Category	Data Category Count Used	Frequency (%)	Observed Average	Rasch-Andrich Threshold
1	735	2%	-1.12	None
2	4879	16%	0.40	-2.31
3	10,654	34%	1.66	0.27
4	15,057	48%	3.06	+2.04

To assess the functionality of the SLQ's Likert-type response categories, the Andrich Rating Scale Model was applied. As illustrated in Table 3, the rating scale showed monotonically increasing average logit values across the four response categories, confirming that respondents could effectively distinguish between the response options. To address threshold disordering, the original five-category scale was reduced to four, making the categories clearer and aligning with the guidelines set by Andrich and Marais. This also ensured that the threshold distances fell within the ideal range of 1.40 to 5.00 logits (Van Zile-Tamsen, 2017). These refinements enhanced the precision of category distinctions, further strengthening the instrument's measurement validity.

Taken together, these results provide strong evidence for the reliability, validity, and measurement integrity of the SLQ, supporting its use for examining principals' strategic leadership behaviours within complex educational contexts.

## Findings and discussion

### *Item calibration and latent trait estimation*

Item calibration results from the Rasch model provide insight into how frequently Chinese secondary school principals enact different strategic leadership behaviours across the five influence actions. Table 4 presents item difficulty estimates (logit values) and corresponding engagement frequencies, revealing meaningful variation in principals' leadership practices.

Items clustered at the higher end of the logit scale (above +1.28) indicate behaviours that principals were less likely to endorse. These items were concentrated primarily within managing, bridging, and bartering, suggesting that a subset of principals engaged less frequently in formal operational oversight, external stakeholder coordination, and negotiation-based leadership. In contrast, items with logit values between +1.28 and 0.00

**Table 4.** SLQ item calibration.

Frequency Levels	5 Dimensions of Strategic Leadership				
	Transforming	Managing	Bonding	Bridging	Bartering
Rarely	-	M5, M6, M2	-	BR2, BR3	B2
Sometimes	T1, T6	M4, M1, M7	-	BR6, BR1, BR5	-
Often	T8, T5, T3, T2, T7, T4	M3	B08, B07, B03, B06	BR4	B3, B6, B4 B1, B5
Almost Always	-	-	B02, B05 B01, B04	-	-

reflect behaviours that principals reported enacting intermittently, spanning transforming, managing, and bridging actions.

The majority of items (49%) were located between 0.00 and  $-1.28$  logits, indicating that principals frequently enacted leadership behaviours across all five strategic dimensions. Notably, bonding-related items were among the easiest to endorse, highlighting the prominence of relationship-building and the cultivation of internal trust in principals' leadership repertoires. Together, these patterns indicate that transforming, bonding, and bartering emerged as the most prevalent strategic leadership behaviours among the sampled principals.

These findings align with prior research emphasizing innovation, relational influence, and negotiation as central components of effective leadership in complex organizational environments (Bowman, 2021; Fazzino, 2012; Kelim, 2023). Within China's centralized education system, where formal authority coexists with strong relational norms, principals appear to rely heavily on interpersonal influence and adaptive change strategies to advance school goals. The relative prominence of bonding suggests that trust-based relationships function as a foundational mechanism through which other strategic actions, such as transformation and negotiation, are enacted.

Collectively, the calibration results underscore that strategic leadership among Chinese principals is not uniformly distributed across all influence actions but reflects a patterned emphasis on relational and change-oriented behaviours. The following sections examine transforming, bonding, and bartering in greater depth to illustrate how these dominant leadership behaviours operate within a centralized and culturally embedded educational context.

### ***Transforming: leading change in complex educational environments***

Transforming leadership highlights principals' capacity to proactively initiate change and implement innovative strategies to improve school performance and learning outcomes. This finding aligns with prior research emphasizing the role of transformational leadership in fostering innovation and collaboration, particularly during periods of disruption (Alsharija & Watters, 2020; Hallinger & Kovačević, 2021; S. W. Lee & Mao, 2023). The present study extends this literature by demonstrating how Chinese principals enact transformative behaviours within a highly centralized, culturally embedded education system.

Rather than responding reactively to external pressures, principals in this study strategically reshaped organizational processes and school culture to support sustained innovation. This pattern points to strategic foresight and continuous improvement as core components of effective transformation. By integrating cultural norms with change-oriented leadership practices, principals in hierarchical settings move beyond incremental reform to align innovation with institutional stability. These findings challenge universal applications of transformational leadership and highlight the importance of contextually adaptive leadership approaches that balance reform, culture, and governance in complex educational environments.

### ***Bonding and bartering: relationship-centered leadership***

The bonding and bartering constructs reflect the culturally embedded importance of relationship-building and negotiation, which are central to school leadership in China. According to Townsend and Pisapia (2018), bonding involves both strategic decision-making and emotional commitment, while Pisapia (2009) conceptualizes bartering as the forging of alliances to advance mutual interests through negotiation.

Findings indicate that bonding emerges as a highly prevalent leadership behaviour, underscoring the pivotal role of interpersonal relationships in fostering trust, collaboration, and a shared vision, critical drivers of stakeholder engagement and effective school decision-making. Equally noteworthy, bartering emerges as a critical strategic leadership tool for securing institutional support and resource allocation. Taken together, these two leadership behaviours illustrate a leadership style grounded in interpersonal dynamics, cooperative negotiation, and the cultivation of strong professional networks, traits that resonate with recent scholarship emphasizing adaptive, relational leadership in complex educational settings (Tian & Huber, 2021).

### ***Managing: a less frequently employed leadership action***

Managing emerged as a comparatively less frequently enacted leadership influence action among the sampled Chinese principals. Although managing is traditionally associated with maintaining organizational stability, efficiency, and goal attainment (Pang, 2021), the findings suggest that principals often rely on hierarchical structures and established chains of command rather than direct operational involvement. As a result, managerial functions appear to be exercised indirectly, allowing principals to concentrate on higher-level strategic priorities.

Consistent with prior research, this pattern reflects a broader shift towards strategic leadership approaches in which administrative oversight is complemented, or at times overshadowed, by visionary leadership, relationship-building, and negotiation, particularly under conditions of uncertainty and reform (Bowman, 2021; Trinidad, 2021). Similar trends have been noted in educational systems, where principals are progressively shifting from routine administrative functions to strategic coordination roles (Kelim, 2023; Tian & Huber, 2021). Importantly, managing and transforming are not mutually exclusive; rather, they operate as interconnected leadership behaviours whose relative emphasis varies by context (Tian & Huber, 2021).

### ***Wright map analysis: a graphical representation of strategic leadership engagement***

The Wright Map (Figure 1) visually depicts how the 895 respondents' abilities align with the difficulty of the SLQ's 35 items on a common logit scale. The distribution of responses illustrates varying perceptions of strategic leadership, ranging from high engagement (top-left, +4 logit) to low engagement (bottom-left, below zero logit).

The polytomous scoring analysis highlights the distribution of highly endorsed leadership behaviours versus those that respondents found more difficult to demonstrate. Items range from greater difficulty (harder to endorse, positioned near the top) to lower

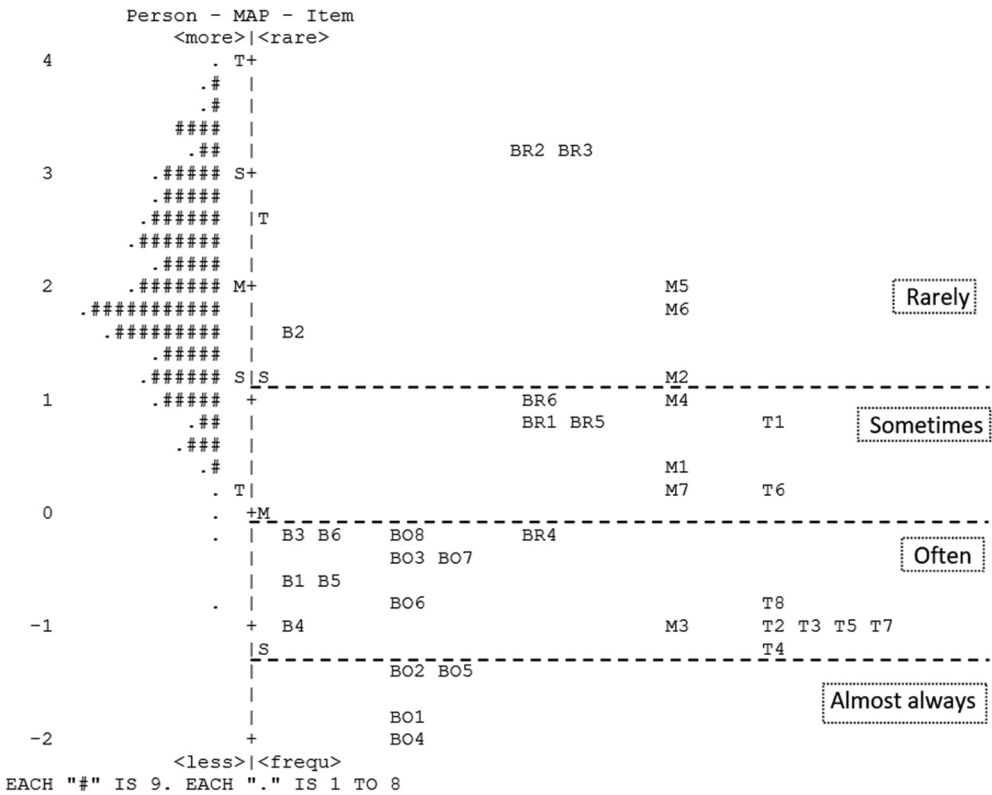


Figure 1. Wright Map.

difficulty (easier to endorse, positioned near the bottom). For instance, items at the lower end (e.g., B04 at  $-1.96$  logit) were easiest to endorse, indicating broad consensus among principals, whereas items at the upper end (e.g., BR2 at  $+3.24$  logit) were harder to endorse, signalling greater challenges in external stakeholder engagement. The distribution of responses along the latent trait scale validates a well-calibrated item targeting across the five leadership constructs, guaranteeing a thorough assessment of strategic leadership behaviours. The mean logit score of  $2.07$  ( $SD = 0.95$ ) indicates that 96% of respondents fall within  $\pm 2SD$  of the mean, reflecting broad coverage of respondents' abilities across the strategic leadership continuum and confirming the scale's comprehensive measurement range across the five strategic leadership constructs.

**Principals' perception of strategic leadership**

This section examines how demographic variables (gender, age, education, experience, and school location) influence principals' perceptions of their strategic leadership behaviours. Table 5 provides a comprehensive view of how principals perceive strategic leadership. The logit values of individuals (LVP) across these demographic subgroups indicate that most Chinese principals perceive themselves as demonstrating moderate to high levels of strategic leadership. However, younger and less experienced principals report comparatively lower perceived leadership capabilities, suggesting that leadership

**Table 5.** Principals perceptions of strategic leadership.

Demographic	Levels of Perception			
	Very high level LVP > +3.02	High level +3.02 > LVP > +2.07	Moderate level +2.07 > LVP > +1.12	Low level LVP < +1.12
Gender				
Male	96	230	256	107
Female	43	67	75	21
Age				
Below 40 years	4	8	14	6
40–49 years old	48	113	114	45
More than 49 years	87	176	203	77
Education				
Diploma	4	5	6	3
Undergraduate	99	195	223	99
Postgraduate	36	97	102	26
Experience as Principals				
Less than 4 years	21	47	56	23
4–8 years	38	70	82	35
More than 8 years	80	180	193	70
School Location				
Rural	34	69	69	43
Urban	105	228	262	85

**Table 6.** ANOVA test of principals demographic variables.

No	Demographic variables	F-test
1	Gender	5.081*
2	Age	0.568
3	Qualifications	0.211
4	Experience as principals	0.301
5	School location	0.331

Note: \* $p < 0.05$ .

experience influences self-assessed effectiveness. Meanwhile, principals in urban settings generally report higher self-assessed strategic leadership than their rural counterparts, suggesting that the context affects how leadership is expressed (Tian & Huber, 2021).

Gender and education did not significantly impact leadership perceptions. Further analysis using ANOVA revealed a statistically significant gender difference ( $p < 0.05$ ), with female principals reporting higher mean logit scores (2.20) than males (2.03) (see Table 6). This finding suggests that female principals may exhibit higher levels of self-perceived leadership confidence, broadly aligning with Chatchawaphun et al. (2016), who found no substantial correlation between age and gender in strategic leadership perceptions. Nonetheless, previous studies underscore the potential impact of demographic variables, including age, gender, and school type, on leadership behaviour (Pisapia & Pang, 2013).

### **Rasch Differential Item Functioning (DIF) analysis**

To ensure measurement fairness and validity, a Rasch Differential Item Functioning (DIF) analysis was conducted to determine whether any items in the SLQ systematically favoured specific demographic subgroups. DIF arises when certain items elicit different response patterns across subgroups, not due to actual differences in the underlying trait being measured but as a result of bias in item interpretation or variation in response

**Table 7.** DIF results of principals' demographic variables.

No	Item	Item logit	Item Statement	Demographic Variables with DIF
1	T4	-1.21	I work to create a shared vision	Age
2	T5	-0.93	I emphasize the organization's core values in discussions and decision-making	Age
3	T6	0.14	I encourage people to become leaders	Age
4	T8	-0.75	I work hard to develop a shared direction for the organization.	School Locality
5	M5	2.00	I monitor the work of others.	Age; Qualification; School Locality
6	M6	1.75	I tell people to follow the chain of command	Qualification
7	B5	-0.64	I try to create win-win solutions in dealing with people.	Qualification
8	BR2	3.24	I develop alliances with people from inside the organization	Gender
9	BO8	-0.27	I am honest with people.	Qualification

patterns. DIF reflects potentially biased item interpretations or varied response patterns unrelated to actual differences in leadership traits (Rencz et al., 2021; Rodriguez-Boerwinkle et al., 2021). If left unaddressed, such discrepancies can undermine measurement invariance, potentially compromising the instrument's validity and the accuracy of comparative analyses.

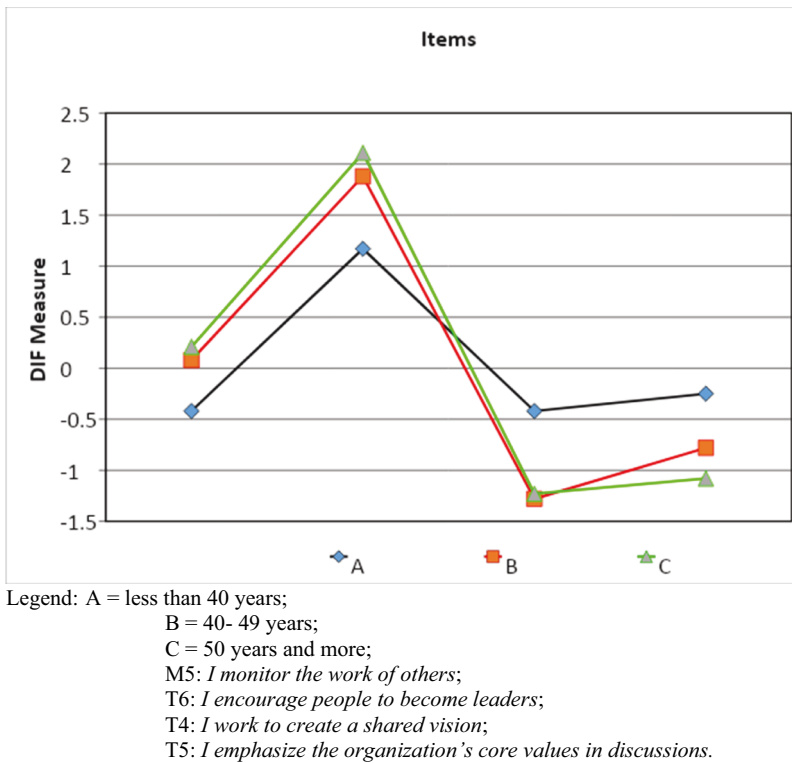
Table 7 summarizes the DIF analysis, revealing that nine items (T4, T5, T6, T8, M5, M6, B5, BR2, and BO8) displayed DIF across four demographic variables: age, qualification, school locality, and gender, suggesting nuanced variations in how different demographic groups interpret or value specific leadership actions. The significance of DIF was assessed using three criteria: DIF contrast size  $> 0.5$  logits,  $t$ -value  $> 2.0$ , and  $p < 0.05$ .

Notably, age and qualifications emerged as key demographic factors influencing responses. For example, Figure 2 illustrates person DIF by age, indicating that younger principals are more inclined to encourage leadership among others (T6), whereas older principals emphasize oversight and focus on monitoring work (M5), fostering a shared vision (T4), and reinforcing core values (T5).

Similarly, Figure 3 depicts DIF based on academic qualifications, revealing that principals with diplomas are less likely to engage in negotiation-based leadership behaviours (B5, BO8), less inclined to closely monitor subordinates (M5), and less likely to endorse strict hierarchical management practices (M6) relative to those with higher academic degrees.

### **Addressing DIF and measurement invariance**

Differential Item Functioning (DIF) poses a critical challenge to measurement reliability and invariance when items do not function equivalently across demographic subgroups (Rencz et al., 2021; Rodriguez-Boerwinkle et al., 2021). DIF arises when discrepancies in item responses indicate systematic bias rather than authentic variation in the underlying construct, thereby jeopardizing the validity of group comparisons. If left unaddressed, DIF violates core Rasch assumptions and may introduce measurement bias that compromises interpretive accuracy (Goh et al., 2018; Hasiuk et al., 2021). Prior research indicates that DIF frequently emerges across demographic variables such as age and gender, particularly in culturally embedded or context-sensitive instruments (Effatpanah et al., 2025).



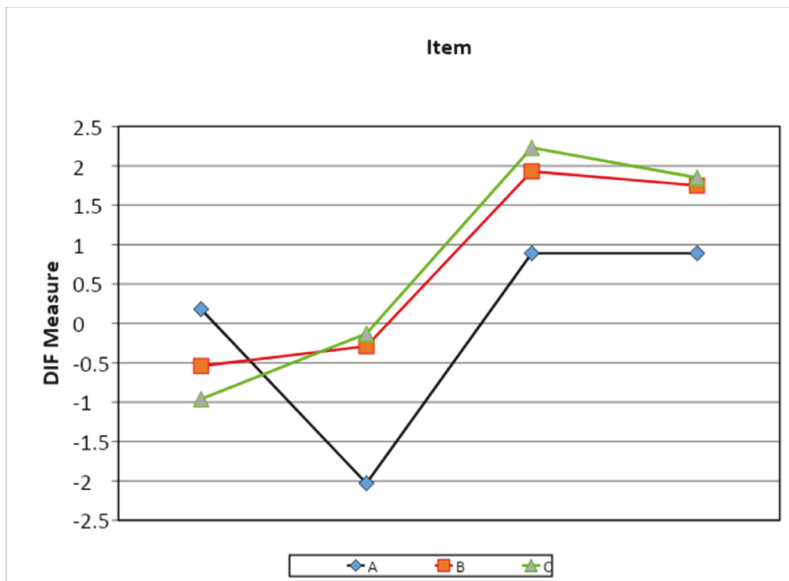
**Figure 2.** Person DIF plot based on age.

Scholars disagree on how to best address DIF. While some advocate removing biased items, others caution that indiscriminate deletion can narrow construct coverage and obscure meaningful subgroup differences (Goh et al., 2018; Hasiuk et al., 2021). Instead, targeted item revision is increasingly recommended as a more balanced strategy, allowing researchers to enhance measurement invariance while preserving theoretical and content validity. This approach is supported by evidence demonstrating that careful item refinement strengthens instrument reliability without undermining construct integrity (Effatpanah et al., 2025; Hasiuk et al., 2021).

In this study, Rasch DIF analysis provided diagnostic insights into subgroup-specific response patterns, informing the refinement of the Strategic Leadership Questionnaire (SLQ). Targeted revision to address DIF enhances the instrument's methodological rigour and practical applicability, making it suitable for use in culturally and demographically diverse educational leadership settings.

### **Key findings and contributions**

This section examines principals' perceptions of their strategic leadership behaviours across key demographic variables, including gender, age, educational attainment, leadership experience, and school location. Person logit values (LVPs) derived from Rasch



Legend: A = Diploma

B = Undergraduate

C = Postgraduate

B5: *I try to create win-win solutions in dealing with people*

BO8: *I am honest with people*

M5: *I monitor the work of others*

M6: *I tell people to follow the chain of command*

**Figure 3.** Person DIF plot based on qualifications.

measures were used to compare subgroup differences, which revealed how contextual and professional characteristics shape leadership perceptions.

Overall, the results indicate that Chinese secondary school principals generally perceive themselves as demonstrating moderate to high levels of strategic leadership. As shown in Table 5, LVPs across most demographic groups exceed the item mean (0.00), suggesting that principals perceive themselves as frequently engaging in strategic leadership behaviours. This pattern aligns with prior research indicating that principals in centralized systems often develop adaptive leadership repertoires to manage complex policy environments (Tian & Huber, 2021; Walker & Qian, 2015).

Differences emerged across age and leadership experience groups. Younger, less experienced principals reported lower LVPs, whereas principals with longer tenure reported higher perceived strategic leadership capacity. This trend suggests that leadership experience contributes to principals' confidence and perceived effectiveness in navigating strategic demands, consistent with studies on leadership development as a cumulative and career-shaped process (Pisapia & Pang, 2013). Experience appears particularly relevant in centralized systems, where principals must learn to balance policy compliance with relational and strategic coordination.

School location also influenced leadership perceptions. Principals working in urban schools reported higher LVPs than those in rural or less-resourced settings. This finding may reflect differential access to professional networks, institutional support, and external

resources, which can facilitate strategic leadership practices such as bridging and bartering (Qian et al., 2023). Contextual constraints in rural settings may limit opportunities for external engagement, thereby shaping how strategic leadership behaviours are enacted and perceived.

Gender differences were examined using both descriptive statistics (Table 5) and inferential analysis (Table 6). Although gender differences were modest, ANOVA results indicated a statistically significant difference ( $p < .05$ ), with female principals reporting slightly higher mean logit scores ( $M = 2.20$ ) than male principals ( $M = 2.03$ ). This finding aligns with prior research suggesting that female school leaders may place greater emphasis on relational and collaborative leadership practices, which are central to strategic leadership frameworks (Chatchawaphun et al., 2016; Pisapia & Lin, 2011). However, the relatively small magnitude of difference suggests that gender does not fundamentally alter strategic leadership perceptions but may influence emphasis on specific influence actions, particularly bonding-related behaviours.

Educational attainment did not produce substantial differences in overall leadership perception. Principals across qualification levels reported comparable LVPs, indicating that formal academic credentials alone may be less influential than experiential learning in shaping strategic leadership capacity. This finding supports research emphasizing the importance of situated leadership practice and professional learning over formal qualifications in developing leadership competence (Tian & Huber, 2021).

To further examine whether the SLQ functioned equivalently across demographic groups, Rasch Differential Item Functioning (DIF) analysis was conducted. DIF analysis assesses whether specific items systematically favour particular subgroups due to differences in interpretation rather than differences in the underlying construct (Rencz et al., 2021; Rodriguez-Boerwinkle et al., 2021). Using established criteria (DIF contrast  $> 0.5$  logits,  $|t| > 2.0$ ,  $p < .05$ ), nine items were identified as exhibiting DIF across age, gender, qualification, and school locality (Table 7).

Age-related DIF patterns revealed that younger principals were more likely to endorse items related to encouraging leadership, among others (e.g., T6), whereas older principals more strongly endorsed items related to monitoring work processes (M5) and reinforcing shared vision and values (T4, T5). These differences suggest that leadership focus may shift over the course of a career, with early-career principals emphasizing empowerment and later-career principals prioritizing oversight and institutional coherence.

Qualification-based DIF indicated that principals with lower academic credentials were less likely to endorse negotiation-oriented behaviours (B5, BO8) and direct managerial oversight (M5, M6) compared to those with higher qualifications. This pattern may reflect differences in exposure to leadership training or confidence in navigating complex administrative negotiations.

Importantly, the presence of DIF does not invalidate the SLQ but highlights areas where item interpretation varies across demographic groups. Consistent with methodological guidance (Goh et al., 2018; Hasiuk et al., 2021), the findings suggest that targeted item refinement, rather than wholesale item removal, offers a more appropriate strategy for preserving content validity while improving measurement invariance. Addressing DIF strengthens both the psychometric rigour and practical applicability of the instrument in diverse educational contexts.

In summary, experience, context, and demographic factors shape principals' perceptions of strategic leadership, and the SLQ demonstrates overall robustness as a measurement tool. The observed subgroup variations reinforce the importance of contextually responsive leadership development and provide empirical guidance for refining leadership assessment instruments in centralized and culturally embedded education systems.

## Existing research

Recent scholarship has significantly advanced understanding of school leadership during periods of rapid change and uncertainty, particularly in response to crises such as COVID-19 (Bowman, 2021; Netolicky, 2020; Wilmot, 2024). However, important gaps remain in the literature that limit the generalizability and conceptual breadth of existing findings. While the role of school leadership in promoting equity, inclusion, and resilience is well documented, much current research is geographically bounded or methodologically constrained, limiting its applicability across diverse educational systems (Acton, 2021; Trinidad, 2021).

Many empirical studies are conducted in Western or Middle Eastern contexts, where governance structures and cultural norms differ significantly from those in East Asia. For example, Alsharija and Watters (2020) highlight secondary principals' roles as change agents in Kuwait, yet their findings may not readily transfer to education systems characterized by strong centralization and hierarchical authority. Similarly, qualitative studies examining school leadership during the COVID-19 pandemic in the United States provide valuable crisis-specific insights but are embedded in decentralized governance contexts that differ markedly from those in East Asian systems (Bowman, 2021). Research conducted in Taiwan and Thailand further enriches culturally grounded understandings of leadership (Chatchawaphun et al., 2016; Hsiao et al., 2013), yet these studies remain context-specific and offer limited comparative insight across centralized education systems.

Within China, leadership research has predominantly emphasized instructional leadership or relied heavily on qualitative approaches (Qian et al., 2017; Walker & Qian, 2015). While these studies illuminate pedagogical and relational dimensions of leadership, they often overlook the broader behavioural repertoire through which principals navigate policy mandates, organizational constraints, and stakeholder relationships. As a result, systematic measurement of strategic leadership behaviours remains underdeveloped.

The present study addresses these gaps by examining principals' strategic leadership behaviours across multiple regions in China using a rigorous quantitative approach. By applying a validated strategic leadership framework and Rasch-based measurement, the study extends leadership research beyond a pedagogical focus to capture how principals integrate relational, transformational, and negotiation-oriented behaviours within a centralized, culturally embedded system. In doing so, it contributes empirically grounded insights that enhance theoretical development, support cross-context comparison, and inform leadership development in complex educational environments.

## Bridging methodological gaps

Leadership research has traditionally leaned heavily on qualitative approaches, which, while providing rich contextual insights, often lack the empirical precision necessary for broad generalizability (Minh, 2025). For instance, case studies by Reyes-Guerra (2009) and Shaw (2018) offer valuable narratives of leadership practices during crises but provide limited quantitative validation of leadership constructs. Similarly, Fazzino (2012) and Trinidad (2021) discuss equity and engagement in schools during COVID-19, yet neither study integrates psychometric assessments to systematically measure leadership behaviours.

In contrast, an emerging body of literature advocates for the application of Rasch measurement to achieve greater precision in leadership research (Sun et al., 2024). Studies applying Rasch analysis to a leadership scale found that reducing the number of items and refining the response format significantly enhanced the instrument's functionality and applicability in educational settings (Bailes & Nandakumar, 2020; J. K. Lee et al., 2023). Despite these advancements, most work in Rasch methodology continues to focus on test theory calibration and instrument validation (Andrich & Marais, 2019; Bond et al., 2020), rather than applying Rasch analysis directly to investigate leadership phenomena.

Addressing this gap, the present study applies Rasch analysis to systematically examine leadership behaviours, thereby offering a more statistically rigorous perspective on leadership constructs. This approach not only overcomes the limitations of qualitative and descriptive research but also provides a replicable model for integrating psychometric methods into leadership studies. By weaving together contextual nuance with robust measurement practices, the study advances strategic leadership research in under-explored educational settings and lays the groundwork for more nuanced explorations of how leadership unfolds across diverse contexts.

## Implications for leadership development

The results of this research provide an update on strategic leadership frameworks that remain pivotal in shaping both policy and practice. Empirical findings indicate that transforming, bonding, and bartering are the predominant leadership strategies, whereas managing and bridging are utilized contextually, corresponding with ongoing discourse on adaptive leadership in rapidly changing environments. These findings also align with the scoping review by Cardno and Reynolds (2021), which illustrates the importance of adaptive leadership approaches in educational settings. Notably, demographic variations, particularly by gender, underscore the need for targeted professional development initiatives, echoing calls for inclusivity and equity in leadership training. Cobbinah (2020), who discusses barriers to strategic leadership in education and emphasizes the need for inclusive leadership training programmes, further supports this observation.

Critically, the Rasch Differential Item Functioning (DIF) analysis performed in this study demonstrates how measurement bias can be minimized, ensuring that leadership constructs are assessed equitably across diverse principal populations. However, it is important to note that Humphry and Montuoro (2021) argue that the Rasch model cannot reveal systematic DIF in single tests, suggesting the need for alternative methodologies in certain contexts.

By addressing both theoretical and methodological gaps, this study fills key gaps in these areas. It refines the SLQ and enhances global discourse on school leadership by offering actionable strategies for leadership development in diverse, complex educational environments. Such progress is essential not only for sustaining effective governance and strategic leadership capacities but also for driving inclusive educational reforms in complex, often resource-constrained settings.

## Final reflections

The findings of this study underscore that effective strategic school leadership rests on principals' capacity to align decision-making with institutional vision while navigating increasingly complex and uncertain educational environments. As policy demands, technological change, and social expectations continue to evolve, principals' ability to combine strategic foresight with adaptive action is essential for sustaining organizational coherence and long-term school development.

Central to this process is cultivating a collaborative and supportive school climate. Consistent with research on transformational leadership, fostering trust, shared purpose, and collective engagement strengthens stakeholder motivation and enhances institutional resilience (Colorado State University Prevention Research Center, 2022). Such relational conditions enable principals to mobilize staff and stakeholders towards shared goals, particularly during periods of disruption and reform.

In parallel, value-driven leadership grounded in ethical practice and inclusivity has become increasingly important. Leaders who prioritize ethical decision-making and inclusiveness are better positioned to guide schools through complex transformations associated with public health crises, digitalization, and equity-oriented reforms (Stansberry Beard, 2025).

Beyond its substantive findings, this study demonstrates the value of integrating psychometric rigour with strategic leadership theory. By applying a robust measurement framework, the research offers a replicable model for examining leadership behaviours in complex educational systems. Collectively, these contributions advance understanding of institutional resilience and support the development of empirically grounded, context-sensitive leadership practices capable of sustaining school effectiveness amid continuous change.

## Limitations and future research

This study has several limitations that should be acknowledged, and these limitations point towards meaningful opportunities for future inquiry. One important constraint concerns the use of principals' self-reported data as the sole source of evidence. Self-report measures are vulnerable to perceptual bias and common-method variance, and prior research has shown that self-evaluations of leadership behaviour may not always correspond to externally observed or multi-source assessments (Donaldson & Grant-Vallone, 2002; Lee & Carpenter, 2018; Podsakoff et al., 2024). Such discrepancies may arise from social desirability effects, culturally shaped norms of self-presentation, or differences between intended and enacted leadership practices (Tschannen-Moran & Hoy, 2000). Future studies would benefit from triangulating data sources by incorporating teacher ratings, student perspectives, supervisor evaluations, or structured observational evidence to obtain a more comprehensive picture of strategic leadership in practice.

Another limitation relates to the cross-sectional nature of the data. Although the Rasch model improves measurement precision at the item level, the study's design does not allow for examining how principals' strategic leadership behaviours evolve in response to policy shifts, organizational changes, or broader educational reforms. Longitudinal research designs could provide insight into developmental trajectories and allow researchers to examine whether strategic leadership behaviours strengthen, stabilize, or diminish over time.

A further limitation concerns the composition of the sample, which was drawn from principals who participated in a national leadership training network. While this recruitment strategy enabled access to a large and geographically diverse group of school leaders, it may not fully represent principals who do not participate in formal training programmes. Future research could complement this approach with alternative sampling strategies that include underrepresented regions or school types, or by comparing principals who engage in leadership training with those who do not, thereby yielding a more nuanced understanding of variation in strategic leadership practices.

There is also scope to extend the theoretical breadth of future studies. Although strategic leadership provided a useful framework for the present analysis, additional insight could be gained by examining how it interacts with other leadership approaches, such as instructional, distributed, or transformational leadership. Moreover, mixed-methods research that integrates surveys, interviews, documentary analysis, and field observations could deepen understanding of how transforming, managing, bonding, bridging, and bartering behaviours are enacted in the everyday life of schools.

## Conclusion

The post-COVID era has introduced unprecedented challenges for school leadership, compelling principals to reimagine teaching and learning experiences and develop innovative strategies to address diverse student needs. As educational environments grow increasingly complex, school leaders must apply pandemic-era insights to navigate comprehensive, schoolwide instruction in a volatile, uncertain, complex, and ambiguous (VUCA) world. Frequent disruptions, sporadic school closures, and shifting stakeholder expectations underscore the importance of strategic planning and ongoing professional development to ensure institutional resilience and adaptability.

## Author contributions

CRedit: **Na Jiang:** Conceptualization, Formal analysis, Methodology, Resources, Visualization, Writing – original draft, Writing – review & editing; **Rui Deng:** Conceptualization, Data curation, Supervision, Writing – review & editing; **Corinne Jacqueline Perera:** Formal analysis, Methodology, Resources, Validation, Writing – review & editing; **Bambang Sumintono:** Data curation, Formal analysis, Methodology, Validation; **Zamzami Zainuddin:** Methodology, Validation, Writing – review & editing.

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## References

- Acton, K.S. (2021). School leaders as change agents: Do principals have the tools they need? *Management in Education*, 35(1), 43–51. <https://doi.org/10.1177/0892020620927415>
- Alsharija, M., & Watters, J.J. (2020). Secondary school principals as change agents in Kuwait: Principals' perspectives. *Educational Management Administration and Leadership*, 49(6), 883–903. <https://doi.org/10.1177/1741143220925090>
- Andrich, D. (1978). A rating formulation for ordered response categories. *Psychometrika*, 43(4), 561–573. <https://doi.org/10.1007/BF02293814>
- Andrich, D., & Marais, I. (2019). *A course in Rasch measurement theory: Measuring in the educational, social and health sciences*. Springer Nature Singapore. <https://doi.org/10.1007/978-981-13-7496-8>
- Bailes, L.P., & Nandakumar, R. (2020). Get the most from your survey: An application of Rasch analysis for education leaders. *International Journal of Education Policy and Leadership*, 16(2), n2. <https://eric.ed.gov/?id=EJ1242866>
- Boluarte-Carbajal, A., Salazar-Conde, M., Alata Vasquez, S., & Zegarra-López, A. (2023). Psychometric review of the perceived stress scale under CFA and Rasch models in Lima, Peru. *Frontiers in Psychology*, 14, 1160466. <https://doi.org/10.3389/fpsyg.2023.1160466>
- Bond, T.G., & Fox, C.M. (2013). *Applying the Rasch model: Fundamental measurement in the human sciences*. Psychology Press.
- Bond, T., Yan, Z., & Heene, M. (2020). *Applying the Rasch model: Fundamental measurement in the human sciences* (4th ed.). Routledge.
- Boone, W.J., & Noltemeyer, A. (2017). Rasch analysis: A primer for school psychology researchers and practitioners. *Cogent Education*, 4(1), 1416898. <https://doi.org/10.1080/2331186X.2017.1416898>
- Boone, W.J., Staver, J.R., & Yale, M.S. (2014a). *Rasch analysis in the human sciences* (Vol. 10, pp. 978–994). Springer. <https://doi.org/10.1007/978-94-007-6857-4>
- Boone, W.J., Staver, J.R., & Yale, M.S. (2014b). *Rasch analysis in the human sciences*. Springer Science and Business Media. <https://doi.org/10.1007/978-94-007-6857-4>
- Bowman, N. (2021). *A qualitative study of high school principals during the COVID-19 pandemic and the perceived impact of authentic, communicative, and relational leadership*. (Publican No. 28962839) [Unpublished Doctoral dissertation, Point Park University]. ProQuest Dissertations and Theses Global.
- Brown, B., Wang, T., Lee, M., & Childs, A. (2023). Surviving, navigating and innovating through a pandemic: A review of research on school leadership during COVID-19, 2020–2021. *International Journal of Educational Development*, 100, 102804. <https://doi.org/10.1016/j.ijedudev.2023.102804>
- Bush, T. (2023). School leadership during the pandemic: Managing a global crisis. *Educational Management Administration and Leadership*, 51(5), 1011–1013. <https://doi.org/10.1177/17411432231186129>
- Byrne, B. (2012). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. Routledge. <https://doi.org/10.4324/9780203807644>
- Cardno, C., & Reynolds, B. (2021). Strategy and strategic leadership in education: A scoping review. In *Frontiers in education* (Vol. 6, p. 706608). Frontiers Media SA. <https://doi.org/10.3389/feduc.2021.706608>
- Carvalho, M., Cabral, I., Verdasca, J.L., & Alves, J.M. (2021, October). Strategy and strategic leadership in education: A scoping review. *Frontiers in Education*, 6, 706608. <https://doi.org/10.3389/feduc.2021.706608>
- Chatchawaphun, P., Julsuwan, S., & Srisa-Ard, B. (2016). Development of program to enhance strategic leadership of secondary school administrators. *International Education Studies*, 9(10), 34–46. <https://eric.ed.gov/?id=EJ1116063>

- Cobbinah, J.E. (2020). Barriers to strategic leadership in education. In O'Connor, J. R. (Ed), *Strategic leadership in PK-12 settings* (pp. 82–93). IGI Global. <https://doi.org/10.4018/978-1-5225-9242-6.ch007>
- Colorado State University Prevention Research Center. (2022). School leaders: Promoting positive school culture & climate. [https://www.chhs.colostate.edu/prc/wp-content/uploads/sites/20/2023/11/School-Leaders-Positive-School-Climate-CSU-PRC.pdf?utm\\_source=chatgpt.com](https://www.chhs.colostate.edu/prc/wp-content/uploads/sites/20/2023/11/School-Leaders-Positive-School-Climate-CSU-PRC.pdf?utm_source=chatgpt.com)
- Creswell, J.W., & Creswell, J.D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Dimmock, C., & Walker, A. (2005). *Educational leadership: Culture and diversity* (Vol. ID, p. 4912123). Sage Publications. <https://www.torrossa.com/en/resources/an/4912123>
- Ding, Q., Wu, Q., & Zhou, Q. (2024). Online learning during the COVID-19 pandemic: The wellbeing of Chinese migrant children—a case study in Shanghai. *Frontiers in Psychology, 15*, 1332800. <https://doi.org/10.3389/fpsyg.2024.1332800>
- Donaldson, S.I., & Grant-Vallone, E.J. (2002). Understanding self-report bias in organizational behavior research. *Journal of Business & Psychology, 17*(2), 245–260. <https://doi.org/10.1023/A:1019637632584>
- D'Urso, E.D., De Roover, K., Vermunt, J.K., & Tilmstra, J. (2022). Scale length does matter: Recommendations for measurement invariance testing with categorical factor analysis and item response theory approaches. *Behavior Research Methods, 54*(5), 2114–2145. <https://doi.org/10.3758/s13428-021-01690-7>
- Effatpanah, F., Ravand, H., & Doebler, P. (2025). Differential item Functioning Analysis of Likert Scales: An overview and demonstration of rating Scale Tree model. *Psychological Reports*, <https://doi.org/10.1177/00332941241308806>.
- Engelhard, G., Jr., & Wang, J. (2024). *Invariant measurement: Using Rasch models in the social, behavioral and health sciences*. Routledge. <https://doi.org/10.4324/9781003458746>
- Fazzino, T. (2012). Strategic leadership: Profiles, context, and their relationship to school achievement outcomes [Unpublished Doctoral Dissertation, Florida Atlantic University].
- Fraenkel, J.R., Wallen, N.E., & Hyun, H.H. (2012). *How to design and evaluate research in education* (8th ed.). McGraw-Hill Connect Learn Succeed.
- Goh, H.E., Marais, I., & Ireland, M. (2018). The impact of differential item functioning on the Warwick-Edinburgh mental well-being scale. *Journal of Applied Measurement, 19*(2), 162–172. <https://europepmc.org/article/med/29894985>
- Hallinger, P. (2011). A review of three decades of doctoral studies using the principal instructional management rating scale: A lens on methodological progress in educational leadership. *Educational Administration Quarterly, 47*(2), 271–306. <https://doi.org/10.1177/0013161X10383412>
- Hallinger, P., & Kovačević, J. (2021). Science mapping the knowledge base in educational leadership and management: A longitudinal bibliometric analysis & comma; 1960 to 2018. *Educational Management Administration and Leadership, 49*(1), 5–30. <https://doi.org/10.1177/1741143219859002>
- Hasiuk, M.B., Arnould, C., Kushnir, A.D., Matiushenko, O.A., & Kachmar, O.O. (2021). Cross-cultural adaptation and validation of the Ukrainian version of the ABILHAND-Kids questionnaire. *Disability and Rehabilitation, 43*(4), 576–585. <https://doi.org/10.1080/09638288.2019.1630677>
- Hsiao, H.-C., Lee, M.-C., & Tu, Y.-L. (2013). The effects of reform in principal selection on leadership behavior of general and vocational high school principals in Taiwan. *Educational Administration Quarterly, 49*(3), 421–450. <https://doi.org/10.1177/0013161X12462387>
- Humphry, S., & Montuoro, P. (2021). The Rasch model cannot reveal systematic differential item functioning in single tests: Subset DIF analysis as an alternative methodology. *Frontiers in Education, 6*, 742560. <https://doi.org/10.3389/feduc.2021.742560>
- Irby, B.J., Abdelrahman, N., Lara-Alecio, R., Tong, F., & Elfarargy, H. (2023). Pre-service principals in a principal preparation program: Leadership practices as a response to COVID-19. *Journal of School Leadership, 33*(6), 557–578. <https://doi.org/10.1177/10526846231174148>
- Jackson, M. (2024). COVID-19 as a window for equity-oriented school leadership: What have we learned from principals' COVID-19 response? *Journal of School Administration Research and Development, 9*(1), 39–45. <https://doi.org/10.32674/jsard.v9i1.5598>

- Ke, Y., Liu, L., & Gu, M. (2025). Paternalistic leadership and counterproductive work behavior: Mediating role of leader identification and moderating effect of traditionality in Chinese Generation Z employees. *Frontiers in Psychology, 16*, 1587525. <https://doi.org/10.3389/fpsyg.2025.1587525>
- Kelim, L.S. (2023). *Perceptions of early-career secondary teachers regarding principal leadership behaviors and retention* [Unpublished Doctoral dissertation, Baker University].
- Lee, A., & Carpenter, N.C. (2018). Seeing eye to eye: A meta-analysis of self-other agreement of leadership. *The Leadership Quarterly, 29*(2), 253–275. <https://doi.org/10.1016/j.leaqua.2017.06.002>
- Lee, D.H.L. (2025). When social hierarchy meets hierarchical school culture: Implications for Chinese Hong Kong school leaders. *Educational Management Administration and Leadership, 53*(1), 158–181. <https://doi.org/10.1177/17411432231158299>
- Lee, J.K., Collins, B., Pepper, E., Alvarez, N.A., & Warholak, T. (2023). Improving a leadership scale: Applying Rasch analysis to student pharmacists' attitudes and beliefs about leadership. *American Journal of Pharmaceutical Education, 87*(6), 100063. <https://doi.org/10.1016/j.ajpe.2023.100063>
- Lee, S.W., & Mao, X. (2023). Recruitment and selection of principals: A systematic review. *Educational Management Administration and Leadership, 51*(1), 6–29. <https://doi.org/10.1177/1741143220969694>
- Lin, P. (2025). How do education collectives in China function? A critical analysis of relationship governance in a formal multi-school collaboration. *Educational Management Administration and Leadership, 1*–18. <https://doi.org/10.1177/17411432241307293>
- Marks, H.M., & Printy, S.M. (2003). Principal leadership and school performance: An integration of transformational and instructional leadership. *Educational Administration Quarterly, 39*(3), 370–397. <https://doi.org/10.1177/0013161X03253412>
- McLeod, S., & Dulsky, S. (2021). Resilience, reorientation, and reinvention: School leadership during the early months of the COVID-19 pandemic. *Frontiers in Education, 6*, 637075. <https://doi.org/10.3389/educ.2021.637075>
- Meade, A.W., & Craig, S.B. (2012). Identifying careless responses in survey data. *Psychological Methods, 17*(3), 437–455. <https://doi.org/10.1037/a0028085>
- Minh, N.T.T. (2025). Exploring qualitative data collection methods for dissertation research. In Throne, R. (Ed.), *Qualitative research methods for dissertation research* (pp. 81–124). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-3069-2.ch004>
- Na, J., Sumintono, B., & Yan-Li, S. (2020). Principal's preparation and professional development programs: Case study in Henan, China. *Malaysian Online Journal of Educational Management, 8*(2), 19–31. <https://mojem.um.edu.my/article/view/23152>
- Netolicky, D. (2020). School leadership during a pandemic: Navigating tensions. *Journal of Professional Capital and Community, 5*(3–4), 391–395. <https://doi.org/10.1108/JPC-05-2020-0017>
- Pang, N.S.K. (2021). Restructuring school governance in Hong Kong SAR: Coping with the challenges from globalization. Pang, N.S.K & CHAN, P.W.K. In Pang, N.S.K & Chan, P.W.K (Eds.), *School Governance in Global Contexts* (pp. 247–261). Routledge. <https://doi.org/10.4324/9781003221456>
- Pisapia, J., & Pang, N.S.-K. (2013). Influence actions of school principals in Hong Kong, mainland China and the United States: A cross-cultural perspective. *School Leadership & Management, 33*(1), 26–42. <https://doi.org/10.1080/13632434.2012.723618>
- Pisapia, J.R. (2009). *The strategic leader: New tactics for a globalizing world*. Emerald Publishing Limited. <https://doi.org/10.1108/978-1-60752-273-7>
- Pisapia, J., Reyes-Guerra, D., & Coukos-Semmel, E. (2005). Developing the leader's strategic mindset: Establishing the measures. *Leadership Review, 5*(1), 41–68.
- Podsakoff, P.M., Podsakoff, N.P., Williams, L.J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology & Organizational Behavior, 11*(1), 17–61. <https://doi.org/10.1146/annurev-orgpsych-110721-040030>
- Qian, H., Walker, A., & Li, X. (2017). The west wind vs the east wind: Instructional leadership model in China. *Journal of Educational Administration, 55*(2), 186–206. <https://doi.org/10.1108/JEA-08-2016-0083>

- Qian, H., Walker, A., & Zheng, Y. (2023). Boundary-spanning practices of system leaders in China: Enabling conditions and inherent tensions. *Educational Management Administration and Leadership*, 53(2), 238–257. <https://doi.org/10.1177/17411432231174690>
- Rencz, F., Mitev, A.Z., Szabó, Á., Beretzky, Z., Poór, A.K., Holló, P., Brodszky, V., Sárdy, M., Kárpáti, S., Szegedi, A., Remenyik, É., & Brodszky, V. (2021). A Rasch model analysis of two interpretations of 'not relevant' responses on the Dermatology Life Quality Index. *Quality of Life Research*, 30(8), 2375–2386. <https://doi.org/10.1007/s11136-021-02803-7>
- Reyes-Guerra, D. (2009). The relationship between principal leadership actions and business and social justice cultures in schools [Unpublished Doctoral Dissertation]. Florida Atlantic University.
- Rodriguez, R. M., Silvia, P. J., Kaufman, J. C., Reiter-Palmon, R., & Puryear, J. S. (2023). Taking inventory of the Creative Behavior Inventory: An item response theory analysis of the CBI. *Creativity Research Journal*, 35(2), 143–153. <https://doi.org/10.31234/osf.io/b7cfd>
- Shaw, C.B. (2018). The relationships among the behavioral agility of school leadership teams, culture, and performance [Unpublished Doctoral Dissertation]. Florida Atlantic University.
- Stansberry Beard, K. (2025). Sensemaking and engagement in ethical decision-making (SEED): A United States decision-making framework for educational administration and school leadership. *Educational Management Administration and Leadership*. <https://doi.org/10.1177/17411432241309749>
- Sumintono, B., & Widhiarso, W. (2014). *Application of Rasch modelling in social science research* (Revised ed.). Trimkom Publishing House.
- Sun, J., & Leithwood, K. (2012). Transformational school leadership effects on student achievement. *Leadership and Policy in Schools*, 11(4), 418–451. <https://doi.org/10.1080/15700763.2012.681001>
- Sun, J., Xia, J., Hua, C., Man, K., & Johnson, B.L. (2024). Assessing the psychometric qualities of the data-informed school leadership survey. *Educational Administration Quarterly*, 60(4), 531–580. <https://doi.org/10.1177/0013161X241271250>
- Tian, M., & Huber, S.G. (2021). Mapping the international knowledge base of educational leadership, administration and management: A topographical perspective. *Compare: A Journal of Comparative and International Education*, 51(1), 4–23. <https://doi.org/10.1080/03057925.2019.1585757>
- Torrance, D., Mifsud, D., Niesche, R., & Fertig, M. (2023). Headteachers and the pandemic: Themes from a review of literature on leadership for professional learning in complex times. *Professional Development in Education*, 49(6), 1103–1116. <https://doi.org/10.1080/19415257.2023.2229333>
- Townsend, T., & Pisapia, J. (2018). Strategic leadership to improve the quality of education. In *61st World Assembly ICET 2017* (61st ed.). Masaryk University. [https://icet4u.org/docs/ICET\\_Yearbook\\_of\\_Teacher\\_Education\\_2018.pdf](https://icet4u.org/docs/ICET_Yearbook_of_Teacher_Education_2018.pdf)
- Trinidad, J.E. (2021). Equity, engagement, and health: School organizational issues and priorities during COVID-19. *Journal of Educational Administration and History*, 53(1), 67–80. <https://doi.org/10.1080/00220620.2020.1858764>
- Tschannen-Moran, M., & Hoy, W.K. (2000). A multidisciplinary analysis of the nature, meaning, and measurement of trust. *Review of Educational Research*, 70(4), 547–593. <https://doi.org/10.3102/00346543070004547>
- Van Zile-Tamsen, C. (2017). Using Rasch analysis to inform rating scale development. *Research in Higher Education*, 58(8), 922–933. <https://doi.org/10.1007/s11162-017-9448-0>
- Walker, A., & Qian, H. (2015). Review of research on school principal leadership in mainland China, 1998–2013. *Journal of Educational Administration*, 53(4), 467–491. <https://doi.org/10.1108/JEA-05-2014-0063>
- Wilmot, A.M. (2024). Planning to cultivate social relationships online: Lessons from four Jamaican school principals. *Educational Planning*, 31(1), 45–62. <https://eric.ed.gov/?id=EJ1416288>
- Xue, E., Li, J., & Xu, L. (2020). Online education action for defeating COVID-19 in China: An analysis of the system, mechanism and mode. *Educational Philosophy and Theory*, 54(6), 799–811. <https://doi.org/10.1080/00131857.2020.1821188>
- Zheng, Y., Qian, H., Song, J., & Chen, S. (2024). Exploring the network leadership practice of master principal studio hosts in China. *Educational Management Administration and Leadership*. <https://doi.org/10.1177/17411432241307294>