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The Impact of Home–School Accessibility on Resource Sharing in Rural Small-Scale Kindergartens in Sichuan: A Serial Mediation Analysis

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Abstract:

This study investigated the relationships among home–school accessibility, resource sharing, management collaboration, and inter-school cultural co-construction in rural small-scale kindergartens under the framework of China's Rural Revitalization Strategy. A sample of 229 principals/heads, teachers, and childcare staff from very small (0–50 enrolled children) and small-scale (51–100 enrolled children) rural kindergartens (or preschool education sites) in Sichuan Province were surveyed using self-developed questionnaires and interview protocols. The results indicated that: (1) home–school accessibility was significantly and positively correlated with both management collaboration and inter-school cultural co-construction; management collaboration was significantly and positively correlated with inter-school cultural co-construction; and resource sharing was significantly and positively correlated with home–school accessibility, management collaboration, and inter-school cultural co-construction; (2) inter-school cultural co-construction and management collaboration played a serial mediating role between home–school accessibility and resource sharing. These findings elucidate the mechanisms through which home–school accessibility influences resource sharing in rural small-scale kindergartens, and provide practical implications for the cluster development of such kindergartens in the context of the Rural Revitalization Strategy and emerging demographic shifts.

Keywords

Rural small-scale kindergartens, cluster development, home–school accessibility, resource sharing, management collaboration, inter-school cultural co-construction

1. Introduction

High-quality preschool education bears on the healthy growth of hundreds of millions of children, and is of vital importance to national development and the future of the nation. The high-quality development of rural preschool education is of great significance for revitalising rural education, building a strong education nation, and advancing Chinese-style modernisation. Since the 18th National Congress of the Communist Party of China, China's preschool education has achieved rapid development, with the gross enrolment rate increasing significantly, and problems such as "difficulty in accessing kindergarten" and "high cost of kindergarten"

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being substantially alleviated [1]. In 2024, the Preschool Education Law of the People's Republic of China was formally promulgated, explicitly stating the goal of "building a public-service system for preschool education that covers both urban and rural areas, is rationally distributed, public-benefit and inclusive, safe and high-quality", and requiring that "preferential support be given to rural areas, old revolutionary base areas, ethnic minority regions, border areas and less-developed regions in the development of preschool education" [2].

However, against the backdrop of two simultaneous social developments – the continuous decline in the pre-school-age population and rapid urbanisation – rural preschool education is facing a host of new challenges, including shrinking enrolments in a large number of small-scale kindergartens (or preschool education sites), shortages of resources, worrisome quality, and the risk of closure for some rural kindergartens. These may give rise to new problems such as longer distances for rural children to reach kindergartens and higher costs of access. The No. 1 Central Document of 2025 called for "running well the necessary rural small-scale schools", and the No. 1 Central Document of 2026 further specified the need to "steadily and prudently optimise the layout of rural primary and secondary schools and kindergartens, while retaining and running well the necessary rural small-scale schools and kindergartens", and to "promote the construction of urban–rural school consortia, strengthen the coordinated allocation of teachers at the county level, and promote online sharing of high-quality classrooms between urban and rural schools". This intensive series of policy measures signals that rural education policy has entered a new phase, shifting from quantitative compliance to quality improvement. In this context, how to break through the survival and development dilemmas of small-scale rural kindergartens (preschool sites) has become a practical issue that must be urgently addressed in order to steadily advance China's preschool education towards a safe, high-quality, universal and inclusive direction.

At present, the development predicament of rural small-scale kindergartens (preschool sites) is the result of multiple interacting factors, including declining student enrolments, shrinking operating funds, and teacher attrition. Fundamentally, because of their small size, a single small-scale kindergarten (site) cannot independently bear the costs of high-quality teachers, curriculum development, teaching research activities, etc., thus easily falling into a situation of "scale without economy". Cluster development – that is, forming a consortium of neighbouring rural kindergartens, selecting one or building one with better resources as the hub kindergarten (radiating to others), and establishing a resource-sharing mechanism among all kindergartens in terms of funding, facilities, teachers, management, curriculum and instruction, and culture, so as to achieve resource sharing and complementary advantages – has been adopted and implemented as a policy strategy by other countries or international organisations, as well as by some regions and at different school levels in China. Internationally, countries and organisations such as the United Kingdom, the United States, Japan, Thailand, and Cambodia have effectively improved the quality of rural small-scale schools through school cluster development models. Domestically, some regions have also begun to explore practices such as group-based kindergarten management and kindergarten alliances within school districts.

However, in practice, the cluster development of rural small-scale kindergartens faces a series of fundamental questions that have not yet been adequately answered: What theoretical logic should cluster development follow? How can the level of cluster development be scientifically assessed? What differences exist in home–school accessibility, resource sharing, and other dimensions among kindergartens (sites) of different sizes and

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regions? How should cluster networks be optimally configured? How can various types of resources – human, financial, and material – be effectively shared within a cluster? How should policy guarantee mechanisms be designed? Answering these questions requires not only theoretical reflection but also empirical evidence.

2. Literature Review and Research Hypotheses

2.1 Literature Review

2.1.1 Research on Home–School Accessibility

Research on home–school accessibility mainly focuses on three aspects of rural small-scale kindergartens (preschool sites): travel time distance, spatial distance, and convenience of home–school communication.

With regard to travel time and spatial distance, GIS technology has become one of the effective tools for analysing the accessibility of educational resources. Yin (2006) introduced GIS and remote sensing imagery into the field of educational resource layout, enabling the integration and visual analysis of multi-source data on population distribution, transport networks, and school locations [3]. Kong (2012) used linear programming combined with GIS to delineate optimal school attendance zones for primary and secondary schools, constructing an optimisation model aimed at proximity enrolment [4]. Building on this, Peng and Wang (2013) improved the P-median model by adding a distance threshold constraint, so that the model could simultaneously accommodate convenience for students in remote areas and overall efficiency [5]. Zhang et al. (2022), based on student registration addresses and geocoding techniques, found in their analysis of Zhuzhou County, Hunan Province, that accessibility in northern urban towns was generally higher with smaller spatial disparities, whereas in southeastern rural areas the average distance to school was larger, accessibility was lower, and spatial disparities were more pronounced [6]. From an international perspective, Hite (2008), in a UNESCO report, elaborated on the specific application methods and practices of school mapping and GIS in educational micro-planning [7]; Wang (2006), in his monograph, provided detailed introductions to techniques such as network analysis and location-allocation models [8]; Mulaku and Nyadimo (2013) validated the effectiveness of GIS in assessing national school distribution through the Kenyan school mapping project [9]; Al-Hanbali et al. (2005) developed a GIS data model for school mapping to support educational decision-making in Jordan [10]; and Jamal (2016) conducted a comprehensive assessment of school site selection in Tajikistan using multi-criteria GIS analysis [11].

With regard to the convenience of home–school communication, Guo, Wang, and Jiang (2017), after surveying kindergarten teachers in Cangzhou and Tangshan cities, found that teachers' use of WeChat to communicate with parents remained at a relatively superficial level, and that resource sharing among teachers was insufficient. The root cause lay in the inadequate and unscientific application of WeChat to information communication and resource sharing [12]. Overall, existing research on home–school accessibility has mostly focused on the primary and secondary school levels, with relatively few systematic studies targeting the preschool education stage, particularly small-scale kindergartens.

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2.1.2 Research on Resource Sharing

Research on resource sharing mainly concentrates on four dimensions: human resources, financial resources, material resources, and curriculum resources.

In terms of human resource sharing, Liu, Wang, and Wu (2017) argued that teachers in rural small-scale schools are characterised by complex and diverse types, segmented and dispersed structures, and local and low-level origins, and that teacher team construction faces difficulties such as supply-demand imbalance under multiple institutional logics and disordered turnover driven by individual rational decision-making [13]. Zeng and Fu (2014) proposed reforming the teacher supply model, recommending that local governments collaborate with universities to cultivate local outstanding teachers specifically for small-scale schools, and establish inter-school teacher exchange and sharing systems [14]. Yang and Chen (2024), through an empirical investigation in Lüliang City, Shanxi Province, explored the dilemmas faced by teachers in rural small-scale kindergartens, including cramped and outdated facilities and poor teaching conditions, as well as the psychological experiences of low salary satisfaction, high work pressure, and diminished enthusiasm [15]. Liu and Bao (2023) pointed out that high teacher mobility is an obstacle to building a stable teaching workforce [16]. At the international level, Wheeler et al. (1992), using Thailand as a case study, proposed that school clusters require clear leadership structures, training plans, and monitoring and evaluation mechanisms [17].

In terms of financial resource sharing, Du and Zhang (2015) noted that under the new normal, educational resource allocation should pay attention to the special needs of small-scale schools during their development process [18]; Song (2020) identified problems in rural small-scale kindergartens such as a single source of funding, a high proportion of part-time teachers, and low levels of professionalisation [19]; Guo and Li (2020), based on a field investigation in L Town, Gansu Province, suggested that insufficient funding is the primary factor constraining the development of small-scale kindergartens [20].

In terms of material resource sharing, Wei (2021) proposed that small-scale kindergartens should make full use of local resources to carry out outdoor play activities [21]; Huang (2020) argued that outdated facilities and a lack of play materials are major factors restricting the quality of mixed-age play activities [22].

In terms of curriculum resource sharing, Lei and Zhang (2024) pointed out that curriculum resource scarcity is one of the three major difficulties faced by small-scale kindergartens [23]. Wang (2025), using the framework of "symbiosis theory", explored the resource-sharing mechanism between town and village kindergartens, and found that the status of curriculum resource sharing varied considerably among the four resource centres in township areas [24]; Bu (2015), based on symbiosis theory, distinguished three models – commensal symbiosis, punctate intermittent symbiosis, and mutualistic symbiosis – and suggested that ideal resource sharing should be sustained and stable mutualism [25]. Internationally, Bray (1987) noted that school clusters can overcome the funding, human, and information bottlenecks faced by individual schools by pooling limited resources, thereby generating economies of scale [26]; Giordano (2008), from the perspective of teacher professional development, argued that clusters serve as an organisational form for teacher learning and growth [27]; Atkinson et al. (2007) proposed that the driving forces for inter-school collaboration include teacher professional development, curriculum quality improvement, and responding to external accountability [28].

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2.1.3 Research on Management Collaboration

Research on management collaboration focuses on the allocation of rights and responsibilities within clusters, decision-making mechanisms, institutional norms, and multiple stakeholders. Specifically:

Xue and Meng (2011) proposed that inter-school collaboration should share the development philosophy of "equality and voluntariness, seeking common ground while reserving differences, sincere cooperation, and benefit sharing", establish mechanisms for the flow and sharing of educational resources, and create systems for shared governance and accountability. They further suggested designing different collaborative mechanisms based on two driving forces: market-driven and government-driven [29]. Chen and Yuan (2016) argued that school alliances serve as a beneficial supplement to the binding development of prestigious schools and underperforming schools, providing conditions for bottom-up reform and changing the development trajectory of small-scale schools [30]. An and Wu (2017) identified the characteristics of successful alliances, including strong governmental support, leadership by key individuals, collective shaping of shared vision, and the normative role of organisational systems [31]. Ren and Zhang (2022) proposed that the development logic of "low-position" schools in cluster school networks is manifested in the transformation of "triple relationships": goal reconstruction through brand aggregation and embedded relationships, technological re-engineering through individual learning and team collaboration, and institutional optimisation through inter-school mirroring and balancing relationships [32]. Zhao and Fan (2022) reviewed the experience of cluster development in small-scale schools in the UK, pointing out that they achieve management innovation through regular management meetings, joint planning, information sharing, and other means, and adapt to local conditions by creating clusters, optimising management strategies, and broadening funding channels to promote sustainable development [33].

From an international comparative perspective, Pellini (2007), through a study in Cambodia, explored the importance of community participation in the management of school clusters, finding that when communities become active participants and co-decision-makers, clusters can better respond to local needs and gain broader social support [34]. Ehren and Perryman (2017), from an accountability perspective, noted that accountability in school networks differs from the superior-subordinate relationships in traditional bureaucratic systems, instead constituting a multi-dimensional accountability network involving government, clusters, schools, parents, and communities [35]. Thorpe and Williams (2002), through an examination of six small school federations in Wales, identified key elements of successful federations, including clear shared goals, effective communication mechanisms, and appropriate resource allocation, emphasising particularly that success depends on whether principals and teachers genuinely identify with the value of the federation and are willing to invest time and effort [36].

2.1.4 Research on Inter-school Cultural Co-construction

Research on inter-school cultural co-construction focuses on how rural kindergartens can achieve cultural inheritance, develop distinctive features, and promote community integration development by drawing upon local cultural resources. Specifically:

Gao, Cui, and Gao (2025), from the perspective of cultural confidence, examined the humanistic environment of rural kindergartens and pointed out that the current humanistic environment in rural kindergartens

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suffers from value loss, trapped in dilemmas of imbalanced subject status, weak educational functions, and disconnection from the rural cultural system. The proposed solutions involve renewing educational concepts based on rural contexts, constructing multiple perspectives, and re-affirming the value of local culture, with strategies including teachers' integrative thinking, innovative peer interaction models, and building home-kindergarten cooperative communities [37]. Chen (2025), based on grounded theory, explored the influencing factors of rural kindergarten teachers' local cultural confidence and constructed an influence model consisting of four dimensions: individual, organisational, social, and policy. Within this model, organisational support provides a strong foundation, the social environment serves as an important underpinning, and policy guarantees act as a powerful driver [38]. Sun and Xie (2025), using the "kindergarten-village symbiosis" model as a practical framework, deeply integrated rural natural ecology, productive and living resources, and cultural resources to build an educational community deeply embedded in the village, creating a growth environment for rural children that is both rich in local character and educationally meaningful [39].

Wang and Wang (2025) noted that against the background of rural revitalisation, a new field practice of "new rural preschool education" has emerged, using the development and activation of local curriculum resources as a leverage point, reshaping children's cognition and experience of their surrounding environment through resources near rural kindergartens, thereby enabling small rural resources to promote broader development of kindergartens and townships [40]. Mo (2026) applied narrative therapy to shared reading of ethnic culture picture books in rural kindergartens, constructing a three-tier interactive system involving teachers, parents, and the home-kindergarten interface. Through mechanisms such as story decoding and reconstruction, emotional externalisation, and narrative community building, this approach effectively stimulates children's interest in cultural cognition, enhances the quality of home-kindergarten interaction, and promotes intergenerational transmission of ethnic culture [41]. At the international level, Japan promotes two-way integration between kindergartens and communities, with children going out to the community to learn skills such as planting, and community residents coming into kindergartens to learn needed skills. This approach not only improves the quality of child development but also enhances community vitality, cultivating children's affection for their hometown and awareness of contributing to its development [33].

The four areas of research outlined above provide multi-dimensional perspectives for understanding the cluster development of rural small-scale kindergartens. However, there remains scope for further theoretical construction, technical approaches, and pathway design in the existing literature.

2.2 Research Hypotheses

This study aims to investigate the impact of home–school accessibility on resource sharing in rural small-scale kindergartens (preschool sites) in Sichuan, as well as the underlying mechanisms of this relationship. By comprehensively considering the interrelationships among home–school accessibility, resource sharing, management collaboration, and inter-school cultural co-construction, we propose the following four hypotheses:

H1: Home–school accessibility has a significant positive predictive effect on inter-school cultural co-construction;

H2: Inter-school cultural co-construction has a significant positive predictive effect on management collab-

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oration;

H3: Management collaboration has a significant positive predictive effect on inter-school resource sharing;

H4: Home–school accessibility influences inter-school resource sharing through the serial mediating effect of inter-school cultural co-construction and management collaboration.

In this study, home–school accessibility is abbreviated as KDX, resource sharing as ZYGX, management collaboration as GLHT, and inter-school cultural co-construction as WHGX. The hypothetical model of this study is illustrated in Figure 1.

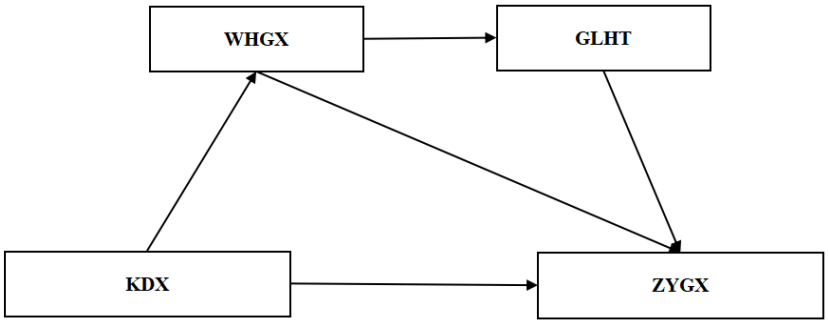


Figure 1. Hypothesised Model

3. Research Methods and Data Processing

3.1 Participants and Survey Procedure

Given the current distribution characteristics of rural preschool education in Sichuan – characterised by "numerous sites, extensive coverage, and scattered distribution" – and in accordance with recommendations from experts in the relevant fields, this study selected 229 respondents from 12 counties and cities across rural areas of Sichuan Province. These included Dayi County, Pengzhou City, and Dujiangyan City in Chengdu City; Pingchang County and Nanjiang County in Bazhong City; Wenchuan County, Zoigê County, and Barkam City in the Aba Tibetan and Qiang Autonomous Prefecture; and Xichang City, Dechang County, Ningnan County, and Leibo County in the Liangshan Yi Autonomous Prefecture. Among the respondents, 25 were kindergarten (preschool site) principals/directors (10.9%), 119 were full-time teachers (52%), and 85 were childcare staff (37.1%).

3.2 Data Processing

In the data processing stage, the bias-corrected percentile bootstrap method was employed to test the mediation effects. The mediation model was examined using SPSS 23.0 in conjunction with the PROCESS macro for SPSS developed by Hayes (2013) [43].

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4. Results and Analysis

4.1 Correlation Analysis

The correlation analysis revealed that, in rural small-scale kindergartens (preschool sites), home–school accessibility was significantly and positively correlated with both management collaboration and inter-school cultural co-construction. A significant positive correlation was also found between management collaboration and inter-school cultural co-construction. Furthermore, resource sharing was significantly and positively correlated with home–school accessibility, management collaboration, and inter-school cultural co-construction (see Table 1).

Table 1. Descriptive Statistics and Correlation Matrix Among Variables

	M±SD	1	2	3	4
1.ZYGX	4.089±0.891				
2.KDX	4.21±0.842	0.778**			
3.WHGX	4.163±0.887	0.843**	0.689**		
4.GLHT	4.11±0.934	0.909**	0.680**	0.878**	

*$p < .05$, ** $p < .01$, *** $p < .001$. Same below.*

4.2 Model Validation Analysis

This study employed the PROCESS macro for SPSS (Model 6) developed by Andrew F. Hayes [44] to examine the mediating roles of inter-school cultural co-construction and management collaboration in the relationship between home–school accessibility and resource sharing, while controlling for respondent position, distance to kindergarten, and number of classes. Regression analysis revealed that: home–school accessibility positively predicted inter-school cultural co-construction ($\beta = 0.691$, $p < .05$); home–school accessibility positively predicted management collaboration ($\beta = 0.161$, $p < .01$), and inter-school cultural co-construction also positively predicted management collaboration ($\beta = 0.785$, $p < .001$); home–school accessibility ($\beta = -0.21$, $p < .01$) and management collaboration ($\beta = -0.41$, $p < .01$) each significantly positively predicted resource sharing, whereas inter-school cultural co-construction did not have a significant direct predictive effect on resource sharing ($\beta = 0.09$, $p > .05$) (see Table 2).

Table 2. Regression Analysis of Variable Relationships in the Model

Regression Model		Overall Fit Indices			Significance of Regression Coefficients	
DV	IV	R	R^2	B	β	t
WHGX	Respondent Position	0.708	0.502	56.432	0.047	0.7
	Distance to Kindergarten				-0.052	-1.071
	Number of Classes				0.139	3.345**
	KDX				0.691	2.291*

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GLHT	Respondent Position	0.89	0.791	169.053	0.19	0.427
	Distance to Kindergarten				-0.023	0.496
	Number of Classes				0.094	-0.682
	KDX				0.161	3.447**
	WHGX				0.785	17.208***
ZYGX	Respondent Position	0.936	0.877	263.694	-0.014	-0.423
	Distance to Kindergarten				0.026	1.082
	Number of Classes				0.029	1.343
	KDX				0.302	8.558***
	WHGX				0.09	1.752
	GLHT				0.599	12.169***

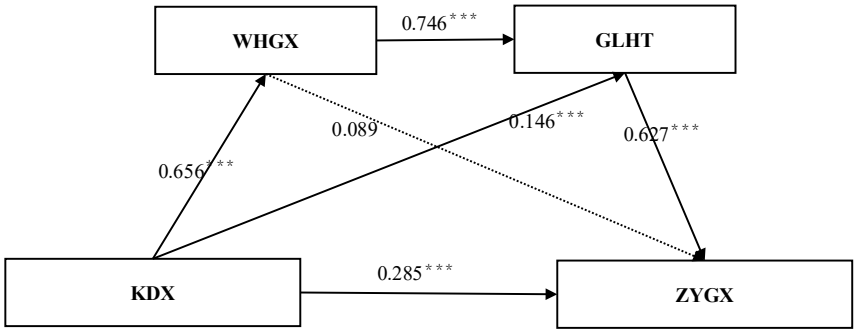


Figure 2. Serial Mediation Effect Diagram

The results of the mediation analysis (see Table 3 & Figure 2) indicated that inter-school cultural co-construction and management collaboration mediated the relationship between home–school accessibility and resource sharing, with a total indirect effect value of 0.483. Specifically, the mediation effect consisted of three indirect pathways: Indirect effect 1 via the path home–school accessibility → inter-school cultural co-construction → resource sharing (−0.035); Indirect effect 2 via the path home–school accessibility → management collaboration → resource sharing (−0.263). The Bootstrap 95% confidence interval for Indirect effect 1 contained zero, whereas the Bootstrap 95% confidence interval for Indirect effect 2 did not contain zero, indicating that Indirect effect 2 was statistically significant. Furthermore, the Bootstrap 95% confidence interval for Indirect effect 3 via the path home–school accessibility → inter-school cultural co-construction → management collaboration → resource sharing (−0.228) did not contain zero, indicating that this serial mediation effect was also significant.

Table 3. Mediation Effect Analysis of Inter-school Cultural Co-construction and Management Collaboration

Mediation Path	Effect	95% Confidence Interval	
		Boot LLCI	Boot ULCI
KDX→WHGX→ZYGX	-0.035	-0.17	0.12
KDX→WHGX→GLHT→ZYGX	-0.228**	-0.387	-0.082
KDX→GLHT→ZYGX	-0.263**	-0.434	-0.088

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5. Discussion and Recommendations

5.1 Discussion and Conclusions

5.1.1 Self-rated Scores of Rural Small-scale Kindergartens (Preschool Sites) across All Dimensions Were at an Above-average Level but Did Not Reach the "Highly Consistent" Threshold

The results indicated that the scores of rural small-scale kindergartens (preschool sites) in Sichuan across the four dimensions ranged from 4.054 to 4.120, placing them at an overall above-average level; however, none of the dimensions exceeded 4.20, and thus had not yet reached the "highly consistent" level. This finding is consistent with the research results of Wu et al. (2022) [45] and Liu and Bao (2023) [46], and confirms the above judgment from the perspective of self-reported perceptions. Although rural small-scale kindergartens (preschool sites) have already established a certain foundation for resource co-construction and sharing, there remains a considerable gap between the current situation and the developmental goals of safe, high-quality, universal, and inclusive preschool education. It is noteworthy that the highest-scoring dimension was human resource sharing ($M = 4.120$), while the lowest-scoring dimension was material resource sharing ($M = 4.054$). This ranking suggests that, in promoting cluster development, the cross-kindergarten circulation of material resources may be the most urgent shortfall that needs to be addressed as a priority.

5.1.2 Home–school Accessibility Is the Primary Factor Constraining the Cluster Development of Rural Small-scale Kindergartens (Preschool Sites)

Rural small-scale kindergartens (preschool sites) scored lowest on the dimension of home–school accessibility, with the largest gap compared to kindergartens of other sizes. This corresponds to the practical challenges faced by rural children, including longer travel distances to kindergartens and difficulties in commuting between home and school. Correlation analysis further revealed that home–school accessibility was significantly and positively correlated with resource sharing ($r = 0.778$, $p < .01$), management collaboration ($r = 0.680$, $p < .01$), and inter-school cultural co-construction ($r = 0.843$, $p < .01$). Moreover, the predictive effect of home–school accessibility on resource sharing remained significant in the serial mediation model ($\beta = 0.302$, $p < .001$). These findings underscore the foundational role of home–school accessibility in cluster development. If the physical distance between kindergartens is too great and transportation conditions are inconvenient, even with the willingness and institutional arrangements for resource sharing, actual resource flows will be difficult to sustain due to prohibitively high transportation and time costs. Drawing on international experience, rural small-scale schools in Lincolnshire, England, adopted a "cluster cooperation" development model, which overcomes the barriers posed by geographic dispersion through the formation of clusters of neighbouring schools [47]. A critical prerequisite for their success was the rational control of the cluster's spatial radius, ensuring that the physical distance between schools remained within an acceptable range. This indicates that optimising the spatial layout of cluster networks and improving home–school accessibility are preconditions for promoting resource sharing, rather than merely auxiliary measures.

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5.1.3 Inter-school Cultural Co-construction and Management Collaboration Played a Significant Serial Mediating Role in the Process through Which Home–school Accessibility Affects Resource Sharing

When home–school accessibility influenced resource sharing through inter-school cultural co-construction and management collaboration, the indirect effect of the serial mediation pathway exhibited a negative value. This seemingly contradictory result may reflect two distinct mechanisms at work. First, in rural areas where home–school accessibility is poor, kindergartens may actually develop stronger cooperative motivations due to the shared experience of being "isolated and without support", thereby promoting resource sharing through the channels of inter-school cultural co-construction and management collaboration. Second, kindergartens with better home–school accessibility may possess superior conditions for resource sharing; however, in the absence of cultural identification and management coordination, resource sharing may remain at a superficial level. In contrast, deeper and more institutionalised resource sharing tends to occur more readily among kindergartens that have undergone more cooperative. This suggests that in promoting cluster development, it cannot be simplistically assumed that closer proximity between kindergartens will necessarily lead to better sharing outcomes. Instead, greater attention should be paid to the bridging role that inter-school cultural co-construction and management collaboration play in resource sharing. At the practical level, the exploration of Qianma Kindergarten in Liyang City, Jiangsu Province, provides a useful reference. Through a "multi-directional alliance" approach, the kindergarten established "urban–rural paired kindergartens" with high-quality urban kindergartens on the one hand, while on the other hand forming a development consortium with rural small-scale kindergartens across the city. Through bidirectional flow pathways including teacher exchange, resource sharing, material sharing, children's visits, job rotation experiences, and integrated teaching research, the kindergarten achieved a transformation from "blood transfusion" to "blood production" [48]. This illustrates that cultural co-construction and management collaboration do not form spontaneously but require continuous cultivation through institutionalised cooperative mechanisms.

5.1.4 Rural Small-scale Kindergartens (Preschool Sites) Exhibited Greater Internal Consistency in Human Resource Sharing Compared to Kindergartens of Other Sizes

The standard deviation for human resource sharing among rural small-scale kindergartens (preschool sites) (SD = 0.925) was lower than that of other kindergartens (SD = 0.946), indicating relatively smaller internal variation in human resource sharing. Similarly, in terms of curriculum resource sharing, the standard deviation for rural small-scale kindergartens (preschool sites) (SD = 0.931) was also lower than that of other kindergartens (SD = 1.022), a difference of 0.091. These results indicate that although the overall level of human resource and curriculum resource sharing among rural small-scale kindergartens (preschool sites) was relatively low, the disparities between individual kindergartens were not substantial, presenting a state of low-level equilibrium. On the one hand, this can be attributed to the common predicament faced by rural small-scale kindergartens, namely weak teaching staff and small numbers of teachers. This "homogeneous predicament" results in similar starting points and conditions for human resource sharing across kindergartens. On the other hand, it also reflects that current explorations of human resource sharing in rural small-scale kindergartens are still in their infancy, with no apparent "leading" effect having yet emerged. In contrast, kindergartens of other sizes exhibited larger standard deviations in human resource and curriculum resource sharing, suggesting

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more pronounced polarisation. Therefore, in promoting the cluster development of rural small-scale kindergartens, it is advisable to capitalise on the advantage of their relatively high internal consistency by adopting a phased approach of pilot implementation followed by wider rollout, so as to avoid a series of problems that could arise from excessive internal disparities.

5.1.5 Management Collaboration Exerted the Strongest Direct Predictive Effect on Resource Sharing and Served as a Mediator Connecting Home–school Accessibility, Inter-school Cultural Co-construction, and Resource Sharing

Regression analysis revealed that the standardised regression coefficient of management collaboration on resource sharing was $\beta = 0.599$ ($p < .001$), which was the largest among the three predictors and substantially higher than the direct effect of inter-school cultural co-construction on resource sharing ($\beta = 0.09$, $p > .05$, not significant). This indicates that, in the process of promoting resource sharing, institutionalised management collaboration mechanisms are more critical than cultural-level identification. Even if kindergartens lack deep cultural consensus, resource sharing can still proceed in an orderly manner as long as effective management coordination mechanisms are established. This finding is consistent with the conclusions of Zhao and Fan (2022) regarding the cluster development model of rural small-scale schools in the UK, where small schools achieved management innovation through regular management meetings, joint planning, information sharing, and other means, and created clusters and optimised management strategies according to local conditions [33]. Wang (2025) also confirmed this through empirical research on the practices in Tongren City [24]. This suggests that the essence of management collaboration lies not in unifying every detail, but in establishing an institutional framework that provides clear guidelines for all kindergartens to follow.

5.2 Recommendations

5.2.1 Promoting the Equal Development of Small-scale Kindergartens within Clusters through the Concept of Resource Sharing and Establishing Positive Cooperative Relationships

In the process of promoting the universal and inclusive development of preschool education, county-level governments should adhere to the concept of resource sharing. Through various measures such as constructing integrated school district systems, jointly utilising funding among kindergartens (preschool sites), procuring facilities and equipment, and facilitating teacher exchanges, governments can promote the high-quality and balanced development of kindergartens (preschool sites) of different sizes. Particularly in the realm of early childhood care and education activities, neighbouring kindergartens (preschool sites) should strive to explore unified curriculum standards, teaching research activities, and personnel management; promote collective teacher lesson planning and preparation, coordinate class scheduling, implement visiting teaching for specialised subjects such as arts and physical education, and establish corresponding policy support mechanisms. In comparison with international practices, Russia, in promoting the development of small-scale kindergartens in rural areas, has implemented a joint development model for rural kindergartens. Under this model, participating small-scale kindergartens "share material and technical resources while also exchanging experiences in kindergarten development, sharing teacher training programmes and child development plans,

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thereby achieving a state of mutual independence and mutual assistance among rural preschool institutions" [51].

5.2.2 Establishing a Cluster Kindergarten Management Mechanism with Multi-stakeholder Participation

First, county-level governments should take the lead in formulating regional management systems for the cluster development of small-scale kindergartens (preschool sites) in accordance with the requirements for high-quality and inclusive preschool development. These systems should specifically include: overall development goals, cluster kindergarten (preschool site) management structures and responsibility definitions, and supporting policy frameworks, thereby providing institutional safeguards for coordinating the development of cluster kindergartens (preschool sites). In response to the issue of prominent disadvantages at both ends of the "inverted U-shaped" distribution of inter-school management collaboration, institutional design should pay particular attention to the differentiated needs of two extremes: ultra-small-scale sites suffering from insufficient management staffing, and ultra-large-scale sites facing complex administrative hierarchies. For ultra-small-scale sites, the focus should be on "establishing rules and regulations and standardising management"; for ultra-large-scale sites, the focus should be on "streamlining hierarchies and stimulating motivation".

Second, a management body with clearly defined authority and responsibilities should be established to ensure professional management of cluster kindergartens (preschool sites). On the one hand, county-level relevant departments should form cluster management units composed of educational supervisors, consulting experts, and principals of hub cluster kindergartens (preschool sites). The functions of these units should include organising and coordinating cooperative development among cluster kindergartens (preschool sites) within the county, and providing corresponding supervisory and evaluation services. On the other hand, a management centre should be established within the cluster under the overall leadership of the hub kindergarten principal, comprising principals and childcare management personnel from all participating kindergartens (preschool sites). The functions of this centre should encompass specific affairs including kindergarten (preschool site) management, curriculum and teaching reform, childcare quality monitoring, and resource allocation.

Third, teachers from all kindergartens (preschool sites) within the cluster should be encouraged to form various professional teaching development committees, such as subject teaching committees, play activity committees, and physical education committees. Professional teachers should participate substantively in curriculum development, childcare method reform, teaching supervision, and childcare quality monitoring within their respective domains. This approach enables teachers to leverage their professional strengths and integrate their perspectives and experiences into management, thereby maximising teacher motivation. Empirical data indicate that the mean difference for human resource sharing is 8.418, underscoring the important role that rational allocation and mobility of teacher resources play in cluster development. Through participation in the construction of professional committees, teachers can transcend the physical boundaries of individual kindergartens and achieve professional growth on a broader platform.

Fourth, communities, residents, and parents of young children have strong demands for high-quality preschool education. Therefore, cluster kindergartens (preschool sites) should actively involve local community

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leaders, retired teachers, village officials, artisans, new-type professional farmers, and parent representatives in cluster management decision-making. Community forces should also be mobilised to provide necessary operational resources for cluster development. Community and parent participation in management decision-making helps ensure that preschooler and parent needs are adequately reflected in layout adjustments and resource-sharing programme designs, preventing decisions from becoming disconnected from grassroots realities.

Fifth, non-profit organisations can also serve as important supporters of cluster development. Many non-profit organisations possess advanced concepts and professional standards in educational management and have the capacity to mobilise social resources. Where conditions permit, regions should actively engage with non-profit organisations to introduce various resources and innovative solutions for improving the quality of kindergarten (preschool site) care and education. For example, the "One Village, One Kindergarten: Village Kindergarten Programme" initiated by the China Development Research Foundation [52] has achieved positive outcomes over more than a decade of implementation in terms of beneficiary coverage, cost-effectiveness, educational outcomes, and social impact [53].

5.2.3 Strengthening Multi-level Government Responsibilities to Provide Resource Support for Kindergarten Cluster Development

First, the funding required for small-scale kindergarten (preschool site) clusters should, on the basis of ensuring that each kindergarten (preschool site) receives its full allocation of public funds, emphasise the coordinating responsibility of provincial-level governments, with the central government providing subsidies through special transfer payments. Under the current institutional framework, it is necessary to establish a provincial-level coordinated preschool education funding guarantee mechanism, increase provincial government responsibility, determine the cost-sharing responsibilities of governments below the provincial level, implement centrally-arranged transfer payments and local government investment at all levels, and increase fiscal transfer payments from provincial and higher levels of government to preschool education in rural areas, particularly underdeveloped regions. County-level governments should allocate special funds to promote the orderly sharing of high-quality educational resources among schools [54]. At the same time, local governments should rationalise the management relationship between central schools and township schools, grant financial independence to small-scale schools to ensure they equitably obtain sufficient operational funding and maintain equal status in inter-school resource sharing. In terms of professional management, the coordinating, radiating, and guiding functions of township central schools should be strengthened, promoting integrated schooling, collaborative development, and comprehensive evaluation between township central schools and schools within the same township [55].

Second, infrastructure for hub cluster kindergartens used for resource sharing and teaching operational equipment should be respectively the responsibility of provincial and county-level governments. Provincial governments should bear primary responsibility for large-scale construction and procurement projects such as building construction, play activity areas, teacher housing, and canteens. County-level governments should bear responsibility for teaching equipment such as printers and copiers, telephones, computers, sports equipment, library materials, and teaching aids and toys. Additionally, rural roads, transportation conditions, and transport vehicles required for visiting teachers should also fall within the purview of county-level govern-

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ment responsibility. Therefore, county-level governments should establish county-level preschool education material allocation platforms, with priority given to guaranteeing basic operating conditions for ultra-small-scale sites, while simultaneously promoting the transfer of surplus material resources from township central kindergartens and medium-scale kindergartens to weaker sites. Notably, against the backdrop of digital transformation in China's education development, to achieve leapfrog development in rural preschool education, it is necessary to transform development approaches and make full use of information technology, particularly through the innovative application of a new generation of information technology represented by artificial intelligence. This will promote the digital transformation of small-scale kindergartens (preschool sites) and enable cluster of small-scale kindergartens (preschool sites) to make full use of digital educational resources in resource sharing, thereby improving the efficiency of resource sharing.

Third, in terms of human resources, the allocation of department heads, office secretaries, and related teaching support staff at hub cluster kindergartens should be increased to facilitate efficient communication among cluster kindergartens (preschool sites) and enable the hub to fully understand and respond promptly to the needs of all participating kindergartens (preschool sites). In cluster development, high-quality teacher resources are the key. Skills training for various groups including administrators, teachers, and childcare staff should be strengthened, with particular emphasis on improving competencies in cooperative management for administrative personnel, collaborative teaching for teachers, and AI technology application. This will enable them to adapt to evolving care and education development needs and promote quality improvement in small-scale kindergartens (preschool sites). At the same time, comprehensive mechanisms for teacher recruitment and retention in rural small-scale kindergartens should be established and improved. Teachers serving in ultra-small-scale sites should be given policy preferences in professional title evaluation and appointment, awards and recognition, and training and further education, so as to effectively enhance the attractiveness and stability of teaching positions in rural kindergartens.

5.2.4 Introducing Scientific Technologies and Procedures to Optimise the Cluster Network of Small-scale Kindergartens

First, consideration should be given to introducing GIS technology to conduct comprehensive design of small-scale kindergarten (preschool site) cluster networks, taking into account multiple indicators including regional population distribution, administrative divisions, natural geographical environment, kindergarten (preschool site) service areas, and resource carrying capacity. Taking the example of preschool-age population changes, the number of children enrolling in kindergartens in some rural areas may fluctuate due to population return migration or the effects of fertility policies. Therefore, the planning of small-scale kindergarten (preschool site) layouts must adhere to dynamic principles, be based on objective preschool-age population changes, and undertake scientific planning rather than making simplistic decisions based solely on the scale of kindergartens (preschool sites) over the past 1–2 years.

Second, public hearings should be convened involving county and township-level educational administrators, kindergarten (preschool site) administrators, teaching staff, parents of young children, and villagers. Detailed plans and policy impacts of the small-scale kindergarten (preschool site) cluster network should be communicated, and opinions from all stakeholder groups should be fully solicited. Empirical analysis of home–school accessibility indicates that ultra-small-scale sites significantly lag behind in terms of children's

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travel time and spatial distance to kindergartens, with a notably higher proportion of parents expressing subjective dissatisfaction regarding "inconvenient access to kindergartens" compared to other size groups. Therefore, during the layout planning hearing process, particular attention should be paid to parents' concerns regarding children's commuting burdens, avoiding decision-making logic based solely on administrative efficiency.

Third, an evaluation indicator system should be established at both macro and micro levels. Macro-level indicators should include preschool-age population changes, geographical environment, transportation conditions, and educational condition guarantee capacity. Micro-level indicators should include the operational costs of each cluster kindergarten (preschool site), child development levels, preschooler retention rates, kindergarten (preschool site) adaptability, and economic burden on families. Each indicator should be assigned specific scores and requirements to monitor the rationality of small-scale kindergarten (preschool site) layout and cluster network planning.

5.2.5 Grounded in the Context of the Rural Revitalisation Strategy, Promoting High-quality Interaction between Small-scale Kindergartens and Rural Communities to Provide Impetus for Cluster Development

First, the basic principles of cluster development should be upheld. Specifically: (1) The principle of systematicity should be followed, taking into account both internal and external educational factors, with attention to effective linkage between national strategy and regional development, close connection between top-level design and grassroots practice, and coordination and unity between long-term goals and stage-specific objectives. (2) The principle of coherence should be followed, maintaining the overall stability of existing poverty alleviation through education policies, ensuring policy continuity during the transition period, both extending and optimising existing good policies and constructing coordinated supply of universal and special policies to meet the development needs of different regions at different stages of development. (3) The principle of appropriateness should be followed, emphasising adaptation to local conditions, meeting genuine local needs, following the resource allocation logic of universal and inclusive preschool education, and conducting educational planning according to local development realities and characteristics to promote the cluster-based joint development of rural small-scale kindergartens (preschool sites).

Second, the educational main front role of rural kindergartens (preschool sites) should be fully leveraged, and a monitoring and parenting intervention system for early childhood development in rural areas should be established. Attention should be paid to the comprehensive development of rural children in moral, intellectual, physical, aesthetic, and labour education, as well as the personality development needs of rural sentiments and values such as survival confidence. Special support should be provided for children from disadvantaged groups whose development is relatively lagging.

Third, educational resources from kindergartens (preschool sites), families, and society should be integrated to construct a "trinity" educational cooperation model. On the one hand, the "home-kindergarten cooperation" mechanism should be improved, establishing family education training platforms through modern information technology, and promoting parental participation in, supervision of, and management of major kindergarten (preschool site) affairs through parent committees, parent open days, and home-kindergarten contact

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cards. On the other hand, the role of community organisations should be leveraged, integrating kindergarten (preschool site) education socialisation with community civilisation development, utilising the community as an off-campus educational base for social services, artistic activities, local culture instruction, public welfare labour, social practice, and other activities to achieve resource sharing. Multiple interviewees expressed concern about the issue of home-kindergarten co-education.

Finally, a "family–kindergarten (preschool site)–society" educational community should be constructed. Esser's concentric circle theory posits that children's living environment is composed of three concentric circles: family, kindergarten (preschool site), and community. The universal and inclusive development of preschool education and the comprehensive development of children are influenced by multiple factors including kindergartens (preschool sites), families, and society. To a certain extent, the role of family education may even be greater than that of kindergartens (preschool sites). Compensating for the deficiencies and inadequacies of rural family education, revitalising family education, forming educational synergy among rural families, kindergartens (preschool sites), and society, and constructing a "family–kindergarten (preschool site)–society" educational community are powerful measures for the current universal and inclusive development of rural preschool education. First, through social work intervention, family cognition and educational values should be transformed. On the one hand, parents should be made aware that education is not only the task of kindergarten (preschool site) teachers but also the responsibility of the family. They should correctly recognise that the most effective family education is parental involvement and companionship, and improve the level of effective parental participation in family education. On the other hand, parents should be helped to correctly position rural preschool education and urban preschool education, dispelling excessive admiration for urban preschool education, and recognising the advantages of rural kindergartens (preschool sites) in terms of attention to children, duration of care and education, and thoroughness of individualised guidance, thereby encouraging parents to recognise and be willing to send their children to rural kindergartens (preschool sites).

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