

A Conceptual Model of Secondary School Location Management for Urban–Rural Integration in Northeast China

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Abstract

Demographic decline, population mobility, spatial inequality, school consolidation, and uneven educational accessibility complicate secondary school location management, particularly in regions undergoing urban–rural transformation. Previous studies have treated school allocation, spatial accessibility, demographic change, and educational governance as separate issues and therefore explain little about how these conditions become coordinated location decisions. This study develops a conceptual framework that explains how policy capacity, social and demographic conditions, and spatial accessibility interact with management processes to shape secondary school location decisions under urban–rural integration in Northeast China. The framework draws on an integrative synthesis of 24 substantive studies on school location, educational planning, spatial accessibility, school consolidation, demographic change, educational equity, and educational governance. The synthesis identified three determinant dimensions and linked them to four management functions: planning, organizing, implementation, and supervision. Policy capacity and spatial accessibility shape the effectiveness of location planning. Social and demographic conditions modify planning needs through population distribution, migration, student distribution, and educational demand. Organizing, implementation, and supervision translate planning decisions into service provision, while urban–rural integration acts as a contextual moderator. The model connects these processes to three intended outcomes: access, equity, and efficiency. The framework links spatial school-location research with the managerial processes that turn demographic, accessibility, and policy evidence into adaptive location decisions. It remains conceptual and has not been empirically validated. Future research should operationalize its constructs and test the proposed relationships with integrated spatial, demographic, and management data across contrasting urban–rural contexts.

Keywords: School Consolidation; Educational Equity; Demographic Decline; Public Policy and Governance; Urban–Rural Integration

Introduction

Rural–urban educational inequality in China is as much a spatial problem as a distributional one. Xiang and Stillwell¹ mapped rural–urban educational inequalities across China and found that gaps in access and provision vary systematically by location, not only by household or school characteristics. Li, reached a similar conclusion for secondary education, reporting persistent rural–urban differences in the inputs and opportunities available to junior high school students.² Where a school sits, therefore, shapes who can reach it, and the geography of provision becomes a mechanism of inequality in its own right.

This spatial mechanism becomes acute where the school-age population is both shrinking and relocating. Northeast China, comprising Liaoning, Jilin, and Heilongjiang, has recorded sustained net out-migration, and Jiang identified the loss of younger, working-age residents as a defining feature of the region's demographic decline.³ As families leave, the students who remain no longer fit the network of schools built for an earlier, larger population. Sun et al.,⁴ documented this supply–demand divergence for school land in China, showing that the mismatch between school capacity and shifting demand is a recognized structural pattern rather than a regional peculiarity. Northeast China is where the mismatch is most advanced.

Authorities respond to the mismatch by consolidating schools, closing or merging under-enrolled institutions, and concentrating provision in fewer, larger sites. Consolidation is the point at which spatial inequality is either produced or contained. Li and Gao found that the extent of rural school consolidation was associated with differences in rural students' progression to high school,⁵ and Hannum, Liu, and Wang showed that China's rural school-closure initiative reorganized access at the system level, not only at the level of individual buildings.⁶ These consequences follow from a decision, and the decision is a governance act rather than a technical calculation. Aasland and Søholt examined contested rural closures in Norway and asked whether

¹ Lu Xiang and John Stillwell, "Rural-Urban Educational Inequalities and Their Spatial Variations in China," *Applied Spatial Analysis and Policy* 16, no. 2 (2023): 873–96, <https://doi.org/10.1007/s12061-023-09506-1>.

² Jian Li, "Who Decided College Access in Chinese Secondary Education? Rural-Urban Inequality of Basic Education in Contemporary China," *Universal Journal of Educational Research* 4, no. 10 (2016): 2380–93, <https://doi.org/10.13189/ujer.2016.041018>.

³ Yu Jiang, "Population Migration and Brain Drain in Northeast China," *China Population and Development Studies* 1, no. 2 (2017): 71–80, <https://doi.org/10.1007/bf03500925>.

⁴ Wenwen Sun et al., "Spatial Mismatch Analyses of School Land in China Using a Spatial Statistical Approach," *Land Use Policy* 108 (2021): 105543, <https://doi.org/10.1016/j.landusepol.2021.105543>.

⁵ Yu Li and Bo Gao, "Does School Consolidation in Rural Areas Affect Students' Education? Empirical Evidence From China," *European Journal of Education* 59, no. 4 (2024): e12790, <https://doi.org/10.1111/ejed.12790>.

⁶ Emily Hannum, Xiaoying Liu, and Fan Wang, "Estimating the Effects of Educational System Consolidation: The Case of China's Rural School Closure Initiative," *Economic Development and Cultural Change* 70, no. 1 (2021): 485–528, <https://doi.org/10.1086/711654>.

local administrations, despite formal autonomy over school structure, act as agents of centralization.⁷ Kim, Kim, and Jeon built a closure-prioritization model for shrinking regions that explicitly treats educational accessibility as a decision criterion.⁸ On this evidence, consolidation is a distributive choice made under institutional constraint, and its outcomes depend on how that choice is planned, justified, and carried out.

One line of research addresses where schools should be located to serve a given population. Gao et al.⁹ measured spatial accessibility to primary and secondary schools across China and found uneven access between and within regions, and Han et al. developed an evaluation–optimization–validation procedure that repositions rural schools to widen service coverage.¹⁰ This work answers a precise question: given current demand, which locations maximize reachability? It does not address how an education authority moves from that answer to a funded, implemented, and monitored school network.

Linking spatial reorganization to institutional decision-making is not new. Under School Mapping Restructure, an approach with roots in the UNESCO-IIEP school-mapping tradition, Zhao and Parolin analyzed how rural closures and mergers in China changed the role of the small rural school,¹¹ and later showed that families' actual school preferences diverged from the efficiency logic used to justify restructuring. This tradition already connects the geography of provision to the institutions that redraw it.¹² What it leaves underspecified is the internal sequence by which a restructuring decision is executed once accessibility evidence exists: how responsibilities are assigned, resources are committed, and outcomes are checked. The present study takes up that sequence rather than claiming to discover the spatial–institutional link for the first time.

⁷ Aadne Aasland and Susanne Søholt, “Agents of Centralization? Local School Administrations and Contested School Closures in Norwegian Rural Districts,” *Journal of Rural Studies* 80 (2020): 595–605, <https://doi.org/10.1016/j.jrurstud.2020.09.008>.

⁸ Solhee Kim, Taegon Kim, and Jeongbae Jeon, “Optimal Prioritization Model for School Closure Decisions Considering Educational Accessibility in Shrinking Regions,” *Sustainability* 17, no. 9 (2025): 4057, <https://doi.org/10.3390/su17094057>.

⁹ Yuan Gao et al., “Imbalance in Spatial Accessibility to Primary and Secondary Schools in China: Guidance for Education Sustainability,” *Sustainability (Switzerland)* 8, no. 12 (2016), <https://doi.org/10.3390/su8121236>.

¹⁰ Z Han et al., “Improving Educational Equity by Maximizing Service Coverage in Rural Changyuan, China: An Evaluation-Optimization-Validation Framework Based on Spatial Accessibility to Schools,” *Applied Geography* 152 (2023): 102891, <https://doi.org/10.1016/j.apgeog.2023.102891>.

¹¹ Dan Zhao and Bruno Parolin, “School Mapping Restructure in China: What Role for the Small Rural School?,” *Frontiers of Education in China* 6, no. 2 (2011): 248–78, <https://doi.org/10.1007/s11516-011-0131-5>.

¹² Dan Zhao and Bruno Parolin, “Merged or Unmerged School? School Preferences in the Context of School Mapping Restructure in Rural China,” *Asia-Pacific Education Researcher* 23 (2014): 547–63, <https://doi.org/10.1007/s40299-013-0129-2>.

Naming that institutional dimension precisely matters because it carries an established meaning that the school-location literature rarely uses. In the foundational public-policy formulation, policy capacity comprises analytical, operational, and political competencies realized at the individual, organizational, and systemic levels;¹³ Applied specifically to public services, this translates into the ability to produce and use evidence, to coordinate resources and implementation, and to secure legitimacy for a decision.¹⁴ The operative distinction for school siting is between holding a policy and holding the capacity to enact it. Yan, Sano, and Sumiya¹⁵ found that education-system reforms in decentralized settings stalled less from the absence of policy than from weak capacity to convert policy into coordinated action across government levels, and Saguin and Ramesh showed that decentralized education reform depended on the capacity existing at the tier to which authority was devolved.¹⁶ Northeast China's problem is of this type. Identifying an optimal school location is an analytical task; sustaining that location across fiscally strained and administratively separate county governments is a managerial and political one.

Educational demand is not fixed by the resident population either. Wang and Yuan documented rural families relocating, sometimes temporarily, to enroll their children in urban schools, showing that where families seek schooling reflects preference and mobility rather than residence alone.¹⁷ For siting decisions, the resident count understates and mislocates real demand. A location optimized for today's registered students may serve a different population within a few years, or may lose those students to continued out-migration.

These strands answer different questions and rarely speak to one another. Spatial-optimization studies ask where schools should be located to maximize coverage; consolidation and closure studies ask who gains or loses when the network contracts; policy-capacity research asks whether an authority can implement its decisions. Each is necessary. None specifies the management process that converts spatial evidence, demographic projection, and policy priority

¹³ Xun Wu, M Ramesh, and Michael Howlett, "Policy Capacity: A Conceptual Framework for Understanding Policy Competences and Capabilities," *Policy and Society* 34, no. 3–4 (2015): 165–71, <https://doi.org/10.1016/j.polsoc.2015.09.001>.

¹⁴ Kwangseon Hwang and Hyunseok Hwang, "Enhancing Policy Capacity in South Korea: Integrating Analytical, Managerial, and Political Dimensions for Effective Governance," *Cogent Social Sciences* 11, no. 1 (2025): 2447394, <https://doi.org/10.1080/23311886.2024.2447394>.

¹⁵ Yifei Yan, Hironobu Sano, and Lilia Asuca Sumiya, "Policy Capacity Matters for Education System Reforms: A Comparative Study of Two Brazilian States," *Journal of Comparative Policy Analysis: Research and Practice* 25, no. 2 (2023): 253–81, <https://doi.org/10.1080/13876988.2022.2110472>.

¹⁶ Kidjie Ian Saguin and M Ramesh, "Policy Capacity Under Decentralization: Kindergarten Education Reforms in the Philippines," *Public Administration and Development* 46 (2026): 135–49, <https://doi.org/10.1002/pad.2086>.

¹⁷ Dan Wang and Yuan Teng, "Educational Migration and Rural Decline in China," *The China Journal*, no. 88 (2022): 100–125, <https://doi.org/10.1086/719473>.

into a school-location decision that can be organized, implemented, and supervised over time. That missing process, not any single determinant, is the gap this study addresses.

Northeast China concentrates all three pressures at once: depopulation that destabilizes demand, consolidation that is already reshaping the network, and county-level administration that must implement decisions with limited fiscal room. This makes it a demanding case for any account of how school-location decisions should be managed. Accordingly, this study addresses two questions. First, what dimensions and factors should inform the management of secondary school locations under urban–rural integration in Northeast China? Second, how can these dimensions be integrated into a conceptual model of secondary school location management for the region?

The study proposes a conceptual model of secondary school location management for urban–rural integration in Northeast China. The model links three determinant dimensions, policy capacity, social and demographic conditions, and spatial accessibility, to four management functions: planning, organizing, implementation, and supervision. As a conceptual contribution, it does not test causal relationships; it synthesizes theoretical and empirical literature into a model that explains how the determinants of school location enter the management process. Consistent with the school-mapping and policy-capacity work reviewed above, the model does not present these dimensions as discoveries. Its contribution is to specify how they operate together as a managed sequence, providing future empirical research with a defined structure for testing under conditions of demographic decline and urban–rural transformation.

Research Methods

This study employs an integrative literature review to develop a conceptual model of secondary school location management within urban–rural integration in Northeast China. An integrative review is appropriate because it synthesizes evidence from studies using diverse methods and generates new conceptual insights from the existing literature.¹⁸ The process of organizing, interpreting, and integrating concepts drawn from multidisciplinary literature follows Jabareen's approach to conceptual framework building,¹⁹ which conceptualizes framework development as a process of theorization by identifying and integrating interconnected concepts. The study does not collect primary data or test statistical relationships. Instead, it systematically identifies, compares, and integrates concepts and findings concerning school location, spatial

¹⁸ Robin Whitemore and Kathleen Knafl, “The Integrative Review: Updated Methodology,” *Journal of Advanced Nursing* 52, no. 5 (2005): 546–53, <https://doi.org/10.1111/j.1365-2648.2005.03621.x>; Hannah Snyder, “Literature Review as a Research Methodology: An Overview and Guidelines,” *Journal of Business Research* 104 (2019): 333–39.

¹⁹ Yosef Jabareen, “Building a Conceptual Framework: Philosophy, Definitions, and Procedure,” *International Journal of Qualitative Methods* 8, no. 4 (2009): 49–62, <https://doi.org/10.1177/160940690900800406>.

accessibility, demographic change, educational equity, school consolidation, educational planning, and policy capacity to construct a conceptual model applicable to the context of Northeast China.

The reasoning is abductive. The three guiding theoretical perspectives supply initial conceptual orientations, while evidence extracted from the reviewed studies confirms, refines, differentiates, or revises those orientations. The final model, therefore, emerges from iterative movement between theory and evidence rather than from a purely deductive or inductive route. Four stages structured the review: literature identification and selection, structured data extraction, integrative synthesis, and conceptual model development. The review carried out these stages in a repeated cycle, comparing concepts identified in the literature against the theoretical perspectives and refining them during synthesis.

This review searched Scopus as the primary bibliographic database on 19 August 2026. Scopus was selected for its broad coverage of peer-reviewed journals across education, geography, planning, and public policy — the disciplines that intersect in school-location research. The search covered English-language, peer-reviewed publications from 2005 to 2026. The search was international in scope because school location, spatial accessibility, school consolidation, demographic change, and educational equity have been examined across diverse national contexts. Studies from China, and particularly from Northeast China, received greater interpretive weight during synthesis because the resulting model targets that region.

Search terms were derived from the core concepts of the research problem and combined using the Boolean operators AND and OR. Rather than relying on a single search string, the search was organized into eight thematic query blocks to capture the problem's multidisciplinary dimensions: review methodology; policy capacity and governance; rural and urban–rural education policy; migration and demographic change; school mapping and educational planning; spatial accessibility to facilities; educational equity in secondary education; and school consolidation and closure. The principal keywords included "secondary school," "school location," "school location planning," "educational management," "educational planning," "spatial accessibility," "school consolidation," "school closure," "demographic change," "urban–rural integration," and "urban–rural development." A representative search block combined the terms as: ("secondary school" OR "school location" OR "school location planning") AND ("educational management" OR "educational planning") AND ("spatial accessibility" OR "school consolidation" OR "school closure") AND ("urban–rural integration" OR "urban–rural development" OR "demographic change").

A study was eligible if it was a peer-reviewed publication published between 2005 and 2026, written in English, and addressed at least one of the following: school location, educational

planning or management, spatial accessibility, school consolidation or closure, demographic change, educational equity, educational policy, or urban–rural educational development. Each included study also had to provide theoretical, conceptual, empirical, or spatial evidence relevant to the management, planning, accessibility, or spatial distribution of educational facilities. A study was excluded if it fell outside the research problem, provided insufficient information for meaningful synthesis, could not inform the conceptual model, was not peer-reviewed, or duplicated another record.

Two boundary rules governed borderline cases. Geography was not treated as an absolute filter: international studies were retained when the mechanisms examined were transferable to school-location management, including accessibility measurement, facility distribution, and population–facility relationships. Education level was likewise not treated as an absolute filter. Studies of primary or basic education were retained only when the mechanism under examination was transferable to school-location management, and their findings were not interpreted as direct evidence of secondary-specific effects unless the original study explicitly examined secondary education.

The eight queries returned 445 bibliographic records. After removing 15 duplicate records identified by duplicate DOIs or overlapping titles across the queries, 430 unique records remained for title and abstract screening. Records were screened against the predefined eligibility criteria, and 350 were excluded at this stage for being unrelated to the demographic, spatial, institutional, or structural determinants of school-location change. The largest excluded subset originated from the school-closure query and comprised pandemic-era studies focused primarily on temporary COVID-19 school closures and remote learning. These studies addressed epidemic response rather than the demographic and spatial restructuring of school networks and were therefore excluded. The remaining 80 records underwent full-text assessment against the predefined eligibility and relevance criteria. Of these, 56 were excluded at the full-text stage because they did not provide sufficient conceptual, empirical, spatial, or policy evidence relevant to the proposed model or otherwise failed to meet the eligibility criteria. The final substantive corpus, therefore, comprised 24 studies, which are synthesized in Table 1. The complete selection process is reported in a PRISMA 2020 flow diagram. Methodological sources and publications used to define the guiding analytical constructs were cited separately and were not counted as part of the substantive corpus.

Following study selection, data were extracted systematically from each included study. The extraction focused on study context and population, educational level, geographic setting, research design, principal concepts or variables, analytical approach, and findings relevant to school location, spatial accessibility, demographic change, educational equity, school

consolidation, educational planning, and policy capacity. Particular attention was given to the mechanisms through which demographic, spatial, institutional, and policy conditions influenced the location, distribution, accessibility, or restructuring of schools. This structured extraction enabled comparison across studies with different methodological designs and disciplinary orientations while preserving the contextual conditions under which their findings were produced.

The extracted evidence was then integrated through an iterative abductive synthesis. Studies were compared across recurring mechanisms, contextual conditions, and management implications rather than statistically aggregated. Evidence was first organized around the principal constructs identified in the research problem and the three guiding theoretical perspectives. The analysis then examined convergences, divergences, and boundary conditions across studies, with particular attention to the interactions among population change, spatial accessibility, educational equity, school consolidation, planning capacity, and governance. Findings from international studies and studies outside secondary education were used as transferable mechanism-level evidence only when they satisfied the boundary rules described above. Evidence from China, and from Northeast China where available, received greater interpretive weight when assessing the contextual relevance of the emerging model.

The final stage involved conceptual model development. The model was constructed by integrating mechanisms consistently supported by the reviewed evidence and distinguishing direct empirical findings from higher-order conceptual inferences. An iterative comparison between the extracted evidence and the three guiding theoretical perspectives was used to identify relationships that were supported, modified, differentiated, or not sufficiently supported by the literature. The resulting framework therefore represents a conceptually derived model of secondary school location management within urban–rural integration, grounded in the reviewed literature while recognizing the contextual specificity of Northeast China. The model is intended as a conceptual framework for organizing relationships among demographic change, spatial accessibility, educational equity, school-network restructuring, planning capacity, and governance rather than as a statistically tested causal model.

The corpus spans quantitative, spatial, policy, and conceptual studies, so no single appraisal instrument fits all designs. Appraisal, therefore, used four criteria applied across designs: clarity of research purpose, transparency of method, adequacy of the evidence supporting the reported findings, and relevance to the problem of school location management. Appraisal assigns the interpretive weight to each study during synthesis rather than serving as an additional exclusion gate. Empirical studies from China that examined school location, consolidation, accessibility, or demographic change carried the greatest weight, and international or primary-education studies contributed at the level of transferable mechanisms.

Each included study was coded in a structured extraction matrix recording author and year, geographical and educational context, research purpose, theoretical orientation, design or analytical approach, principal findings, and factors relevant to school location, spatial accessibility, social and demographic conditions, policy and institutional conditions, and implications for planning and management. Coding proceeded on two levels. At the first level, concrete factors reported in the studies were labeled as first-order evidence, for example, travel distance, topography, service coverage, population change, educational migration, school consolidation, resource allocation, and institutional coordination. At the second level, related first-order codes were grouped into higher-order categories, such as geographical accessibility, demographic dynamics, and educational governance.

The second-order categories were then abstracted into the model's dimensions. The corpus clustered thematically into eight groups during coding, which collapsed into three determinant dimensions after conceptually redundant clusters were merged. Spatial clusters covering distance, travel time, transportation, topography, and service coverage formed spatial accessibility. Clusters covering population change, rural decline, educational migration, and student distribution formed social and demographic conditions. Clusters covering consolidation, resource allocation, policy standards, and institutional coordination formed policy capacity, defined through its analytical, managerial, and political components as set out in the policy-capacity literature.²⁰ Rural–urban inequality and population mobility formed a separate contextual layer rather than a fourth determinant. The four analytic fields used during extraction were organizing devices for comparison, not predetermined dimensions of the final model, and the reduction from eight thematic clusters to three determinants plus a contextual layer is the substantive result of the synthesis rather than an assumption imposed on it.

The model integrates the three determinant dimensions with four management functions: planning, organizing, implementation, and supervision. Planning assesses demographic conditions, educational demand, spatial accessibility, school capacity, and policy priorities to determine school locations and resource needs. Organizing coordinates institutional responsibilities and allocates human, financial, and material resources. Implementation converts approved plans into location decisions, facility provision, network adjustment, and resource allocation. Supervision monitors and evaluates implementation and feeds the results back into

²⁰ Wu, Ramesh, and Howlett, “Policy Capacity: A Conceptual Framework for Understanding Policy Competences and Capabilities”; Hwang and Hwang, “Enhancing Policy Capacity in South Korea: Integrating Analytical, Managerial, and Political Dimensions for Effective Governance”; Yan, Sano, and Sumiya, “Policy Capacity Matters for Education System Reforms: A Comparative Study of Two Brazilian States.”

subsequent planning. The model treats these relationships as conceptual propositions derived from the synthesis, not as tested effects.

Urban–rural integration is positioned as the contextual environment surrounding this process, not as a determinant, a theory, or a policy variable operating at the same level as the three dimensions. Its policy content enters through policy capacity; its theoretical content frames how educational provision is understood; and its contextual content shapes the conditions — such as urbanization, mobility, and infrastructure connectivity — under which the determinants act on the management functions. Separating these roles prevents the concept from functioning simultaneously as cause, lens, and setting, which is the ambiguity identified in earlier formulations.

Three features support the credibility of the synthesis. The extraction matrix and two-level coding scheme make the path from primary evidence to model dimensions auditable. The distinction between substantive studies and construct-defining sources keeps the corpus composition transparent. The appraisal criteria make explicit why some studies weigh more than others. These safeguards do not eliminate every source of bias, however. Two limitations follow from the design and are reported in the study's limitations. Screening and coding were conducted without independent double coding, which introduces risks of selection and interpretation bias. The corpus is concentrated on China, which limits the model's transferability.

The study drew only on published scholarly literature and involved no human participants, interviews, surveys, or personal data, so no ethical approval or participant consent was required. All sources are attributed to their original authors. The resulting model is a literature-informed framework that requires empirical validation using spatial, demographic, institutional, and educational data from secondary schools in Northeast China.

Two flags from the diagnostic still stand — the added transition sentence and the passive restructure of the screening/coding sentence — let me know if you'd like either reverted to the original phrasing.

Results

This study is conceptual, so its Results take the form of a thematic synthesis rather than results derived from primary data. The synthesis synthesized the reviewed studies to identify recurring factors shaping school location, educational accessibility, school consolidation, demographic change, resource allocation, and rural–urban educational inequality. Three determinant dimensions emerged: policy capacity, social and demographic conditions, and spatial accessibility. These three dimensions connect to four management functions, namely planning, organizing, implementation, and supervision, and the functions in turn contribute to three

educational service outcomes: access, equity, and efficiency. Urban–rural integration sits outside the three determinants as the broader context in which school location decisions are made.

Characteristics of the Reviewed Studies

The 24 substantive studies cover school accessibility, secondary school allocation, rural school consolidation, school mapping, educational migration, demographic change, and rural–urban educational inequality. Most use spatial analysis, quantitative empirical methods, or policy analysis, and most examine China, with attention to rural areas, urban–rural disparities, and specific districts or regions. A smaller set of international studies contributes transferable evidence on accessibility measurement, school-network restructuring, and closure governance.

Several studies examine primary or basic education. These were retained where the mechanism they analyze, such as spatial accessibility, travel distance, topography, service coverage, or resource distribution, transfers to the general problem of educational facility location. Their findings are not read as direct evidence about secondary schools. Studies that examine secondary education,²¹ or both primary and secondary schooling;²² carry greater weight when the framework is interpreted for a secondary school setting.

Table 1.
Substantive studies included in the synthesis and their mapped dimension

Author(s)	Year	Context	Focus/method	Key finding relevant to the framework	Mapped dimension
Dai et al.	2017	Shijingshan, Beijing	Secondary school allocation optimization	Allocation can be optimized to improve equal access to secondary education.	Spatial accessibility
Gao et al.	2016	China	Spatial accessibility analysis	Access to primary and secondary schools is uneven across areas	Spatial accessibility
Han et al.	2023	Rural Changyuan	Evaluation–optimization–validation	Service coverage can be built into location optimization	Spatial accessibility
Zhu et al.	2023	Nanjiang County	Spatial accessibility analysis	Topography, not distance alone, shapes access to rural schools	Spatial accessibility
Yang et al.	2026	China	National accessibility analysis	Accessibility and equity remain spatially differentiated	Spatial accessibility
Sun et al.	2021	China	Spatial statistical analysis	Supply of school land diverges from the shifting school-age population	Spatial accessibility

²¹ Teqi Dai et al., “Secondary School Allocation Optimization towards Equal Access: A Case Study on Shijingshan District, Beijing,” *Dili Xuebao/Acta Geographica Sinica* 72, no. 8 (2017): 1476–85, <https://doi.org/10.11821/dlxb201708011>.

²² Gao et al., “Imbalance in Spatial Accessibility to Primary and Secondary Schools in China: Guidance for Education Sustainability”; Yichen Yang, “Evaluating the Accessibility and Equity of Basic Educational Facilities in China during the Poverty Alleviation and Elimination Campaign (2015-2021),” *Geography and Sustainability* 7, no. 2 (2026): 100422, <https://doi.org/10.1016/j.geosus.2026.100422>.

Wang & Teng	2022	Rural China	Educational migration and rural decline	Educational migration accompanies rural demographic change	Social and demographic
Jiang	2017	Northeast China	Population migration analysis	Out-migration and brain drain drive regional demographic decline	Social & demographic
You et al.	2021	Northeast China	Spatial population analysis	Population distribution shifted substantially, altering service demand	Social & demographic
Zhao & Parolin	2014	Rural China	School preference study	Family school preferences diverge from the efficiency logic of restructuring.	Social & demographic
Zhao et al.	2024	Rural China	Resource allocation and migration	Resource allocation tied to consolidation has long-term migration effects	Social & demographic
Hannum et al.	2021	Rural China	System consolidation	Rural school closure reorganized access at the system level	Policy capacity
Jia & Zhou	2013	Rural China	Consolidation models	Consolidation takes different organizational forms	Policy capacity
Li & Gao	2024	Rural China	Consolidation, empirical	Consolidation carries educational consequences for location decisions	Policy capacity
Dong et al.	2013	Rural China	Consolidation and achievement	Consolidation must be judged against student outcomes	Policy capacity
Hong.	2015	Rural China	Consolidation analysis	Consolidation shapes the organization and future of rural education	Policy capacity
Guo	2013	Rural China	Policy/problem analysis	Consolidation creates implementation problems needing a policy response	Policy capacity
Wu	2020	China	Policy/standards analysis	Consolidation developed through changing policy standards	Policy capacity
Zhao & Parolin	2011	Rural China	School Mapping Restructure	Restructure closed or merged small rural schools, changing their role	Policy capacity
Aasland & S�holt	2020	Norway	Closure governance	Local administrations can drive centralizing closures despite autonomy	Policy capacity
Kim et al.	2025	Shrinking regions	Closure prioritization model	Accessibility can serve as an explicit closure-decision criterion	Policy capacity
Li	2016	China	Rural–urban inequality	Rural–urban differences shape access in basic and secondary education	Urban–rural context
Hao et al.	2014	China	Educational stratification	The rural–urban divide is linked to educational stratification	Urban–rural context
Xiang & Stillwell	2023	China	Spatial inequality analysis	Rural–urban educational inequality varies spatially	Urban–rural context

Policy Capacity

The first determinant is policy capacity. The reviewed studies show that school location decisions cannot be reduced to geographic optimization, as they involve institutional authority, policy coordination, resource allocation, implementation, and monitoring. Following the public-policy literature, policy capacity here means the analytical, managerial, and political ability to translate evidence and policy intent into a coordinated decision, rather than the mere presence of a policy on paper.²³

Consolidation is the clearest expression of this capacity at work. Jia and Zhou identified several organizational forms of rural school consolidation, which shows that restructuring is an organizational choice, not only a spatial one.²⁴ Guo documented the implementation problems consolidation generates and the policy responses they require,²⁵ and Wu traced how consolidation developed through successive policy standards.²⁶ The consequences of these choices depend on how they are designed and implemented: Dong, Chang, Bai, and Mei et al. linked consolidation to student outcomes and the organization of rural education, and Li and Gao provided recent empirical evidence that consolidation has measurable educational consequences.²⁷

Governance evidence from outside China sharpens the point. Aasland and Søholt examined contested rural closures in Norway and asked whether local administrations act as agents of centralization even when they hold formal autonomy over school structure.²⁸ Kim, Kim, and Jeon built a closure-prioritization model for shrinking regions that treats educational accessibility as an explicit decision criterion rather than a by-product of fiscal choices.²⁹ Zhao and Parolin

²³ Wu, Ramesh, and Howlett, “Policy Capacity: A Conceptual Framework for Understanding Policy Competences and Capabilities”; Hwang and Hwang, “Enhancing Policy Capacity in South Korea: Integrating Analytical, Managerial, and Political Dimensions for Effective Governance”; Yan, Sano, and Sumiya, “Policy Capacity Matters for Education System Reforms: A Comparative Study of Two Brazilian States”; Saguin and Ramesh, “Policy Capacity Under Decentralization: Kindergarten Education Reforms in the Philippines.”

²⁴ Hongyong Jia and Fenfen Zhou, “An Exploration and Analysis of the Modes of Rural School Consolidation in China,” *Chinese Education & Society* 46, no. 5 (2013): 21–35, <https://doi.org/10.2753/CED1061-1932460502>.

²⁵ Qingyang Guo, “The Reasons and Solutions for Problems in Rural School Consolidation,” *Chinese Education & Society* 46, no. 5 (2013): 76–95, <https://doi.org/10.2753/CED1061-1932460506>.

²⁶ Zhihui Wu, “Path and the Standards of Rural School Consolidation in China Since 2000,” in *Handbook of Education Policy Studies: School/University, Curriculum, and Assessment, Volume 2*, ed. Guorui Fan and Thomas S Popkewitz (Singapore: Springer Nature Singapore, 2020), 3–33, https://doi.org/10.1007/978-981-13-8343-4_1.

²⁷ Mei Dong, Fang Chang, and Yuanyan Bai, “An Empirical Study on the Effect of School Consolidation in Rural Areas on Student Achievement,” *Chinese Education & Society* 46, no. 5 (2013): 56–70, <https://doi.org/10.2753/CED1061-1932460504>; Mei Hong, “School Consolidation: Whither China’s Rural Education?,” *Asian Social Work and Policy Review* 9, no. 2 (2015): 138–50, <https://doi.org/10.1111/aswp.12053>.

²⁸ Aasland and Søholt, “Agents of Centralization? Local School Administrations and Contested School Closures in Norwegian Rural Districts.”

²⁹ Kim, Kim, and Jeon, “Optimal Prioritization Model for School Closure Decisions Considering Educational Accessibility in Shrinking Regions.”

showed, under China's School Mapping Restructuring, that the closure and merger of small rural schools redefined the role of the rural school itself.³⁰ Read together, these studies place policy capacity upstream of the management process: it determines whether demographic and accessibility evidence, as well as resource constraints, are coordinated before a location decision is made. Policy capacity in the model therefore covers policy coordination, resource allocation, institutional and implementation capacity, stakeholder coordination, and monitoring.

Social and Demographic Conditions

The second determinant is social and demographic conditions. The reviewed studies show that the population a school serves is not fixed. Wang and Yuan linked educational migration to rural decline, indicating that where families seek schooling is not determined by residence alone.³¹ Jiang identified out-migration and brain drain as drivers of demographic decline in Northeast China,³² and You et al., documented substantial shifts in the region's population distribution between 1992 and 2018. A location that fits one demographic configuration may not fit the next.³³

Two further studies show how demography and institutions interact. Zhao and Parolin found that families' actual school preferences diverged from the efficiency rationale behind restructuring, so demand reflects preference and mobility, not only headcount.³⁴ Zhao et al. demonstrated a long-term relationship between consolidation-linked resource allocation and migration, suggesting that location decisions can feed back into population movement rather than merely respond to it. In the model, this dimension covers population distribution, demographic change, migration, student distribution, and shifts in educational demand.³⁵

Spatial Accessibility

The third determinant is spatial accessibility. The synthesis distinguishes potential accessibility, the geographic relationship between where students live and where schools stand, from realized access, the extent to which students actually reach and use those schools. The distinction matters because management decisions about transport, catchment, and school capacity can raise or lower realized access even when the map of facilities is unchanged.

³⁰ Zhao and Parolin, "School Mapping Restructure in China: What Role for the Small Rural School?"

³¹ Wang and Teng, "Educational Migration and Rural Decline in China."

³² Jiang, "Population Migration and Brain Drain in Northeast China."

³³ Haolin You, "Spatial Evolution of Population Change in Northeast China during 1992-2018," *Science of The Total Environment* 776 (2021): 146023, <https://doi.org/10.1016/j.scitotenv.2021.146023>.

³⁴ Zhao and Parolin, "Merged or Unmerged School? School Preferences in the Context of School Mapping Restructure in Rural China."

³⁵ Yu Zhao, "The Long-Term Influence of Education Resources Allocation on the Migration: Evidence from the China's Rural School Consolidation Policy," *Journal of Asian Economics* 91 (2024): 101710, <https://doi.org/10.1016/j.asieco.2024.101710>.

The distinction is grounded in the wider accessibility literature: access is a multidimensional fit between a population and a service, not a single spatial measurement,³⁶ so a school can be geographically close yet practically unreachable if capacity, transport, or scheduling barriers stand between potential and realized access. Regarding potential accessibility, Gao et al. measured uneven access to primary and secondary schools across China, and Dai et al. framed secondary school allocation in Beijing as an optimization problem aimed at equal access.³⁷ Han et al. showed that service coverage can be built into an evaluation–optimization–validation procedure, so location should be judged by the population served rather than by the count of facilities.³⁸ Sun et al. documented a supply–demand mismatch between school-land provision and the shifting school-age population, linking accessibility directly to demographic change.³⁹ Regarding the friction that turns potential access into realized access, Zhu et al. showed that topography, not distance alone, governs the effort required to reach rural schools.⁴⁰

Yang et al. provided recent national-scale evidence that accessibility and equity remain spatially differentiated.⁴¹ This dimension covers distance, travel time, transport, road conditions, topography, and service coverage.

Urban–Rural Inequality as the Broader Context

Rural–urban educational inequality is the fourth recurring theme, but the model treats it as context rather than as a fourth determinant. Xiang and Stillwell showed that rural–urban educational inequality in China varies spatially.⁴² Li identified rural–urban differences in educational opportunity across basic and secondary education,⁴³ Hao, Hu, and Lo linked the rural–urban divide to educational stratification.⁴⁴ Wang and Yuan connected these conditions to population movement and rural decline.⁴⁵

³⁶ Roy Penchansky and J William Thomas, “The Concept of Access: Definition and Relationship to Consumer Satisfaction,” *Medical Care* 19, no. 2 (1981): 127–40, <https://doi.org/10.1097/00005650-198102000-00001>.

³⁷ Dai et al., “Secondary School Allocation Optimization towards Equal Access: A Case Study on Shijingshan District, Beijing.”

³⁸ Han et al., “Improving Educational Equity by Maximizing Service Coverage in Rural Changyuan, China: An Evaluation–Optimization–Validation Framework Based on Spatial Accessibility to Schools.”

³⁹ Sun et al., “Spatial Mismatch Analyses of School Land in China Using a Spatial Statistical Approach.”

⁴⁰ Yuanyuan Zhu, “Accessibility of Primary Schools in Rural Areas and the Impact of Topography: A Case Study in Nanjiang County, China,” *Land* 12, no. 6 (2023), <https://doi.org/10.3390/land12061134>.

⁴¹ Yang, “Evaluating the Accessibility and Equity of Basic Educational Facilities in China during the Poverty Alleviation and Elimination Campaign (2015–2021).”

⁴² Xiang and Stillwell, “Two Aspects of the Rural–Urban Divide and Educational Stratification in China: A Trajectory Analysis,” *Comparative Education Review* 58, no. 3 (2014): 509–36, <https://doi.org/10.1086/676828>.

⁴³ Xiang and Stillwell, “Rural–Urban Educational Inequalities and Their Spatial Variations in China.”

⁴⁴ Hao, Hu, and Lo, “Two Aspects of the Rural–Urban Divide and Educational Stratification in China: A Trajectory Analysis.”

⁴⁵ Wang and Teng, “Educational Migration and Rural Decline in China.”

These findings matter for school location because the same location strategy produces different results in a dense urban district, a declining rural county, or an area of high mobility. Urban–rural integration, therefore, enters the model as the broader spatial, demographic, institutional, and policy environment in which decisions are made. Positioning it as context, rather than as one of the three determinants, resolves the ambiguity of treating urban–rural integration as a policy, a theory, and a determinant simultaneously.

Thematic Coding Framework

The synthesis moved from concrete evidence in individual studies to the model's dimensions through two-level coding. First-order codes recorded the factors reported in the studies. Related first-order codes were grouped into second-order categories, which were then abstracted into the determinant dimensions and the contextual layer. Table 2 records this path.

Table 2.
Two-level coding structure

First-order evidence	Second-order category	Core dimension
Policy standards	Policy implementation	Policy capacity
School consolidation	Institutional restructuring	Policy capacity
Resource allocation	Educational governance	Policy capacity
Institutional coordination	Organizational capacity	Policy capacity
Population change	Demographic dynamics	Social and demographic conditions
Rural decline	Demographic dynamics	Social & demographic conditions
Educational migration	Population mobility	Social & demographic conditions
Student distribution	Educational demand	Social & demographic conditions
Distance	Geographical accessibility	Spatial accessibility
Travel time	Travel accessibility	Spatial accessibility
Transportation	Mobility accessibility	Spatial accessibility
Topography	Physical accessibility	Spatial accessibility
Service coverage	Spatial service provision	Spatial accessibility
Rural–urban inequality	Spatial inequality	Urban–rural context
Population mobility	Urban–rural dynamics	Urban–rural context

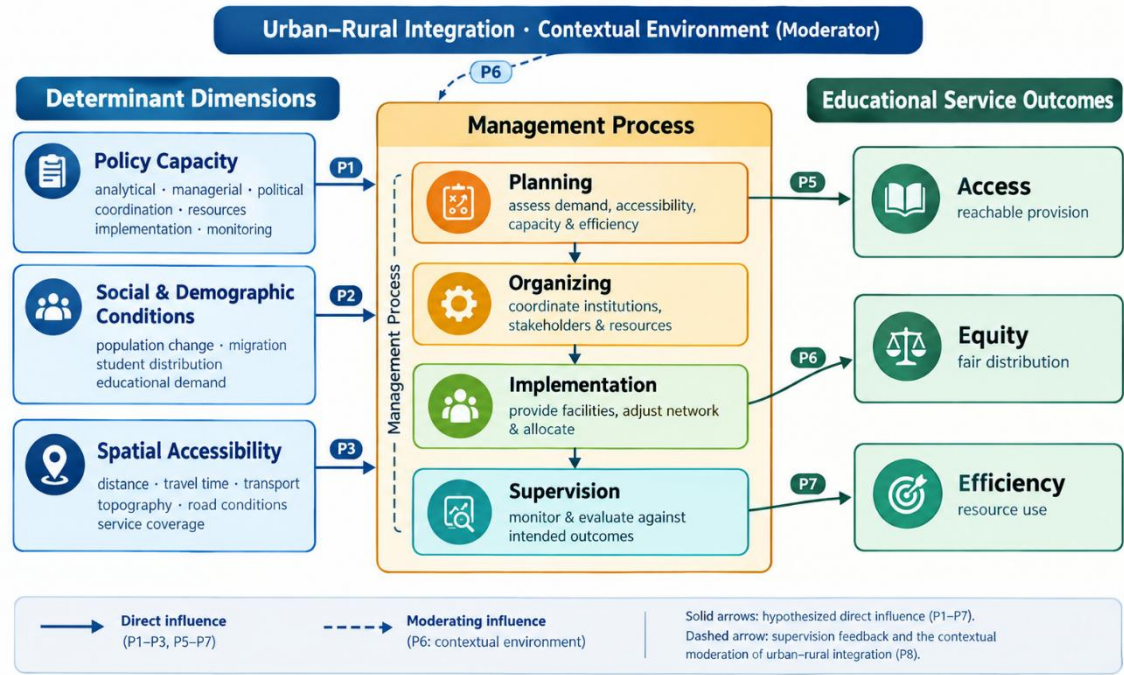
The Proposed Conceptual Model

The synthesis frames school location management as a management process driven by three determinants within a broader urban–rural context. Policy capacity is the ability of educational authorities to formulate, coordinate, implement, and supervise location decisions. Social and

demographic conditions include population distribution, demographic change, migration, student distribution, and educational demand. Spatial accessibility covers distance, travel time, transport, topography, road conditions, and service coverage.

The three determinants feed four management functions. Planning identifies demand and determines locations. Organizing coordinates institutions, stakeholders, and resources. Implementation converts decisions into facilities and services. Supervision checks implementation against the intended outcomes and feeds the results back into planning. The process aims at three outcomes: access, equity, and efficiency. Urban–rural integration surrounds the framework as context. It can strengthen or weaken the relationships among determinants, functions, and outcomes, depending on population density, transport connectivity, resource distribution, and the institutional relationship between urban and rural areas. Figure 1 shows these components and their directional relationships, which correspond to propositions P1 through P8.

Figure 1.
Proposed conceptual model of secondary school location management



Propositions of the Proposed Model

1. P1. Policy capacity positively influences the effectiveness of school location planning.
2. P2. Social and demographic conditions influence school location planning through changes in population distribution, migration, student distribution, and educational demand.
3. P3. Spatial accessibility positively influences the effectiveness of school location planning.
4. P4. Policy capacity strengthens the coordination between school location planning and educational resource allocation.

5. P5. Effective school location planning contributes to improved educational access.
6. P6. Effective organizing and implementation strengthen the translation of school location plans into equitable educational services.
7. P7. Effective supervision strengthens the alignment between school-location implementation and the intended outcomes of access, equity, and efficiency.
8. P8. Urban–rural integration moderates the relationships between the three determinant dimensions and school location management by shaping the demographic, spatial, institutional, and resource conditions in which school location decisions are implemented.

Conceptual Contribution

The resulting framework extends previous research in three ways. First, previous studies have largely examined individual dimensions of school location, such as spatial accessibility, school consolidation, demographic change, and educational inequality; the present synthesis integrates these dimensions into a single framework for school location management. Second, the framework distinguishes determinants from management functions: policy capacity, demographic conditions, and spatial accessibility explain the conditions that shape school location decisions, whereas planning, organizing, implementation, and supervision describe how those decisions are managed. Third, the framework positions urban–rural integration explicitly as a contextual environment, rather than treating it simultaneously as a policy, a theory, and a determinant variable. Accordingly, the contribution of the proposed model is not a new empirical causal relationship, but a conceptual explanation of how policy, demographic, and spatial factors can be integrated into the management of school location to pursue educational access, equity, and efficiency.

Discussion

Reframing School Location Management as a Management Process

The synthesis reframes school location as a management process rather than merely a spatial planning problem. Location decisions involve planning, organizing, implementation, and supervision, and these functions translate demographic, accessibility, and policy evidence into the provision of educational services. Li and Han et al. treat allocation, consolidation, accessibility, and inequality as connected features of provision, and the framework builds on that connection.⁴⁶

⁴⁶ Li, “Who Decided College Access in Chinese Secondary Education? Rural-Urban Inequality of Basic Education in Contemporary China”; Han et al., “Improving Educational Equity by Maximizing Service Coverage in Rural Changyuan, China: An Evaluation-Optimization-Validation Framework Based on Spatial Accessibility to Schools.”

The framework does not claim to introduce system-level educational planning. That claim would ignore a long institutional history, and positioning against it is necessary, not optional. The UNESCO-IIEP school-mapping and micro-planning tradition, formalized by Hallak, has matched school supply to population and accessibility since the 1970s, and the joint UNESCO, UNICEF, World Bank, and Global Partnership for Education guidelines for education sector analysis already combine demographic, spatial, and institutional inputs into a single diagnostic procedure.⁴⁷ Within China, the State Council's 2012 directive on the balanced development of compulsory education pursues equal provision across urban and rural areas through resource redistribution and school restructuring, setting explicit national targets to narrow within-county disparities.⁴⁸ In China specifically, Zhao and Parolin showed that School Mapping Restructure applied this logic to rural closures and mergers,⁴⁹ and later found that family preferences diverged from its efficiency rationale.⁵⁰ Set against these traditions, the framework's contribution is narrow and specific: it names the internal management sequence that converts an accessibility or demographic analysis into an implemented, supervised location decision, a sequence these traditions assume but rarely specify.

Policy Capacity and the Efficiency–Access Tension

The synthesis places policy capacity upstream of the management process. Following the public-policy literature, policy capacity is the analytical, managerial, and political ability to convert evidence and intent into coordinated action:⁵¹ not the presence of a policy on paper. Consolidation demonstrates why this distinction matters. Jia and

⁴⁷ Jacques Hallak, *Planning the Location of Schools: An Instrument of Educational Policy* (Paris: UNESCO International Institute for Educational Planning, 1977); UNESCO International Institute for Educational Planning et al., *Education Sector Analysis Methodological Guidelines, Volume 1: Sector-Wide Analysis, with Emphasis on Primary and Secondary Education* (Dakar/Paris: IIEP-UNESCO Pôle de Dakar, 2014).

⁴⁸ State Council of the People's Republic of China, "Opinions of the State Council on Deepening the Promotion of Balanced Development of Compulsory Education (国务院关于深入推进义务教育均衡发展的意见)" (State Council of the People's Republic of China, September 5, 2012), https://www.gov.cn/zhengce/zhengceku/2012-09/07/content_5339.htm.

⁴⁹ Zhao and Parolin, "School Mapping Restructure in China: What Role for the Small Rural School?"

⁵⁰ Zhao and Parolin, "Merged or Unmerged School? School Preferences in the Context of School Mapping Restructure in Rural China."

⁵¹ Wu, Ramesh, and Howlett, "Policy Capacity: A Conceptual Framework for Understanding Policy Competences and Capabilities"; Yan, Sano, and Sumiya, "Policy Capacity Matters for Education System Reforms: A Comparative Study of Two Brazilian States"; Jia and Zhou, "An Exploration and Analysis of the Modes of Rural School Consolidation in China."

Zhou ⁵² showed that restructuring is an organizational choice, and rural school closure carries organizational and policy consequences beyond the relocation of a single building.

The central tension the framework addresses is between efficiency and access. Consolidation is often justified by resource concentration, yet it can raise travel burdens and reduce opportunities for students in remote areas.⁵³ An administratively efficient decision is therefore not necessarily an equitable one. Governance evidence sharpens the point. Aasland and S holt found that local administrations can drive centralizing closures even when they hold formal autonomy, showing that the efficiency logic can override local access concerns without a strong capacity to weigh them.⁵⁴ Kim, Kim, and Jeon responded to the same tension by building accessibility into the closure-decision rule itself.⁵⁵ Policy capacity, in the framework, is the institutional ability to keep efficiency and access in view before a decision is made, and to coordinate transport, capacity, and mobility during implementation rather than after.

Demographic Change as a Dynamic Planning Condition

The framework treats demographic conditions as a dynamic determinant rather than a background variable. Jiang identified out-migration as a driver of demographic decline in Northeast China,⁵⁶ and You et al., documented substantial shifts in the region's population distribution.⁵⁷ A location that maximizes accessibility under current conditions may not remain optimal as the served population changes.

This creates a timing problem. A location decision is expected to provide stable service over the years, while the population it serves can move within a shorter horizon. Zhao et al. showed that consolidation-linked resource allocation and migration have a long-run relationship, suggesting that location decisions can shape population movement rather than merely track it.⁵⁸ The effect is not uniform: decline can leave excess capacity in one county while concentration raises demand in another, so the relationship between

⁵²Jia and Zhou, "Modes of Rural School Consolidation."

⁵³ Hannum, Liu, and Wang, "Estimating the Effects of Educational System Consolidation: The Case of China's Rural School Closure Initiative."

⁵⁴ Aasland and S holt, "Agents of Centralization? Local School Administrations and Contested School Closures in Norwegian Rural Districts."

⁵⁵ Kim, Kim, and Jeon, "Optimal Prioritization Model for School Closure Decisions Considering Educational Accessibility in Shrinking Regions."

⁵⁶ Jiang, "Population Migration and Brain Drain in Northeast China."

⁵⁷ You, "Spatial Evolution of Population Change in Northeast China during 1992-2018."

⁵⁸ Zhao, "The Long-Term Influence of Education Resources Allocation on the Migration: Evidence from the China's Rural School Consolidation Policy."

demography and location management is context-dependent. Planning should therefore weigh population trends and migration alongside current student distribution.

Accessibility as Both a Spatial and a Managerial Outcome

The framework's most distinctive claim is that accessibility is both spatial and managerial. Following the multidimensional conception of access developed for health services,⁵⁹ the synthesis separates potential accessibility, the geographic relation between students and schools, from realized access, the extent to which students reach and use those schools; the fit between population and service, not distance alone, determines which of these obtains. Spatial studies establish the potential layer: Gao et al. measured uneven access, Han et al. optimized service coverage, Zhu et al. showed that topography increases the effort to reach rural schools, and Dai et al. framed allocation as an equal-access optimization.⁶⁰ Sun et al. documented a supply–demand mismatch between school land provision and the school-age population, which links the potential layer to demographic change.⁶¹

Management decisions move students between the potential and realized layers through five mechanisms. Location selection sets the distance students face. Consolidation raises or lowers the travel burden depending on which schools close and which remain open. Service coverage and capacity determine whether a nominally available school can serve its catchment. Transport arrangements can make a distance into a manageable or unmanageable trip. Organizational coordination determines whether spatially disadvantaged students can use services that exist on paper. The evidence that these are management effects, not only geographic ones, is concrete: Kim, Kim, and Jeon showed that changing the closure-decision rule to weight accessibility changes, which schools close and therefore who retains access, is a management intervention altering an accessibility outcome.⁶² Han et al. showed the same in reverse, repositioning schools to widen coverage for a fixed population.⁶³

⁵⁹ Penchansky and Thomas, “The Concept of Access: Definition and Relationship to Consumer Satisfaction.”

⁶⁰ Han et al., “Improving Educational Equity by Maximizing Service Coverage in Rural Changyuan, China: An Evaluation-Optimization-Validation Framework Based on Spatial Accessibility to Schools.”

⁶¹ Sun et al., “Spatial Mismatch Analyses of School Land in China Using a Spatial Statistical Approach.”

⁶² Kim, Kim, and Jeon, “Optimal Prioritization Model for School Closure Decisions Considering Educational Accessibility in Shrinking Regions.”

⁶³ Han et al., “Improving Educational Equity by Maximizing Service Coverage in Rural Changyuan, China: An Evaluation-Optimization-Validation Framework Based on Spatial Accessibility to Schools.”

Management does not dissolve spatial constraint. Topography, settlement pattern, road network, and density set limits that administration alone cannot remove. Accessibility is the product of spatial structure and managerial intervention acting together, which is why the framework routes it through the management functions rather than treating it as a fixed input.

Urban–Rural Integration as Context, Not Determinant

The synthesis fixes the conceptual position of urban–rural integration, which earlier formulations treated as a policy, a theory, and a variable. The framework treats it as the contextual environment in which location decisions occur. Xiang and Stillwell showed that educational inequality varies spatially across urban and rural areas. Li and Hao, Hu linked the divide to differences in opportunity and stratification.

As context, urban–rural integration does not replace the three determinants; it conditions them. Population density, transport connectivity, institutional capacity, and resource distribution shape whether a given location strategy is feasible or equitable. This also bounds the framework: it does not explain urban–rural integration, but asks how location management operates under different degrees of urban–rural connectivity and inequality.

Applying the Framework to Northeast China

Northeast China motivates the framework because it concentrates three pressures at once: an aging demographic structure, a contracting school-age population, and county-level administration operating under fiscal strain. National census data confirm the first of these directly: in the 2020 national population census, Liaoning recorded the highest share of residents aged 60 and above of any province in China (25.7 percent, against a national figure of 18.7 percent), and Heilongjiang recorded the second-lowest share of children aged 0–14 nationally (10.3 percent, against 18.0 percent nationally); Jilin sits close to both.⁶⁴ Jiang⁶⁵ and You et al.,⁶⁶ document the resulting population movement from 1992 to 2018.

Official 2024 school-level statistics from all three provinces show this pressure falling unevenly across school types rather than uniformly across the network, and

⁶⁴ National Bureau of Statistics of China, “Bulletin of the Seventh National Population Census (No. 5): Population Age Composition (第七次全国人口普查公报 (第五号))” (National Bureau of Statistics of China, May 11, 2021), https://www.stats.gov.cn/sj/zxfb/202302/t20230203_1901085.html.

⁶⁵ Jiang, “Population Migration and Brain Drain in Northeast China.”

⁶⁶ You, “Spatial Evolution of Population Change in Northeast China during 1992–2018.”

unevenly across the three provinces themselves. Primary-school counts fell in all three: Jilin lost 382 primary schools in a single year, Liaoning 135, and Heilongjiang 73.⁶⁷ At the junior-secondary level, the picture diverges. Jilin's junior-secondary school count rose slightly (four more schools), with enrollment roughly flat; Liaoning's junior-secondary schools rose by two, and enrollment grew 2.3 percent; Heilongjiang's junior-secondary schools fell by eight, and enrollment fell by roughly 3 percent.⁶⁸ Treating “Northeast China” as a single demographic case, therefore, risks obscuring a divergence that the three provincial administrations are already producing independently.

Provincial policy documents provide one explanation consistent with the framework's account of policy capacity. Under its 2021–2025 plan, Heilongjiang directed 125 counties and county-level districts to adopt individualized (“one county, one policy”) school-layout optimization, consolidating small and under-enrolled schools while forming 62 school districts, 183 school-group partnerships, and 462 urban–rural school communities to extend resources to rural and weak schools.⁶⁹ The same policy explicitly retained and prioritized 187 small “border-area schools” that a purely enrollment-driven consolidation logic would likely have closed, citing frontier stability and equity rather than efficiency as the rationale.⁷⁰ This is a documented instance of the efficiency–access tension that the framework describes in the abstract: a named policy that prioritizes access and political stability over consolidation efficiency at a set of specific sites.

⁶⁷ Jilin Provincial Department of Education, “Jilin Province Education Development Overview (2024 Edition) (吉林省教育事业发展概况 (2024年版))” (Jilin Provincial Department of Education, June 27, 2025), https://jyt.jl.gov.cn/jysyfgk/202506/t20250627_9266566.html; Liaoning Provincial Department of Education, “2024 Liaoning Province Education Development Statistical Bulletin (2024年辽宁省教育事业发展统计公报)” (Liaoning Provincial Department of Education, March 4, 2025), <https://jyt.ln.gov.cn/jyt/gk/zfxgk/fdzdgknr/tjxx/2025090518184418047/>; Heilongjiang Provincial Department of Education, “Basic Situation of Heilongjiang Province’s Education Development in 2024 (2024年黑龙江省教育事业发展基本情况)” (Heilongjiang Provincial Department of Education, June 16, 2025), https://jyt.hl.gov.cn/jyt/c110518/202506/c00_31849800.shtml.

⁶⁸ Education, “Jilin Province Education Development Overview (2024 Edition) (吉林省教育事业发展概况 (2024年版))”; Education, “2024 Liaoning Province Education Development Statistical Bulletin (2024年辽宁省教育事业发展统计公报)”; Education, “Basic Situation of Heilongjiang Province’s Education Development in 2024 (2024年黑龙江省教育事业发展基本情况).”

⁶⁹ Heilongjiang Provincial Department of Education, “Provincial Department of Education: Optimizing Basic Education Layout, Promoting Equity, Improving Quality (省教育厅：基础教育优布局 促公平 提质量)” (Heilongjiang Provincial People’s Government, January 10, 2026), https://www.hl.gov.cn/hlj/c107857/202601/c00_31904685.shtml.

⁷⁰ Education, “Provincial Department of Education: Optimizing Basic Education Layout, Promoting Equity, Improving Quality (省教育厅：基础教育优布局 促公平 提质量).”

These sources substantiate the framework's contextual claims more directly than the earlier draft could, but they do not establish a demonstrated regional effect for Northeast China. The school-level statistics are single-year comparisons (2023 to 2024), not a multi-year series; the census data describe 2020, four years before the school statistics; and the Heilongjiang policy figures are the provincial government's own reported achievements rather than independently audited outcomes. The claim that can be supported is narrower than “Northeast China is declining”: the three provinces share an aged population structure by national comparison, are managing consolidation pressure through visibly different school-level outcomes even in the same year, and at least one province has documented a named policy mechanism that trades efficiency for access at specific sites.

Boundary Conditions and What the Framework Cannot Explain

The framework has clear boundaries. It applies where school locations involve real spatial variation in population, accessibility, and resources, and it explains less in compact urban systems, where most students already sit near several schools. It is most useful under consolidation, population decline, redistribution, or spatial inequality, conditions that reshape school organization and access in rural China.⁷¹

The framework also has limits of kind, not only of degree. It does not explain within-school effectiveness, so teacher quality, curriculum, instructional leadership, school climate, and student achievement fall outside it. It does not explain why urban–rural integration occurs, only how location management operates within it. It identifies the efficiency–access tension in a specific closure. Still, it does not predict which side will prevail, because that outcome turns on local political capacity, which the model treats as a determinant rather than an output. Stating these limits keeps the contribution defensible and separates it from a general theory of educational provision.

From Constructs to Measurement

The model cannot be tested by structural equation modeling in its current form, because its constructs are not yet operationalized. Measurement must precede estimation. Policy capacity can be indexed through policy coordination, resource allocation, institutional and implementation capacity, and monitoring. Social and demographic conditions can be measured using population density, student population trends, migration, and projected demand. Spatial accessibility can be

⁷¹ Hannum, Liu, and Wang, “Estimating the Effects of Educational System Consolidation: The Case of China’s Rural School Closure Initiative”; Hong, “School Consolidation: Whither China’s Rural Education?”; Zhao, “The Long-Term Influence of Education Resources Allocation on the Migration: Evidence from the China’s Rural School Consolidation Policy.”

measured through travel distance and time, transport availability, topographic constraint, and service coverage. The four functions map to observable practice: planning to needs assessment and demand projection; organizing to stakeholder coordination and resource mobilization; implementation to facility provision, transport arrangement, and resource distribution; supervision to monitoring, evaluation, and accountability. The outcomes need indicators, too: access measured by travel time and coverage; equity by accessibility gaps between groups; and efficiency by the ratio of resources and capacity to the population served. Only once these definitions have evidence of reliability and validity do the propositions in Figure 1 become testable.

Limitations

Five limitations bound the study. First, the framework is conceptual and has not been empirically validated; the relationships in P1 through P8 are propositions, not established effects. Second, the evidence base focuses on China, and the synthesis offers no province-level comparisons for Liaoning, Jilin, and Heilongjiang beyond the single-year school statistics and the 2020 census data reported above. Hence, the Northeast China claims remain contextual rather than fully demonstrated. Third, the literature search was Scopus-based and purposive rather than a fully documented systematic protocol, which may introduce coverage bias. Fourth, the framework has not undergone validation by stakeholders or an expert panel, so practitioners may identify constraints that the corpus does not capture. Fifth, the constructs are not yet operationalized, so the propositions cannot be estimated at this time. Taken together, these limits mark the framework as a conceptual synthesis and research agenda rather than a validated model.

Directions for Future Research

Research should proceed in stages. First, operationalize the constructs into measured indicators with tested reliability and validity. Second, test whether the three determinants relate to the four functions, and whether those functions relate to access, equity, and efficiency. Third, compare contrasting settings: within China, treat Liaoning, Jilin, and Heilongjiang as distinct cases rather than a single region, extending the single-year comparison reported above into a multi-year panel to test the contextual role of urban–rural integration directly. Fourth, run stakeholder validation with administrators, principals, planners, and transport authorities before large-scale estimation. Finally, combine GIS-based accessibility measures with survey-based measures of policy and management capacity to test the framework's central claim: that access depends not only on geographic structure but also on how systems manage the location and organization of schools.

Conclusion

This study contributes a conceptual framework that connects school location management to educational planning by linking policy capacity, social and demographic conditions, and spatial accessibility to the functions through which location decisions are planned, organized, implemented, and supervised. The framework does not claim a new planning paradigm. It specifies the management sequence that existing spatial, demographic, and policy research assumes but leaves implicit, and it recasts accessibility as the joint product of spatial structure and managerial intervention aimed at access, equity, and efficiency. Its central limitation is that it remains conceptual and untested, and its evidence concentrates on China through a purposive rather than systematic search. The priority for future work is to operationalize the constructs and test the propositions, ideally by pairing GIS-based accessibility measures with measures of policy and management capacity, so that the framework can be judged on its ability to explain how location management shapes educational access, equity, and efficiency across different spatial and institutional settings.

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Ethical Statement

This study is a conceptual synthesis based on a review of previously published literature. It did not involve human participants, human data, or animals, and therefore, ethical approval was not required. All sources used have been appropriately cited.

Conflict of Interest Statement

The authors declare no conflict of interest.

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Author Contributions

Conceptualization, Chen Hao and Johar Permana; methodology, Chen Hao and Taufani C. Kurniatun; investigation and formal analysis, Chen Hao; writing, original draft preparation, Chen Hao; writing, review and editing, Johar Permana, Taufani C. Kurniatun, and Suryadi; supervision, Johar Permana and Suryadi; validation, Taufani C. Kurniatun and Suryadi. All authors have read and agreed to the published version of the manuscript.

Declaration of Generative AI in Scientific Writing

During the preparation of this work, the authors used Claude to improve the manuscript's language, grammar, and readability. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the publication's content.

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