

**Lost in the Signal:
Educational Information Barriers and Decision Quality
Among Low-Income Families in Urban China**

[Shengran Zhan]
[1045026456@qq.com]
Submitted to SARC 2026

Lost in the Signal: Educational Information Barriers and Decision Quality Among Low-Income Families in Urban China

Abstract

This study investigates how educational information barriers—spanning source access, policy comprehension, and institutional trust—impede educational decision-making among low-socioeconomic-status (low-SES) families in Wuhan, China. Using survey data from 300 households, a pre-registered Randomized Controlled Trial (RCT), and spatial analysis, the research develops the Educational Information Accessibility Index (EIAI), identifies "information desert" sub-districts, and tests whether a plain-language Educational Decision Handbook improves decision quality over eight weeks. Findings aim to deliver a replicable diagnostic instrument and an evidence-based policy tool for municipal education bureaus.

I. Research Problem & Introduction

China's National Bureau of Statistics (2022) estimates 293 million rural-to-urban migrants reside in cities. Low-income parents are not information-scarce; they are unable to discriminate authoritative guidance from rumor and commercially motivated content pervading social media. This **signal-to-noise discrimination** gap represents a new axis of educational inequality not yet rigorously quantified. China's sweeping reforms—*shuang jian* ("double reduction"), school district rezoning (*xuequfang*), and expanded secondary admissions—reached approximately 95% of compulsory education students by autumn 2022 (Ministry of Education, 2022). Wuhan—with over 1.2 million school-age children and the highest inter-provincial migrant concentration in central China (Wuhan Municipal Bureau of Statistics, 2023)—is the ideal research site.

II. Literature Review

Lareau's (2003) "concerted cultivation" framework established that middle-class families systematically decode institutional information; Woronov (2015) adapts this to China, documenting networks structurally inaccessible to lower-income peers. Van Dijk (2020) identifies layered digital barriers beyond device ownership, while Warschauer (2003) shows effective use requires social embedding. Guo and Iredale (2004) demonstrate that bureaucratic digitization can inadvertently disadvantage hukou-constrained migrant families. Xiang et al. (2018; 2020) confirm educational disadvantage clusters spatially into "spatial traps" that persist under changing policy regimes. Nguyen (2008) found plain-language information shifted enrollment decisions in Madagascar. Muralidharan and Sundararaman (2015) and Shadish et al. (2002) provide RCT and quasi-experimental standards; Epstein (2001), Duflo et al. (2007), and Hayes (2018) ground the intervention design and analytical framework. No existing study combines a validated multi-dimensional measure of individual information barriers with a real-world intervention and spatial mapping within a single Chinese urban context.

III. Research Questions

Central RQ: To what extent do educational information barriers affect decision quality among low-SES families in urban China, and can a low-cost intervention measurably reduce those barriers?
RQ1: What are the psychometric properties of the EIAI across dimensions of contact frequency, policy comprehension, and institutional trust? **RQ2:** Does the Educational Decision Handbook improve decision quality compared to a matched control, after controlling for baseline EIAI and demographics? **RQ3:** Do information barriers cluster geographically, and does proximity to transit nodes and community centers predict barrier severity?

IV. Methodology

Phase 1 — EIAI Survey. The EIAI (0–100) aggregates three subscales: Contact Frequency (F)—weekly interactions with seven source types, rescaled 0–100; Comprehension Score (C)—a 10-item policy knowledge quiz; and Institutional Trust (T)—a validated 8-item Likert scale (target $\alpha \geq 0.75$). The composite $EIAI = (F + C + T) / 3$ is administered face-to-face to 300 low-SES households across six Wuhan sub-districts. Multivariate OLS regression with VIF diagnostics identifies predictors; Cronbach's α and inter-rater reliability (target $\kappa \geq 0.80$) ensure validity.

Phase 2 — RCT. A pre-registered (OSF) covariate-adaptive RCT assigns 150 treatment / 150 control households, stratified by sub-district, grade, and EIAI tercile. Treatment receives a plain-language *Educational Decision Handbook* (flowcharts, checklists, glossary) plus a 30-minute orientation. The primary outcome is the Decision Quality Score (DQS): enrollment alignment, deadline compliance, and decision confidence. ITT ANCOVA follows Muralidharan and Sundararaman (2015); Cohen's d with 95% bootstrapped CI (10,000 replications). Attrition risk is mitigated by non-overlapping residential clusters; multiple imputation ($m = 20$) if attrition exceeds 15% (Shadish et al., 2002).

Phase 3 — Spatial Mapping. Sub-district EIAI means are mapped in ArcGIS 10.8; Moran's I identifies "information desert" clusters ($p < 0.05$). Geographically weighted regression, controlling for migrant proportion and median income, tests whether transit access and community centers predict barrier severity (Xiang et al., 2018).

V. Conclusion

Finally, the combination of the Educational Information Accessibility Index (EIAI), a plain-language handbook intervention, and spatial "information desert" mapping represents a targeted and cost-effective approach to address the signal-to-noise discrimination gap facing low-income families in urban China—without requiring large-scale infrastructural reform. Existing educational equity initiatives have focused primarily on resource distribution and device access, overlooking the primary barrier of information quality and institutional comprehension. There is an urgent need not only to address the symptoms of educational inequality, but to restore families' capacity to navigate increasingly complex policy environments. This integrated framework represents a new diagnostic and policy avenue that may transform how municipal education bureaus identify and serve the most informationally marginalized communities in urban China. Total budget: ¥2,850; 12-month timeline aligned with the 2025–26 enrollment cycle; no ethics waiver required beyond standard consent.

References

- Duflo, E., Glennerster, R., & Kremer, M. (2007). Using randomization in development economics research: A toolkit. In T. P. Schultz & J. A. Strauss (Eds.), *Handbook of development economics* (Vol. 4, pp. 3895–3962). Elsevier.
- Epstein, J. L. (2001). *School, family, and community partnerships: Preparing educators and improving schools*. Westview Press.
- Guo, C., & Iredale, R. (2004). The impact of the hukou system on migrants. *Asian Survey*, 44(2), 288–305.
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis* (2nd ed.). Guilford Press.
- Lareau, A. (2003). *Unequal childhoods: Class, race, and family life*. University of California Press.
- Ministry of Education of the People's Republic of China. (2022). Notice on comprehensive implementation of the "double reduction" policy. <http://www.moe.gov.cn>
- Muralidharan, K., & Sundararaman, V. (2015). The aggregate effect of school choice: Evidence from a two-stage experiment in India. *The Quarterly Journal of Economics*, 130(3), 1011–1066.
- National Bureau of Statistics of China. (2022). *China statistical yearbook 2022*. China Statistics Press.
- Nguyen, T. (2008). *Information, role models and perceived returns to education: Experimental evidence from Madagascar* (MIT Working Paper). MIT.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.
- Van Dijk, J. A. G. M. (2020). *The digital divide*. Polity Press.
- Warschauer, M. (2003). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.
- Woronov, T. E. (2015). *Class work: Vocational schools and China's urban youth*. Stanford University Press.
- Wuhan Municipal Bureau of Statistics. (2023). *Wuhan statistical yearbook 2023*. Wuhan Municipal Government Press.
- Xiang, L., Stillwell, J., Burns, L., Heppenstall, A., & Norman, P. (2018). A geodemographic classification of sub-districts to identify education inequality in Central Beijing. *Computers, Environment and Urban Systems*, 70, 59–70.
- Xiang, L., Stillwell, J., Burns, L., & Heppenstall, A. (2020). Measuring and assessing regional education inequalities in China under changing policy regimes. *Applied Spatial Analysis and Policy*, 13, 91–112.