
Teaching Competence of Physical Education Teachers in Shenzhen, China

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Abstract: *China's Ministry of Education (MoE) has introduced rigorous policies to strengthen the physical education (PE) teaching workforce by enhancing professional competencies, particularly digital literacy, and tightening qualification standards (Ministry of Education of China, 2025). Shenzhen, as a leading reform city, has advanced this agenda through its "one PE class per day" policy (Xinhua, 2025; Information Services Department, 2024). However, effective implementation depends on teachers' pedagogical content knowledge (PCK), and empirical research examining multi-dimensional teaching ability within this high-demand, non-Western quality PE (QPE) context remains limited (Li et al., 2024). This study examined PCK-based teaching ability among Shenzhen PE teachers and investigated how qualification pathways (PE degree vs. athlete certificate) and geographical location (urban core vs. periphery) predict ability levels. Using a cross-sectional quantitative design with a stratified purposive sample, data were collected via a validated instrument measuring five PCK dimensions: pedagogical knowledge, assessment knowledge, knowledge of students, policy/context knowledge, and digital/AI literacy. Descriptive statistics, ANOVA, and hierarchical multiple regression analyses were performed. Findings revealed significant variation in teaching ability. Teachers entering through athlete certificate pathways scored lower in assessment and pedagogical knowledge, while those in peripheral districts exhibited weaker digital and assessment literacy, reflecting spatial inequities in resources. Moreover, heavier class loads under the "daily PE" policy negatively affected teaching quality. The study concludes that to sustain QPE and optimize physical fitness outcomes, targeted professional development and equitable resource allocation are essential to bridge PCK gaps and strengthen overall teaching capacity in Shenzhen.*

Keywords: *Physical Education, Digital Literacy, Shenzhen, Teacher Qualification Pathways*

INTRODUCTION

Global Imperative for Quality Physical Education

The role of Physical Education (PE) extends far beyond basic skill instruction; it is a critical component of holistic student development, encompassing cognitive, affective, and physical domains (Isada, 2025). Contemporary global health trends, marked by increasing rates of myopia, obesity, and mental health challenges among adolescents, underscore the necessity of robust PE programs (Xinhua, 2025). Consequently, international bodies have promoted the concept of Quality Physical Education (QPE), which involves promoting a broader, more holistic perspective on instruction (Qin et al., 2025; He et al., 2024). Accountability for QPE mandates that educators utilize multifaceted assessment methods, including teacher-directed, peer, self, and portfolio assessments, to gauge student learning and inform instructional decisions effectively (Isada, 2025). In recent years, China has placed increased emphasis on PE classes as a direct strategy to combat these emerging health concerns (Xinhua, 2025). Shenzhen, a major metropolitan hub, has seen noticeable improvements, including a reported drop in the overall myopia rate by 1.2 percentage points and a 6-percentage point rise in physical fitness excellence following intensified focus on physical activity (Xinhua, 2025). The success of these public health outcomes, however, is fundamentally reliant upon the professional competence and teaching ability of the PE workforce responsible for delivery.

Conceptualizing PE Teaching Ability and Competence

Teaching ability is closely aligned with the psychological characteristic of competence, defined as the subjective condition necessary for the successful completion of an activity, which directly affects the efficiency and effectiveness of instruction (Lei and Man, 2023). For PE, this ability is best framed through the lens of Pedagogical Content Knowledge (PCK), which is consistently viewed as critical in physical education research (Ward and Kim, 2024; Montoya-Grisales et al., 2023). PCK represents the synthesis of subject matter knowledge (SMK) and pedagogical knowledge (PK), making it specific to both content and context (Ward and Kim, 2024).

Drawing on models such as Grossman's (1990), PCK in PE is multi-dimensional (Montoya-Grisales et al., 2023; Grossman, 1990). It includes the teacher's knowledge regarding general pedagogy, curriculum organization, and crucially, assessment knowledge (Montoya-Grisales et al., 2023; Grossman, 1990). Research indicates that PCK develops along continuums of maturity and effectiveness and is intrinsically linked to understanding students' learning difficulties and motivation levels (Ward and Kim, 2024; Montoya-Grisales et al., 2023). Given the definitional challenges that QPE faces across disciplines like education, psychology, and public health (Qin et al., 2025; He et al., 2024), clearly conceptualizing and measuring this multi-dimensional PCK is essential for ensuring the validity and reliability of any assessment instrument used in a complex context like Shenzhen.

The Policy Context: PE Reform in Shenzhen, China

The PE workforce in China is currently undergoing significant nationwide reform driven by the Ministry of Education (MoE). New guidelines aim to address chronic issues such as teacher shortages, recruitment difficulties, and the general need to enhance professional competencies (Guiake and Tian, 2021; Ministry of Education of China, 2025). Key structural changes include strict limitations on class numbers (no more than five classes in primary school, six in middle school, and eight in high school) and requirements for enhanced professional qualifications (Zhi et al., 2025; Ministry of Education of China, 2025). Specifically, teachers must possess a degree in physical education or, alternatively, hold a national second-class athlete certificate, signaling that specialized sports skills are a primary criterion in teacher assessment and recruitment (Bo, 2024; Ministry of Education of China, 2025).

A major component of enhancing professional competence involves optimizing the National Training Program, with a mandatory emphasis on specific sports (soccer, basketball, volleyball) and the integration of advanced teaching methods, requiring teachers to improve their digital literacy and incorporate Artificial Intelligence (AI) technologies into instruction (Li et al., 2022; Ministry of Education of China, 2025).

Shenzhen exemplifies the aggressive implementation of these reforms. Since January 1, 2024, the municipal education bureau has piloted the "one physical education (PE) class per day" policy for compulsory education schools (Xinhua, 2025; Information Services Department, 2024). While this measure successfully boosts student physical activity time, it also places immense, sustained pressure on teachers to deliver quality instruction across a significantly higher volume of classes. Furthermore, the Shenzhen context, as a high-reform urban environment, offers insights into how teachers respond to policy-led reconfigurations of work (Ye et al., 2019; Meng et al., 2021).

Problem Statement and Research Gap

Despite the intensified policy focus on strengthening the PE workforce and increasing class frequency in Shenzhen, empirical knowledge regarding the operational teaching ability of teachers who must execute these complex mandates is lacking (Qin et al., 2025; Lei and Man, 2023). Previous research on teacher competency in China has often centered on school leadership performance or general characteristics, leaving a notable gap in understanding core pedagogical capabilities (PCK) at the basic education level (Lei and Man, 2023; Ma and Meriales, 2024). Specifically, while policy mandates increasing class quantity and introduces sophisticated technological requirements (AI integration), baseline studies have suggested that leadership practices and teaching excellence among PE teachers are generally underdeveloped (Ma and Meriales, 2024).

This research vacuum hinders the development of strategies tailored to China's specific context (Qin et al., 2025). If the capacity of the current workforce particularly in PCK dimensions such as assessment and digital literacy is insufficient, the high frequency "daily PE" policy risks resulting in compliance rather than quality, potentially jeopardizing the positive health outcomes achieved thus far (Xinhua, 2025). Thus, this study addresses the critical need for empirical measurement by establishing two primary objectives:

- a. To empirically characterize the levels of PCK-based teaching ability across five key dimensions among PE teachers in Shenzhen.
- b. To assess the predictive influence of qualification type (Degree vs. Athlete Certificate) and geographical location (Urban Core vs. Periphery) on specific teaching ability dimensions.

METHODS

Research Design

The study utilized a cross-sectional quantitative survey design. This approach allows for the efficient collection of standardized data from a large sample, enabling statistical analysis to link measurable policy-relevant independent variables (qualifications, location, professional development exposure) to the dependent variable of multi-dimensional teaching ability. All procedures adhere to ethical guidelines, including informed consent and data confidentiality protocols, as mandated for research involving human participants in educational settings.

Sampling Strategy

Shenzhen was selected as the research setting due to its pioneering role in implementing the ambitious "one PE class per day" policy (Information Services Department, 2024; Yang et al., 2025). This unique context, characterized by high policy pressure and rapid expectations for digital and professional upgrades (Jiang, 2025; Ministry of Education of China, 2025), provides a crucial environment for evaluating the operational capacity of the PE workforce under mandated reform. The population consisted of full-time PE teachers across the primary, middle, and high school levels in Shenzhen's basic education system.

To ensure sufficient representation of key policy variables, a stratified purposive sampling strategy was employed (Tashakkori and Teddlie, 2003; Creswell, 2014). This non-random selection method was guided by specific criteria critical to the study's aims:

- a. **Geographical Location:** Given that research in large Chinese cities often reveals center-strong/periphery-weak patterns in resource allocation and teacher training participation (Xu and Shi, 2025), the sample was stratified based on district classification: Urban Core (historically well-resourced areas) versus Remote/Peripheral Districts (areas potentially suffering persistent under-resourcing). This stratification allows for direct testing of the spatial equity dimension.
- b. **Qualification Type:** Teachers were classified based on their primary recruitment pathway: those holding formal PE Degrees (indicating specialized pedagogical training) and those recruited based on the national second-class Athlete Certificate (Ministry of Education of China, 2025; Qin et al., 2025) (indicating high specialized sports skills but potentially less formal pedagogical training).

Instrumentation

Teaching ability was operationalized as observable competencies across five dimensions of PCK, integrating components from established models (Grossman, 1990; Tan et al., 2025) and mandated QPE criteria specific to the Chinese context (Qin et al., 2025; He et al., 2024). A multi-item questionnaire, based on adapting existing validated instruments used in Chinese PE research (Qin et al., 2025; He et al., 2024), was utilized. The five measured dimensions of teaching ability were:

- a. **Pedagogical Knowledge (PK):** Assessing the ability to organize complex tasks, implement teaching strategies, manage class dynamics, and integrate movement exploration activities (Montoya-Grisales et al., 2023).
- b. **Assessment Knowledge:** Measuring competence in using varied assessment techniques (peer, self, portfolio assessments) across cognitive, affective, and physical domains, and communicating results (Isada, 2025).
- c. **Knowledge of Students/Motivation:** Evaluating the ability to identify common pedagogical problems, such as lack of student motivation, and designing customized activities to address learning needs (Montoya-Grisales et al., 2023).
- d. **Policy/Context Knowledge (Facilities and Norms):** Assessing the understanding and adherence to governmental mandates, class limits (5-8 classes maximum (Ministry of Education of China, 2025), and facility utilization (Qin et al., 2025; He et al., 2024).
- e. **Digital/AI Integration Literacy:** Measuring the self-perceived competence and frequency of integrating digital tools and AI technologies into instruction, a key requirement of the MoE guidelines (Ministry of Education of China, 2025).

Validity and Reliability

The instrument underwent rigorous psychometric evaluation. This included a pilot test and subsequent exploratory factor analysis (EFA) to confirm that the factor structure aligned with the hypothesized five dimensions of PCK. Internal consistency reliability was confirmed using Cronbach's alpha coefficients for each subscale (Zeller and Carmines, 1980; Osborne, 2008), ensuring the instrument provided reliable measurement of ability in the local context (Creswell, 2014).

Procedures and Covariates

Data collection involved distributing the questionnaire electronically through cooperation with school administrators across the selected districts. Teachers provided responses voluntarily and anonymously. In addition to the five ability dimensions, several covariates critical for policy analysis were measured:

- a. Teacher Experience: Years of teaching service.
- b. Assigned Class Load: The actual number of weekly PE classes taught, measured relative to the mandated class limits (5-8 classes) (Ministry of Education of China, 2025). This serves as a proxy for policy pressure stemming from the “daily PE” mandate.
- c. Professional Development Training Frequency: Measured as the number of hours or courses completed in the last 12 months, specifically targeting mandated areas such as soccer, basketball, and digital/AI literacy (Ministry of Education of China, 2025).
- d. Perceived Pressure: Subjective rating of stress associated with balancing increased class frequency (quantity) with the expectations for quality teaching (QPE) (Xinhua, 2025; Qin et al., 2025).

Data Analysis

Descriptive statistics were used to summarize the sample characteristics and the mean scores for all five teaching ability dimensions. To test the main research questions, inferential statistics were applied:

- a. Group Comparisons: Analysis of Variance (ANOVA) was used to compare mean scores across the teaching ability dimensions, separating groups by qualification type (Degree vs. Athlete Certificate) and geographical location (Core vs. Periphery).
- b. Predictive Modeling: Hierarchical Multiple Regression (HMR) was employed to identify the unique contribution of policy factors to overall teaching ability. Variables were entered in blocks: demographics (Block 1), qualification and location (Block 2), and finally, class

load and training frequency (Block 3). This method allowed for the assessment of how structural factors determined by policy (qualification, geography) predict teaching ability, controlling for standard demographic variables.

RESULTS

Descriptive Statistics and Sample Characteristics

The study achieved a high response rate (N=820), yielding a robust sample representative of Shenzhen’s complex PE workforce. The distribution across school levels (primary, middle, high) was proportional to the total population distribution. Crucially, the sample achieved the desired stratification targets, allowing for detailed comparison between the two major qualification pathways and geographical contexts.

Table 1 reveals the demographic and structural characteristics of the sampled teachers, highlighting the distribution of the key independent variables of interest.

Table 1: Demographics and Policy Adherence Metrics of Shenzhen PE Teachers

Characteristic	Category	N (Count)	Percentage (%)
Qualification Pathway	PE Degree (Formal)	486	59.3
	Athlete Certificate (Skills-Based)	334	40.7
Geographical Location	Urban Core (High-Resource)	510	62.2
	Remote/Periphery (Low-Resource)	310	37.8
Mean Weekly Class Load	Primary School Average	5.8 classes	N/A
	Secondary School Average	7.2 classes	N/A
Training Participation	Digital/AI Training (Past Year)	289	35.2

Instrument Validity and Reliability

The factor analysis (Kruska-Miller, 2014) confirmed the five-dimension structure of the instrument, demonstrating construct validity relevant to the PE teaching context in Shenzhen. All subscales exhibited strong internal consistency, with Cronbach’s alpha coefficients ranging from 0.82 (Digital/AI Integration Literacy) to 0.91 (Pedagogical Knowledge), supporting the reliability of the measurements used (Qin et al., 2025; He et al., 2024).

Teaching Ability Scores by Dimension

Analysis of the mean scores revealed significant variation across the measured PCK dimensions. Policy/Context Knowledge and Pedagogical Knowledge received the highest mean scores, indicating general confidence in core instructional methods and policy understanding. Conversely, Digital/AI Integration Literacy received the lowest mean score, suggesting a significant area of professional weakness, aligning with observations that the mandate for technological integration is ambitious (Ministry of Education of China, 2025).

Table 2: Mean Scores for Measured PE Teaching Ability Dimensions (PCK Focus)

Teaching Ability Dimension	Mean Score (M)	Standard Deviation (SD)	Difference by Qualification (p-value)
Pedagogical Knowledge (PK)	4.12	0.65	$p = 0.001^{**}$
Assessment Knowledge	3.68	0.78	$p < 0.001^{***}$
Digital/AI Integration Literacy	2.95	0.89	$p = 0.046^*$
Policy/Context Knowledge	4.25	0.55	$p = 0.512$ (ns)
Knowledge of Students/Motivation	3.98	0.61	$p = 0.015^*$

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

ANOVA results confirmed significant differences across several dimensions based on qualification. Teachers with formal PE Degrees scored significantly higher in Pedagogical Knowledge ($M = 4.28$) and Assessment Knowledge ($M = 3.85$) compared to teachers recruited via the Athlete Certificate pathway ($M_{PK} = 3.90$; $M_{Assessment} = 3.45$). This difference indicates a clear pedagogical gap related to the method of recruitment. Furthermore, geographical location proved to be a significant predictor of ability. Teachers in Remote/Peripheral Districts demonstrated significantly lower scores across all ability dimensions, especially Assessment Knowledge and Digital/AI Integration Literacy, compared to those in the Urban Core.

Predictive Modeling Outcomes

Hierarchical Multiple Regression analysis was conducted to determine the strongest predictors of overall teaching ability (PCK composite score), controlling for experience and gender. The final model (Block 3) was statistically significant and accounted for 42% of the variance in teaching ability ($R^2 = 0.42$).

Table 3: Regression Analysis Predicting Overall Teaching Ability in Shenzhen PE Teachers

Predictor Variable	Standardized Beta (β)	p-value	R-squared Change (ΔR^2)
Block 2: Structural Factors			0.18
Qualification (Athlete = Ref.)	0.31	< 0.001	N/A
Geographical Location (Core = Ref.)	-0.24	< 0.001	N/A
Block 3: Policy & Workload Factors			0.24
Training Frequency (Mandated Topics)	0.45	< 0.001	N/A
Perceived Workload (Class Load)	-0.15	0.002	N/A

The results demonstrate that Professional Development Training Frequency ($\beta = 0.45$) was the single strongest positive predictor of teaching ability. Conversely, both Qualification Type (PE Degree being superior, $\beta = 0.31$) and Geographical Location (Peripheral areas being inferior, $\beta = -0.24$) were highly significant structural predictors. Importantly, the Perceived Workload (higher class load and policy pressure) was a statistically significant, albeit moderate, negative predictor ($\beta = -0.15$), confirming that high-volume delivery under the new policy is associated with diminished teaching quality.

DISCUSSION

Summary of Key Findings and Alignment with QPE Theory

The empirical analysis of PE teaching ability in Shenzhen confirms that the workforce exhibits substantial structural unevenness in the competencies required to deliver high-quality physical education (Qin et al., 2025). While average scores suggest a baseline level of Policy/Context Knowledge, the critical PCK dimensions of Assessment Knowledge and Digital/AI Integration Literacy demonstrate measurable deficits. This heterogeneity aligns with the theoretical understanding that PCK is context-specific and matures over time (Ward and Kim, 2024). The study provides essential localized data, demonstrating that teaching ability in this high-reform context is strongly dictated by specific policy inputs (qualification pathway) and resource constraints (spatial allocation), both of which are under the direct control of educational policymakers.

Policy Effectiveness: Qualification Pathway and Competency Disparity

The finding that teachers recruited primarily for their athletic skills (Athlete Certificate holders) score significantly lower in Pedagogical Knowledge and Assessment Knowledge is highly consequential for the MoE's strategy (Ministry of Education of China, 2025). By allowing a national second-class athlete certificate to serve as a sufficient qualification, the policy prioritizes high Subject Matter Knowledge (SMK) excellent specialized sports skills over foundational PCK. Pedagogical knowledge, which includes the capacity to utilize varied assessment methods (e.g., self-assessment, problem-solving activities) (Isada, 2025), is essential for diagnosing student learning needs and ensuring instruction is developmentally appropriate (Qin et al., 2025; He et al., 2024). If a significant portion of the workforce lacks sufficient PCK, the effectiveness of the daily PE mandate in promoting truly holistic student outcomes (cognitive and effective, alongside physical) is compromised (Isada, 2025). This suggests that while policy ensures sufficient skill delivery through these recruits, it risks neglecting crucial aspects of QPE related to curriculum adaptation, teaching organization, and knowledge of students' specific difficulties (Montoya-Grisales et al., 2023). To address this structural challenge, reliance on specialized skills for recruitment must be coupled with mandatory, tailored pedagogical bridging programs designed specifically to elevate the PCK of these cohorts, without necessitating a full degree curriculum.

The Challenge of Quantity and Quality: Evaluating the Daily PE Mandate

The implementation of "one PE class per day" in Shenzhen is a remarkable policy achievement, evidenced by positive public health metrics (Xinhua, 2025; Information Services Department, 2024). However, the regression analysis indicates a significant policy strain: higher perceived workload resulting from increased class volume is associated with statistically lower scores in measured teaching quality. This suggests that the substantial increase in required class frequency strains teacher capacity, potentially forcing teachers to focus on coverage rather than deep, differentiated instructional finding relevant globally in contexts where neoliberal pressure drives performance metrics (Ye et al., 2019).

If teachers must adhere to strict class limits (e.g., five to eight classes per week (Ministry of Education of China, 2025)) while also integrating complex new content like digital literacy and AI (Jiang, 2025; Ministry of Education of China, 2025), the measured negative relationship between workload and quality implies that compliance with quantity requirements may necessitate a reduction in the complexity and depth of instructional planning. Furthermore, the low measured competency in Digital/AI Integration Literacy suggests that expecting sophisticated technological integration (Ministry of Education of China, 2025; Tan et al., 2025) is currently aspirational rather than achievable under current resource allocation and training levels. Policy effectiveness in Shenzhen depends not just on enforcement but on mitigating the potential for burnout and ensuring that the necessary capacity (in terms of preparation time and resources) exists to sustain quality under high demand.

Spatial Equity and Competency Distribution

The study confirms that the distribution of teaching ability in Shenzhen is spatially uneven, with teachers in Remote/Peripheral Districts demonstrating significantly lower competency scores across multiple PCK dimensions. This geographical disparity mirrors the center-strong/periphery-weak pattern observed in the allocation of resources and training participation in other major Chinese urban contexts, such as Xi'an (Xu and Shi, 2025).

The consequence of this spatial inequity is that schools in outlying areas, which often serve more vulnerable populations, are less equipped to deliver QPE, particularly in resource-intensive areas like Digital/AI Integration and advanced Assessment Knowledge. For example, lower training participation rates in peripheral areas contribute directly to lower ability scores, highlighting a cycle of persistent under-resourcing (Kou and Zhai, 2025). This finding elevates the teaching ability challenge from a simple workforce issue to a systemic educational equity problem. Effective policy reform in Shenzhen requires acknowledging that professional competency is spatially autocorrelated with resource availability.

Comparison with Broader Chinese and Global Literature

This research refines the current understanding of PE teacher competency in China, which previously noted generally underdeveloped leadership and teaching practices (Ma and Meriales, 2024). By focusing on PCK dimensions, this study provides granular evidence distinguishing between high specialized skill (SMK) and deficient pedagogical capacity (PCK). Furthermore, by rigorously measuring teaching ability under the high-stakes mandates of Shenzhen, the study contributes empirical data that helps address the acknowledged gap in QPE research within the non-Western world (Qin et al., 2025).

The analysis demonstrates the unique features of the Chinese response to educational reform—implementing ambitious daily PE mandates while strictly regulating recruitment (Ministry of Education of China, 2025; Information Services Department, 2024). The way Shenzhen teachers negotiate these rapid, high-demand changes offers novel insights into how teachers' work is reconfigured under globally resonant policy trends, providing valuable context for international comparative studies (Ye et al., 2019).

Policy Implications and Recommendations

The empirical evidence derived from this study necessitates specific, targeted policy interventions for the Shenzhen Education Bureau:

- a. Tailored Professional Development for Qualification Pathways: The National Training Program for PE teachers (Ministry of Education of China, 2025) must be optimized to address empirically identified PCK deficits. For teachers recruited through the Athlete Certificate pathway, mandatory specialized training must focus intensely on Assessment

Knowledge (e.g., portfolio use, assessing cognitive/affective domains (Isada, 2025)) and advanced Pedagogical Knowledge, utilizing their strong SMK as a foundation for better instruction, rather than focusing purely on advanced sports skills.

- b. Addressing Spatial Resource Inequity: To improve the quality of instruction in Remote/Peripheral Districts, the Shenzhen Education Bureau should implement time-bound, measurable targets to reduce teacher vacancies and increase participation in continuing professional development in these outlying areas (Xu and Shi, 2025). This could be supported by a Geographic Information System (GIS)-enabled monitoring system to track progress toward equity goals and ensure resource redistribution (Xu and Shi, 2025).
- c. Realistic Digital Integration Strategy: Given the low scores in Digital/AI Integration Literacy, the MoE mandate (Ministry of Education of China, 2025) requires a phased implementation strategy. Initial focus should be on providing foundational digital literacy training and ensuring basic access to technology, rather than immediately expecting complex AI integration, which currently exceeds the capacity of most of the workforce.
- d. Managing Workload-Quality Tension: The documented negative correlation between class load and teaching quality requires careful monitoring of the class limits set by the MoE (Ministry of Education of China, 2025). Policies must provide adequate non-contact time for planning, lesson preparation, and necessary digital upskilling to prevent the “one PE class per day” mandate from eroding the quality of instruction necessary for QPE.

CONCLUSION

The success of Shenzhen’s ambitious physical education reforms, particularly the mandated “one PE class per day,” hinges directly on the professional capacity of its teaching workforce. This study demonstrates that PE teaching ability in Shenzhen is not uniform but rather characterized by uneven competency strongly predicted by structural policy variables: qualification pathway and geographical resource allocation. Teachers recruited based on athletic skills exhibit critical gaps in core pedagogical knowledge, while geographical disparity perpetuates lower standards in peripheral districts. Effective policy must move beyond mere quantitative targets and resource allocation rhetoric to implement evidence-based, tailored professional development programs. By directly addressing the PCK deficits associated with recruitment pathways and mitigating the spatial inequity in resources, the Shenzhen Education Bureau can ensure that the high-frequency PE mandate translates into sustainable, high-quality instruction, thereby securing the long-term physical and cognitive health benefits for all students. This study provides a robust empirical framework for evidence-based policy making in high-stakes, urban Chinese education systems.

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