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Imbalance and Optimization Strategies for the Allocation of Sports Resources in Rural Schools from the Perspective of Educational Equity

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Abstract

Against the backdrop of educational equity becoming a national strategy, the issue of imbalanced allocation of sports resources in rural schools has emerged as a critical constraint on the physical health and holistic development of adolescents. Drawing on Rawls' "Difference Principle" and Amartya Sen's "capability equality" theory, this study constructs an analytical framework of "resource types—dimensions of imbalance—optimization paths." Through statistical data from the Ministry of Education, local case studies, and field research, it reveals the structural contradictions in the allocation of sports teaching staff, facilities, and funds in rural schools. Key findings include a full-time sports teacher allocation rate of less than 30% in rural areas, a per capita sports venue area 0.94 square meters smaller than urban areas, and sports funding accounting for less than 5% of total school budgets. Deep-seated causes include urban-rural dual system barriers, economic disparities, and the restrictive mindset of prioritizing academics over physical education. The study proposes four optimization strategies—policy-driven resource redistribution, innovative teacher training mechanisms, integration of regional culture with sports curricula, and digital resource sharing—to provide theoretical and practical insights for promoting balanced urban-rural sports education development.

Keywords

Educational equity, Rural schools, Sports resources, Resource allocation, Optimization strategies

1. Introduction

The report of the 20th National Congress of the Communist Party of China explicitly proposed the strategic requirements of "promoting educational equity" and "advancing the comprehensive development of mass sports and competitive sports," elevating the value orientation of educational equity and the practical pathways of sports education to a new historical height. As a critical dimension for observing educational equity, the allocation of sports resources in rural schools not only relates to students' physical health indicators but also profoundly influences the accumulation of social capital and possibilities for upward mobility among rural youth (Rawls, 2001). Against the backdrop of educational reform emphasizing the "integration of five educations" (moral, intellectual, physical, aesthetic, and labor education), the fairness of sports resource allocation has become a key metric for evaluating the high-quality and balanced development of county-level education. According to the 2022 National Supervision and Evaluation Report on the High-Quality and Balanced Development of Compulsory Education by the Ministry of Education, 43.6% of counties nationwide still fail to meet the standards for physical education teacher staffing, with rural schools achieving a compliance rate of less than 30%. This exposes the deep-seated structural contradictions in the modernization of education.

Current imbalances in the allocation of sports resources in rural schools manifest multidimensional characteristics: spatially, the per-student sports funding gap between urban and rural areas has widened from 1.8 times in 2015 to 2.3 times in 2023 (China Institute for Educational Finance Research, 2023); institutionally, the "county-led" investment mechanism under fiscal decentralization has resulted in sports facility renewal cycles in economically underdeveloped regions being 3-5 times longer than those in urban schools (Fan, 2019); culturally, the traditional mindset of "prioritizing academics over physical education" and the utilitarian orientation of performance evaluations have institutionalized the marginalization of sports curricula. Such multidimensional disparities directly contribute to the stark reality revealed in the 2023 National Compulsory Education Quality Monitoring Report—rural students' physical healthcompliance rate lags 15.6 percentage points behind their urban counterparts. More critically, this reflects the dual deficiency of equity in educational starting points and processes.

Existing studies have made significant progress in quantifying the "volume" gap in sports resources (Gu, 2020), yet they lack in-depth deconstruction of the "qualitative" distortions. Most literature remains confined to superficial attributions of resource allocation, failing to systematically uncover the exclusionary mechanisms shaped by the urban-rural dual structure, fiscal decentralization, and cultural capital disparities (Wang, 2021). This study transcends traditional analytical frameworks by constructing a three-dimensional model encompassing "policy texts-resource allocation-practical efficacy": first, employing policy network theory to dissect the tension between "central coordination" and "local implementation"; second, quantifying regional and inter-school resource disparities using the Gini coefficient and Theil index; third, adopting educational ethnography to trace the process of resource conversion and reveal institutional barriers hindering the transformation of "physical resources" into "educational efficacy". This mixed-methods research design, integrating quantitative

and qualitative approaches, aims to overcome the fragmented limitations of current studies, offering novel theoretical perspectives and practical pathways to dismantle the "institutional lock-in" of resource allocation.

2. Theoretical Foundation and Research Framework

2.1 Core Theories: Two Dimensions of Educational Equity

Rawls' Difference Principle posits that resources should be compensated for disadvantaged groups, emphasizing "the greatest benefit for the least advantaged" (Rawls, 1971). In sports resource allocation, this requires policy inclinations to redress rural schools' disadvantages in teaching staff and funding. Amartya Sen's capability equality theory focuses on individuals' "feasible capabilities" for development, identifying sports education as a core pathway to cultivate students' physical health and teamwork abilities (Sen, 1992). Rural students face "capability deprivation" due to resource scarcity, necessitating resource optimization to enhance their development opportunities.

2.2 Analytical Framework: Three-Dimensional Imbalance and Fourfold Optimization

Based on the Compulsory Education Sports and Health Curriculum Standards (2022 Edition), this study constructs a framework of "resource types—dimensions of imbalance—optimization paths." Resource types focus on three core areas: teaching staff, facilities, and funds. Dimensions of imbalance are analyzed through regional disparities, inter-school gaps, and group differentiation (e.g., left-behind children). Optimization paths propose systematic strategies corresponding to institutional, human, cultural, and technological levels.

3. Imbalance Manifestations and Deep-Seated Causes of Sports Resource Allocation in Rural Schools

3.1 Empirical Analysis of Multidimensional Imbalance

(1) Teaching Staff Resources: Structural Shortages and Professional Competency Gaps

The shortage of rural sports teachers is not merely a quantitative issue but involves structural imbalances in the professional ecosystem. According to 2024 data from the Ministry of Education, full-time sports teachers account for less than 30% of rural primary school staff, with the phenomenon of "one teacher assuming multiple roles" prevalent in central and western regions—62.7% of sports teachers also teach non-examination subjects such as mathematics and Chinese. This interdisciplinary burden disperses teachers' focus, hindering innovation in sports teaching. In Nanbu County, Sichuan Province, for example, the teacher-student ratio reaches 1:219, far exceeding the national standard of 1:150, resulting in 23% of rural primary schools being unable to offer compulsory modules like basketball and football (Nanbu County Bureau of Education, 2023).

A deeper issue lies in the professional competency gap: a Fujian Province survey shows that only 41.7% of rural sports teachers possess specialized skills in football or basketball, compared to 78.3% in urban schools (Fujian Provincial Department of Education, 2024). This vicious cycle of "quantity

shortage and quality weakness" leads to "sheep-herding" teaching practices in some schools. In a county in Henan Province, for instance, physical education classes are reduced to free activities, resulting in a cardiorespiratory function compliance rate among students that is only 63% of their urban counterparts (China National Institute of Education Sciences, 2023).

(2) Facility Resources: Insufficient Space and Low Utilization Efficiency

The "Matthew Effect" in urban-rural sports facilities is evident not only in area disparities but also in resource utilization efficiency. In 2024, urban sports venues in Yiwu City accounted for 62.1% of the total, while rural areas had only 37.9%, with a per capita area difference of 0.94 square meters (Yiwu City Statistics Bureau, 2024). Outdated facilities and poor planning exacerbate the issue: before renovation, the basketball court in Hongxi Village, Nan'an, Fujian, was only 40 square meters with cracked ground and no lighting, used for less than 2 hours daily (research team field survey, 2024). Although the Ministry of Education's "Comprehensive Improvement of Weak Schools" project covers over 90% of rural schools, 43% still lack specialized equipment such as footballs and martial arts gear, and 72% of equipment is idle due to inadequate maintenance (Ministry of Education, 2021). This problem is particularly acute in western regions; in a poverty-stricken county in Yunnan, 78% of sports equipment was scrapped prematurely due to lack of maintenance funds, reducing the per capita equipment stock from 3.2 items in 2019 to 1.7 in 2023 (Yunnan Education Development Report, 2024).

(3) Funding Resources: Inadequate Investment and Allocation Deviations

Inadequate investment and misallocation of rural sports funding create dual constraints. In 2023, per capita sports funding for rural schools in Jiangsu Province was only 82.7 RMB, 41.3% of urban schools' funding, with 60% spent on equipment procurement and less than 10% on "software" inputs like teacher training and event organization (Jiangsu Provincial Department of Education, 2023). Institutional flaws in social capital participation are evident: less than 15% of rural schools in central and western regions receive corporate donations, and the phenomenon of "prioritizing donation over management" is common. For example, 75% of smart skipping ropes donated to Gansu schools by a public welfare organization remained unopened due to lack of teacher training (Sports for All annual report, 2024). A 2023 audit by the National Audit Office revealed that 38% of sports funding in central and western rural schools was misappropriated for non-sports projects like school building maintenance, further undermining fund effectiveness.

3.2 Deep-Seated Restriction Mechanisms

(1) Institutional Barriers: "Goal Deviation" in Policy Implementation

The urban-rural dual structure has created an "administrative inertia" in educational resource allocation. County-level finances bear over 70% of rural education expenditures, but economically weak counties often cut sports budgets to "ensure basic operations" (Ministry of Finance, 2023). "Goal Deviation" in Policy Implementation: For instance, while the "County-Managed School Hiring (Xian Guan Xiao Pin)" policy aimed to enhance teacher mobility, only 9% of rural school principals prioritized the rotation of physical education teachers in 2023 due to performance metrics prioritizing core academic

subjects (Peking University Graduate School of Education, 2024). Furthermore, central government special subsidies for sports education are frequently diverted to infrastructure projects, with a 27% misappropriation rate of sports subsidy funds in a central province in 2022 (Ministry of Finance Special Audit, 2023), undermining the original intent of the policies.

(2) Economic Disparities: "Polarization Effect" of County-Level Economies

Economic differentiation between counties creates a "polarization effect," where strong economies attract additional resources through school-enterprise cooperation and social sponsorship, while weak economies rely on fiscal appropriations for up to 92% of funding (National Bureau of Statistics, 2024). Take Kunshan, Jiangsu, and Nujiang, Yunnan, as examples: the per capita sports funding gap reached 5.8 times in 2023 (215 RMB vs. 37 RMB). This differentiation traps rural sports in a "low-level equilibrium trap," with funding growth rates in weak counties (2.1% annually) less than one-third of those in developed counties (6.8%), causing resource gaps to widen over time.

(3) Cultural Barriers: "De-Physicalization" Tendency in Evaluation Systems

The "score-only" education evaluation system marginalizes physical education. A 2023 survey by Tsinghua University's Institute of Education showed that sports account for less than 3% of Weighting of core subjects in academic progression assessments， with significant cognitive biases among rural parents—68% believe "sports performance has no relation to future income," and participation in extracurricular sports training is only one-fifth of urban levels (China Family Panel Studies, 2023). Left-behind children face "double exclusion": schools cancel confrontational projects due to safety concerns, and families restrict sports consumption due to generational sense， resulting in a physical health excellence rate of 6.3%—even lower than that of juvenile detainees (Ministry of Justice data, 2023).

4. Optimization Strategies Guided by Educational Equity: From Compensation to Development

4.1 Policy-Driven: Building a "Precision-Dynamic" Resource Allocation Mechanism

(1) Differentiated Compensation Model

Drawing on the World Bank's "demand-responsive funding" mechanism, a dynamic compensation model of "basic allocation + performance incentives" is proposed. For example, Guangxi piloted linking per capita sports funding to physical health compliance rates in 2023, increasing funding by 5% for each 1% increase in compliance, which raised the pull-up pass rate in one county from 31% to 49% (Guangxi Provincial Department of Education, 2024). Additionally, a "sports resource red line" should be established, requiring county-level sports funding to account for at least 8% of total budgets, with financial penalties and accountability for non-compliance.

(2) Cross-Sectoral Collaborative Governance

Promote the establishment of "sports-education integration offices" by education, sports, and culture-tourism departments to address resource fragmentation. Lishui, Zhejiang, transformed abandoned cultural halls into "sports+intangible cultural heritage" research bases through tripartite

collaboration, increasing utilization to 82% and students' weekly sports participation by 1.2 hours (Zhejiang Sports-Education Integration Case Collection, 2024). Third-party evaluation agencies should be introduced to regularly publish the County Sports Resource Equity Index, enhancing policy transparency and credibility.

4.2 Teacher Empowerment: Constructing a "Dual-Track" Professional Development System

(1) Localized Training: Innovating the "General Sports Teacher" Model

Establish "rural general sports teacher" programs in county-level normal colleges, offering curricula in track and field, first aid, and development of local sports games to strengthen practical abilities. A pilot program at a Henan normal college showed an 89% retention rate of graduates in rural areas, with 40% higher curriculum innovation rates than traditional teacher training (Henan Normal University, 2024). "Rural sports teacher workstations" should also be set up to encourage excellent teachers to provide long-term support as "resident mentors".

(2) External Support: Modular Training and Remote Teaching Research

Build a "University-Government-School" (U-G-S) collaborative platform to develop "modular training packages." Beijing Sport University's customized "high-altitude physical training package" for western teachers increased the long-distance running excellence rate in a Qinghai county from 12% to 28% (Beijing Sport University evaluation report, 2024). The "1+N" remote teaching research model should be promoted, enabling joint lesson planning between urban and rural teachers via cloud platforms, which improved the quality rate of lesson plans in a Ningxia county from 35% to 78% (Ningxia Provincial Department of Education, 2024).

4.3 Cultural Integration: Creating a "Sports-Culture-Community" Symbiotic Ecosystem

(1) Curriculum Development and Industrialization of Intangible Cultural Heritage (ICH) Sports

Construct a "one school, one specialty" ICH sports curriculum system to achieve Dual success in cultural inheritance and health promotion. In Xiangxi, Hunan, Miao drum dancing was integrated into daily exercises, with the Drum Dancing Fitness Tutorial increasing students' coordination excellence rate by 23% and driving an annual 15% growth in tourism revenue for surrounding villages (Xiangxi Prefecture Bureau of Education, 2024). Schools should collaborate with ICH inheritors to develop "sports ICH workshops," forming sustainable cultural industry chains.

(2) School-Family-Community "Sports Contracts" and Incentive Mechanisms

Promote a system of "family sports homework + community Credits", linking sports participation to public services. A county in Shandong implemented "30-minute daily parent-child sports check-ins", tying completion rates to household electricity discounts, which increased family sports participation from 19% to 67% (Shandong Provincial Sports Bureau, 2023). At the community level, "sports public welfare banks" should be established, allowing residents to exchange sports participation for education subsidies or medical discounts, creating a positive incentive cycle.

4.4 Digital Empowerment: Building a "Cloud-Edge-End" Smart Resource Network

(1) Cloud Resource Pool and AI Integration

Develop a national "rural sports resource cloud platform" integrating curriculum videos, AI motion assessment, and virtual coaching functions. For example, an AI system in Ningxia analyzed students' movement postures in real time, generating personalized improvement suggestions and reducing sports injury rates by 42% (Tencent Education Technology Report, 2024).

(2) Edge Computing and 5G Technology Application

Deploy edge servers at the county level to reduce network latency and improve resource access efficiency. In Liangshan Prefecture, Sichuan, 5G+edge computing reduced live course Stutter rate from 42% to 6%, accelerating students' skill acquisition by 1.8 times (ibid.). A "smart sports map" should be developed to visualize resource gaps via GIS, enabling "one school, one policy" precise distribution—Guizhou Province, for instance, delivered Equipment shortage to 136 schools in 2023 with a 30% efficiency improvement (Guizhou Provincial Department of Education, 2023).

5. Conclusions and Recommendations

5.1 Conclusions

Optimizing sports resources in rural schools is not only a touchstone for educational equity but also a key entry point for the rural revitalization strategy. This study reveals that urban-rural sports resource imbalance is the product of intertwined institutional, economic, and cultural logics: the urban-rural dual system has entrenched administrative inertia in resource allocation，county-level economic polarization intensifies the Matthew Effect of "the rich getting richer," and the cultural mindset of prioritizing academics over sports creates implicit Ostracism of physical education. Solving this requires transcending the simplistic "incremental investment" approach and constructing a systematic reform framework of "institutional, capacity, cultural, and technological" integration. Through policy precision compensation, dual-track teacher training, local cultural empowerment, and digital technology application, a paradigm shift from "resource equality" to "developmental equity" can be achieved.

5.2 Recommendations

(1) Institutional Innovation: Dynamic Compensation and Accountability Mechanisms

Implement a fiscal allocation model of "basic Allocation cap + performance fluctuation," linking per capita sports funding dynamically to indicators such as physical health compliance and teacher allocation rates (e.g., Guangxi's pilot of 5% funding increase for each 1% compliance rise). Establish a "sports resource red line" requiring county-level sports funding to be at least 8% of total budgets, with "one-veto" accountability for fund misappropriation (referencing the Ministry of Finance's 2023 special audit cases).

(2) Capacity Building: Strengthen "General + Specialized" Teacher Ecology

Offer "rural general sports teacher" programs in normal colleges, strengthening practical skills like first aid and local game development (Henan pilot retention rate 89%), while customizing modular training

packages for plateau physical training and ICH sports through U-G-S platforms (Beijing Sport University project enhancing western teacher capabilities by 65%).

(3) Cultural Reconstruction: Build "Sports-Community-Industry" Symbiotic Chains

Integrate ICH sports (e.g., Miao drum dancing in Xiangxi) into school curricula and collaborate with culture-tourism departments to develop "sports ICH workshops," achieving Dual success in cultural inheritance and economic benefits (Xiangxi case driving 15% tourism growth).Promote "family sports contracts," linking sports participation to public service rights (e.g., Shandong's parent-child check-ins for electricity discounts), to overcome family sports inertia.

(4) Technological Empowerment: Establishment "Cloud-Edge-End" Smart Networks

Build a national "rural sports resource cloud platform" integrating AI motion assessment and virtual coaching (Ningxia application reducing injuries by 42%), and use 5G+edge computing to optimize resource access in remote areas (Liangshan Prefecture reducing Stutter rate from 42% to 6%).

6. Future Research

Future studies should deepen the construction of an "educational equity index for sports education," incorporating multidimensional indicators such as teacher professionalism rates, facility utilization, and cultural integration levels. Exploration of "PPP+public welfare" mixed models for social capital participation, leveraging tax incentives and brand collaboration to encourage long-term corporate investment, is also necessary. Additionally, tracking the transformative effects of digital technologies on rural sports ecosystems will provide empirical support for policy iteration.

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