

OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION FROM AN ECONOMIC MANAGEMENT PERSPECTIVE

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Abstract: With the development of socio-economic conditions, the importance of education has become increasingly prominent, and the reasonable allocation of educational resources plays a key role in improving education quality, promoting social equity, and driving sustainable economic development. From the perspective of economic management, this study focuses on the problems existing in the allocation of educational resources. In the current education system, resource distribution is markedly unequal: there are clear gaps in educational resources between urban and rural areas, among different regions, and between various types of schools. This not only affects students' access to quality education but also limits the overall advancement of education standards. At the same time, the efficiency with which educational resources are used is low, with instances of waste and underutilization, preventing these resources from achieving their maximum benefit. To address these issues, this study employs relevant theories and methods from economic management to conduct an in-depth analysis of resource allocation in education. By using cost-benefit analysis, it evaluates the outputs generated by different educational resource investments to identify the optimal resource distribution scheme. Additionally, it introduces market mechanisms and competitive structures to enhance the efficiency of resource use, foster healthy competition among educational institutions, and stimulate their innovative vitality. The research findings indicate that optimizing the allocation of educational resources can effectively improve educational equity and raise education quality. Reasonable resource distribution allows more students to benefit from high-quality educational resources and narrows the educational gaps between urban and rural as well as among regions. Simultaneously, improving resource utilization efficiency helps reduce education costs and achieve sustainable use of educational resources. In summary, research on optimizing educational resource allocation from the economic management perspective holds significant theoretical and practical value. This study provides valuable reference for education policy formulation and resource management, contributes to the healthy development of education, cultivates more high-quality talents for society, and promotes economic prosperity and social progress.

Keywords: Educational resource allocation; Education quality; Sustainable economic development; Economic management perspective

1 INTRODUCTION

Educational resource allocation plays a critical role in educational development. Educational resources are the material basis and guarantee for carrying out educational activities and achieving educational objectives, encompassing human resources, physical assets, and financial support. Reasonable allocation of educational resources can provide solid backing for the development of education, help improve educational quality, cultivate high-caliber talents who meet societal needs, and promote social progress and economic growth. High-quality teaching staff can impart richer knowledge and skills, advanced instructional equipment can offer students a better learning experience, and sufficient educational funding can ensure the smooth conduct of educational activities. However, from the perspective of economic management, there are numerous problems and challenges in current educational resource allocation. In terms of inputs, the total amount of educational funding remains insufficient: although the state continues to increase its investment in education, there is still a gap compared to the actual needs of educational development. Moreover, the structure of educational funding is not reasonable: some regions place excessive emphasis on higher education investment while underinvesting in basic education, resulting in lagging development at the foundational level. The channels for sourcing educational resources are also relatively singular, relying mainly on government appropriations, with low enthusiasm for social-capital participation, making it difficult to meet the diversified needs of educational development[1]. In terms of distribution, some schools experience idle teaching equipment and wasted faculty resources, failing to maximize the benefits of educational resources. Inefficiencies in instructional management and research administration further prevent educational resources from being used rationally and effectively. These issues severely constrain the development of education, undermine the realization of educational equity, and hinder improvements in educational quality. Therefore, it is imperative to optimize educational resource allocation from the economic-management perspective. By conducting in-depth research into the economic-management issues of educational resource allocation, identifying existing problems and deficiencies, and proposing corresponding optimization strategies and recommendations, we can enhance the utilization efficiency of educational resources, promote educational equity and quality, and drive the sustainable development of education. In the current education system, under-utilization of resources is pronounced: many schools have high idle rates for teaching equipment, teachers' instructional abilities are not fully leveraged, and the efficiency of research-resource utilization is low. From the economic-management perspective, we can introduce advanced management concepts and methods—for example, establishing a scientific

performance-evaluation mechanism to incentivize teachers to improve teaching quality and research output, thereby fully leveraging teachers as the core educational resource; and employing information-technology tools to facilitate sharing and optimized utilization of educational resources, reducing redundant construction and waste, and thus improving efficiency across teaching, research, and administration. Promoting educational equity and enhancing quality are the core demands of educational development: educational equity is a fundamental basis for social fairness, yet the current imbalance in resource allocation severely impedes its realization. Through this study, we aim to optimize resource allocation to narrow gaps between urban and rural areas, regions, and schools, ensuring every student can enjoy fair and high-quality educational resources. Simultaneously, reasonable allocation and efficient utilization of resources can provide strong guarantees for improving educational quality: sufficient funding can improve teaching conditions, excellent faculty can raise instructional standards, and advanced equipment can enrich pedagogical methods. From the economic-management perspective, by comprehensively considering both the social and economic benefits of education, we can pursue equity while improving quality, cultivate more high-caliber talents suited to societal development needs, and guide the education sector toward greater fairness and higher quality[2].

This study explores the optimization of educational resource allocation from the perspective of economic management, carrying significant theoretical and practical implications and playing a key role in enriching allocation theory, guiding practice, and promoting the sustainable development of education. Although there has been considerable research on educational resource allocation, systematic analysis through the economic management lens remains relatively scarce. Numerous theories in the economic management field—such as resource scarcity theory, cost-benefit analysis, and equity-efficiency theory—offer new perspectives and methods for studying educational resource allocation. By introducing these theories into education research, we can expand both the scope and depth of allocation theory: for example, resource scarcity theory emphasizes rational distribution under limited conditions, prompting a reexamination of resource finitude and considerations of how to maximize educational benefits; cost-benefit analysis provides quantitative means to assess the rationality of allocation, enabling a more scientific measurement of the input-output relationship; and equity-efficiency theory draws attention to balancing fairness with efficiency, thereby refining the goals and principles guiding allocation. At the practical level, this study offers crucial guidance for resource-allocation practice. First, by analyzing the current state of educational resource allocation, we can accurately identify existing problems in input, distribution, and utilization efficiency—for instance, understanding regional and tiered disparities in funding to pinpoint weak links and inform targeted investment strategies; uncovering imbalances between urban and rural, regional, and inter-school allocations to direct optimization efforts and promote equity; and evaluating wasteful or inefficient practices in teaching, research, and administration to propose concrete improvement measures that enhance utilization efficiency[3]. Second, the optimization model and proposed strategies and recommendations developed in this study provide concrete operational schemes for practice: the model, grounded in scientific methods and an indicator system, yields optimal allocation plans to inform decision-makers, while the targeted, actionable strategies for improving input, distribution, and utilization efficiency can guide practical resource-allocation work and ensure that educational resources are used more rationally and effectively. Finally, reasonable allocation of educational resources underpins the sustainable development of education: by optimizing allocation and improving utilization efficiency within limited resource conditions, more high-quality talents can be cultivated to provide intellectual support for socioeconomic development; promoting equity ensures that a broader population can access quality educational resources, thereby raising overall national competence and fostering social harmony and progress; and establishing robust guarantee mechanisms—such as policy support, monitoring and evaluation systems, and social participation channels—can ensure the effective implementation of optimization measures and provide the institutional foundation for the sustainable development of education.

2 MODELS OF EDUCATIONAL RESOURCE ALLOCATION

2.1 Definition and Significance of Educational Resource Allocation

Educational resource allocation refers to the process by which society, according to the needs of educational development, distributes and utilizes various educational resources across different regions, schools, educational levels, and academic disciplines. It encompasses human resources, material assets, financial support, and more, aiming to achieve educational objectives and functions through rational arrangement. In essence, educational resource allocation is not merely a simple distribution of resources but a dynamic and complex systems-engineering endeavor. It involves multiple dimensions—quantity, quality, structure, and effectiveness of resources—and requires comprehensive consideration of factors such as equity, efficiency, and adaptability. Whether allocation is reasonable directly impacts equality of educational opportunity, improvement of education quality, and coordination between education and socio-economic development. Allocation should follow certain principles. First, the principle of equity demands that every learner enjoys relatively equal educational resources, eliminating disparities caused by geography, family background, or other factors. Whether in urban or rural areas, developed or underdeveloped regions, there must be reasonable guarantees in resource distribution. Second, the principle of efficiency seeks to maximize educational output under limited resource conditions. By optimizing how resources are used and structured, utilization efficiency can be improved, avoiding waste and idleness. Finally, the principle of adaptability requires that resource allocation align with socio-economic development needs, cultivating the types of talent society demands[4].

2.2 Common Models of Educational Resource Allocation

The common models of educational resource allocation include the government-led model, the market-driven model, and the hybrid model. Under the government-led model, the state plays a decisive role by formulating education policy, planning development, and allocating funding to centrally manage resources. This ensures equity and public welfare, directing resources to disadvantaged groups and underdeveloped areas, though it may suffer from inefficiencies and lack flexibility. The market-driven model emphasizes market mechanisms: schools and institutions adjust their resource inputs and distributions based on demand and compete to improve quality and efficiency. However, it can lead to over-concentration of resources in profit-generating regions and fields, exacerbating inequity. The hybrid model combines government macro-control with market regulation, guaranteeing basic equity while enhancing utilization efficiency. Here, government ensures fundamental fairness, and the market optimizes resource allocation within that framework. These concepts, principles, and models form the basic theoretical framework of educational resource allocation, providing an important foundation for subsequent optimization research from an economic-management perspective. By thoroughly understanding these theories, we can better analyze existing allocation issues and propose targeted optimization strategies. Key economic-management theories offer crucial guidance: resource scarcity theory highlights that limited funding, teachers, and facilities require rational prioritization—allocating scarce funds to the most impactful areas; cost-benefit analysis provides quantitative methods to compare investment costs (purchase, operation, maintenance) against long-term social and economic returns, ensuring maximum payoff; and the equity-efficiency framework balances equal opportunity with effective use by directing more support to disadvantaged regions while optimizing school layouts and teacher training to avoid waste. These interrelated theories must be applied in combination with real-world conditions to continuously refine allocation plans, improve efficiency, and promote healthy educational development[5].

Education and the economy interact in close and complex ways, profoundly affecting resource allocation. Classical economists like Adam Smith noted that education enhances worker skills and productivity, driving growth, while Marx emphasized education's role in producing labor capacity critical for development. Modern human-capital theory further argues that investment in education—improving knowledge, skills, and health—forms the backbone of economic expansion. Educational externality theory adds that benefits extend beyond individuals to society at large, fostering overall economic progress[6]. Education boosts growth by raising labor quality—systematic training equips workers with advanced skills, improving productivity (e.g., technically trained industrial workers operate equipment more efficiently)—and by driving innovation, as universities and research institutes cultivate talent that develops new technologies, prompting industrial upgrades and structural shifts (for example, internet growth rests on computer-science education and research). It also optimizes industrial structure by shifting labor from primary to secondary and tertiary sectors, enhancing economic sophistication. Conversely, economic development shapes allocation: wealthier regions allocate more fiscal revenue to education—coastal areas often outspend central and western regions, resulting in better facilities and faculty—and sectoral shifts direct resources toward disciplines aligned with emerging industries (e.g., new-energy programs receive extra support). Advanced economies also harness market mechanisms and information technologies to adjust allocations to demand and share resources widely—online education, for instance, disseminates quality materials broadly. In summary, interaction theories reveal both education's vital contributions to growth and how development influences allocation. Deep understanding of these mechanisms enables optimization of resource allocation from an economic-management perspective, fostering coordinated, sustainable advancement of education and the economy.

3 ANALYSIS OF THE CURRENT STATUS OF EDUCATIONAL RESOURCE ALLOCATION FROM THE PERSPECTIVE OF ECONOMIC MANAGEMENT

3.1 Current Status of Educational Resource Inputs

From an aggregate standpoint, in recent years China's investment in educational resources has continued to rise, with government fiscal education spending accounting for over 4 percent of GDP, reflecting the state's strong emphasis on education; this growing investment has provided a solid material foundation for educational development, gradually improving school infrastructure and strongly supporting faculty development. In terms of input structure, however, imbalances have emerged: basic education—the cornerstone of the system—enjoys relatively stable funding, yet resources remain insufficient in some remote and rural areas, while higher education—vital for training high-level talent and fostering research innovation—has received substantial support, especially at key universities investing heavily in research projects and discipline building; vocational education has attracted increased attention and funding in recent years but still lags behind general education in overall investment. Funding sources have become more diversified: national budgetary appropriations remain the primary source, ensuring basic operations for schools at all levels; social donations—from enterprises, charitable organizations, and individuals—serve as an important supplement; and institutional revenues such as tuition and accommodation fees help alleviate funding pressure. Significant regional disparities persist: economically developed eastern coastal regions with higher fiscal revenues invest adequately in education—schools there boast modern facilities and can attract excellent teachers—whereas central and western regions, with slower economic growth and limited education funding, see much larger gaps in infrastructure and faculty quality; for example, schools in some remote mountainous areas may lack basic teaching equipment and suffer from

insufficient, unevenly qualified teaching staff. Disparities across education levels also remain: preschool education has grown rapidly yet still suffers from underinvestment—private kindergartens often face unstable staffing and high fees—while compulsory education, though a national priority with stable funding, continues to exhibit an urban–rural divide, leaving rural schools with considerable room for improvement in facilities and staffing; in higher education, “double first-class” universities receive far more resources than ordinary institutions, driving differentiated development but risking excessive concentration of resources and undermining educational equity[7].

3.2 Problems in Educational Resource Allocation

Educational resources are distributed unevenly across schools at all levels and types, among different disciplines, and between urban and rural areas, which undermines educational equity and quality improvement: in higher education, key institutions receive disproportionately more investment—government funding tilts toward “double-first-class” universities to build top-level research facilities and recruit leading talent, granting them advanced laboratories, extensive library collections, and international exchange opportunities, whereas ordinary and especially local colleges face resource shortages, outdated equipment, and weak faculty, hindering their ability to attract excellent students and staff and widening institutional gaps; in basic education, high-quality resources concentrate in a few key primary and secondary schools staffed by experienced teachers, equipped with comprehensive facilities and modern pedagogy, fueling “school-choice fever,” while weaker schools suffer teacher attrition and insufficient enrollment, compromising education quality. Discipline-level allocation is likewise skewed: popular and applied fields such as computer science and finance—driven by labor-market demand—attract more funding for laboratories and industry-expert instruction, while foundational disciplines like philosophy and history lag in facility upgrades and research funding, and emerging fields in their infancy lack faculty and equipment, stifling innovation. The urban–rural divide is especially pronounced: urban schools enjoy greater fiscal support for modern teaching buildings and sports facilities, better teacher remuneration and development opportunities that draw top educators, and advanced multimedia and networked learning resources, whereas rural schools—hamstrung by limited local budgets—face dilapidated infrastructure, obsolete teaching equipment, a shortage of qualified teachers with little systematic training, and slow adoption of educational technology, depriving rural students of quality learning experiences. This imbalance both exacerbates inequality of educational opportunity—limiting some students’ development—and impedes overall quality improvement, resulting in wasteful and inefficient resource use[8]. Research resource utilization further suffers from low funding-use efficiency—some projects overstate needs yet misuse funds on unrelated expenses; project duplication across teams leads to scattered, wasted investment; major research equipment is rarely shared beyond its home unit, underutilizing costly assets; and low commercialization rates leave many findings confined to papers and reports, squandering potential productivity. School management also exhibits inefficiencies: bloated administrative structures and redundant personnel slow decision-making, cumbersome approval procedures hinder teaching and research, and unscientific human-resource management fails to fully motivate staff; financial planning often lacks foresight and precision, causing some programs to be underfunded while others hoard idle funds; and asset management lapses in registration, auditing, and maintenance lead to loss and waste of fixed resources.

3.3 Analysis of Factors Affecting Educational Resource Allocation

From an institutional perspective, the absence of comprehensive management regulations and supervisory mechanisms for educational resources means their use lacks effective constraints and norms; from a conceptual standpoint, some schools and educators do not fully appreciate the scarcity of educational resources and lack awareness of conserving and using them efficiently; and from a technical angle, low levels of educational informatization and the absence of effective resource-sharing platforms and management tools impede reasonable allocation and high-efficiency utilization of resources.

In terms of instruction, there is significant room to improve resource utilization efficiency. Regarding faculty, some teachers’ instructional abilities are not fully leveraged: in certain schools, teaching loads are unevenly assigned—some teachers are overburdened with courses, diluting their focus and preventing in-depth development of pedagogy and content, which undermines quality; others have too few assignments, leading to underutilization of staff. Moreover, teacher-training resources are not used optimally: although schools organize various training activities, much of the content is disconnected from actual classroom needs, and teachers struggle to apply what they learn in practice, resulting in wasted training expenditure. As for instructional facilities, laboratories, multimedia classrooms, and other equipment in many schools are underused—due to lack of effective management and scheduling, these assets often sit idle and fail to meet student needs. Textbook resources are similarly wasted: outdated materials that are not revised in a timely manner continue to be used, depriving students of up-to-date knowledge and adding unnecessary costs[9].

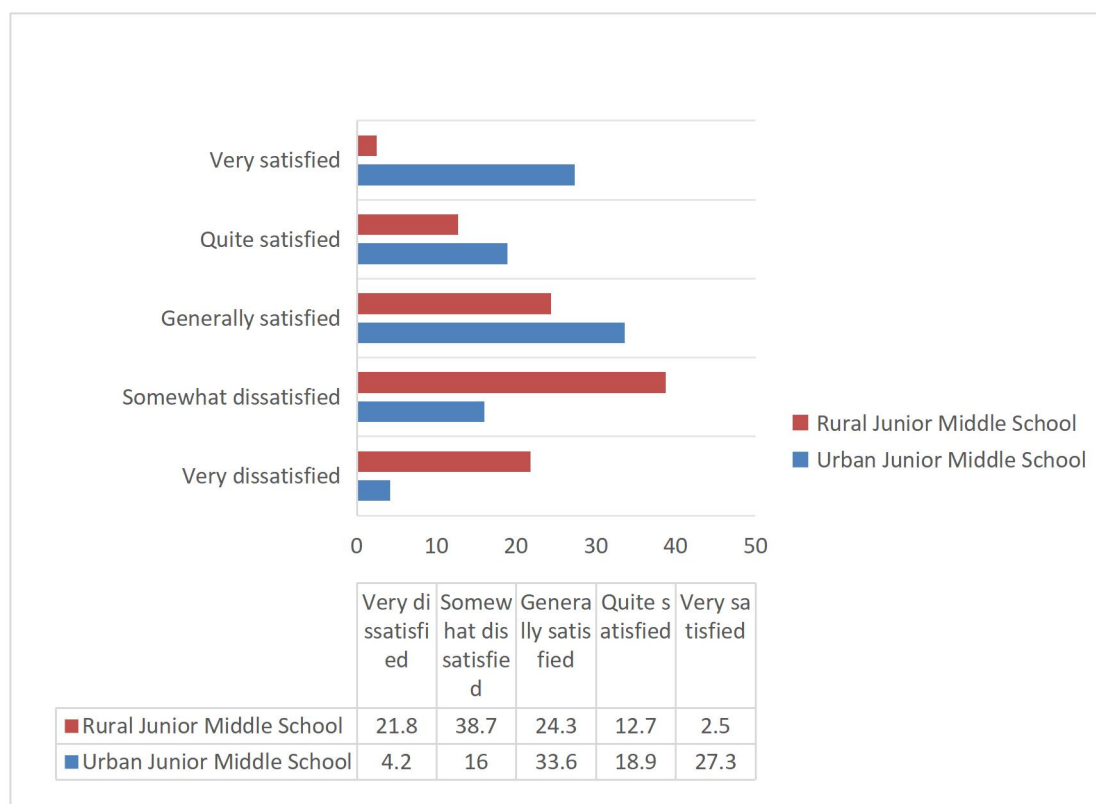
3.4 Survey on Teachers’ and Students’ Satisfaction with Venues and Equipment

Adequate venues and equipment are fundamental conditions for physical education (PE) teaching. As PE integrates both theory and practice, it heavily relies on the support of textbooks and equipment, with practical instruction depending on the availability of venues and facilities. This study conducts a statistical survey on the satisfaction levels of PE teachers and students from urban and rural junior high schools in a certain city regarding sports venues and equipment, with the results presented as follows:

Table 1 Statistics on the Satisfaction of Urban and Rural Junior High School PE Teachers with Sports Venues and Equipment in a Certain City

Satisfaction Level	Urban Junior Middle School (n = 59)		Rural Junior Middle School (n = 27)	
	Count	Percentage (%)	Count	Percentage (%)
Very dissatisfied	1	3.4	7	25.9
Somewhat dissatisfied	5	8.5	4	29.6
Generally satisfied	19	32.2	9	33.3
Quite satisfied	27	45.8	4	14.8
Very satisfied	7	11.9	0	0

According to Table 1, it can be observed that urban junior high school PE teachers in a certain city reported significantly higher levels of "generally satisfied," "relatively satisfied," and "very satisfied" with sports venues and equipment compared to their rural counterparts, accounting for 32.2%, 45.8%, and 11.9%, respectively. In contrast, rural junior high school PE teachers reported higher levels of "very dissatisfied" and "somewhat dissatisfied," accounting for 25.9% and 29.6%, respectively. Overall, from the perspective of PE teachers, urban junior high schools show a higher level of satisfaction with sports venues and equipment than rural schools, indirectly reflecting that sports facilities and equipment in rural areas are insufficient to meet the needs of physical education. The satisfaction levels of PE teachers and students regarding sports venues and equipment also reflect the actual situation of urban and rural junior high schools in the city. As shown in Figure 1, the satisfaction levels of urban junior high school students are mainly concentrated in the categories of "generally satisfied" and "very satisfied," accounting for 33.6% and 27.3%, respectively. The proportion of students who were "very dissatisfied" was the lowest at only 4.2%. In contrast, rural junior high school students' satisfaction levels were mainly concentrated in the categories of "very dissatisfied" and "somewhat dissatisfied," accounting for 21.8% and 38.7%, respectively, with only 2.5% being "very satisfied." Overall, at the student level, satisfaction in urban areas is still higher than that in rural areas. This finding is consistent with the previous survey results on sports venues and equipment. The relatively old and rudimentary condition of sports facilities and equipment in rural areas is the main reason for the lower satisfaction levels among PE teachers and students.

**Figure 1** Statistical Chart of Student Satisfaction with Sports Venues and Equipment in Urban and Rural Junior High Schools of a Certain City

3.5 The Logical Approach to Educational Resource Allocation Amid Changes in the School-Age Population Structure

At present, the structural and trend-based changes in the school-age population present dynamic challenges that are difficult for the education sector to address. It is necessary for educational resource allocation to not only meet the demands of fairness, efficiency, and stability, but also to reconsider the narrative logic for constructing a grand

framework based on the human condition. Following the developmental logic of school-age population structure, population mobility, and high-quality demographic development, educational resource allocation should construct a logical narrative that supports educational equity and high-quality, balanced development (as shown in Figure 2).

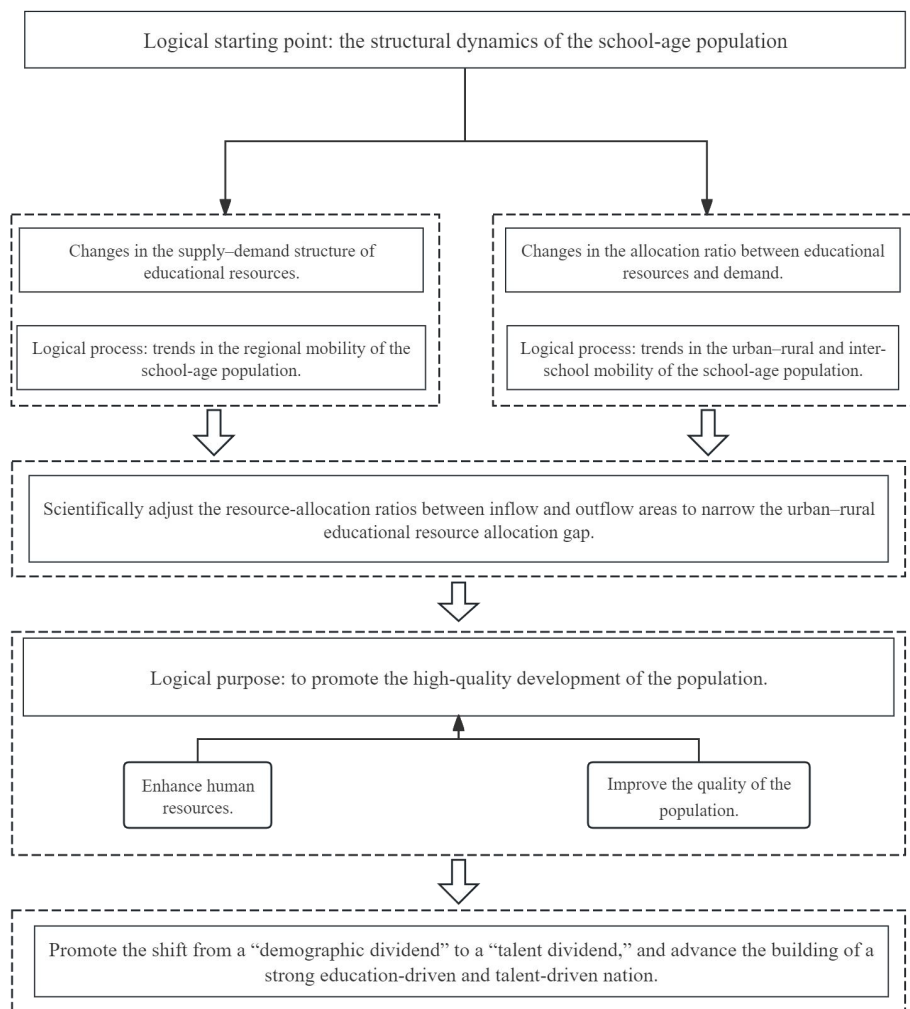


Figure 2 The Logical Approach to Educational Resource Allocation Amid Changes in the School-Age Population Structure

As the fundamental subject at the intersection of education and demography, changes in the school-age population primarily influence factors such as student enrollment numbers, scale of school-age population, gross enrollment rate, and urbanization rate of enrolled students, driving structural transformations in the supply and demand of educational resources. Educational resource allocation, as a macro-level practice focusing on regions, schools, and educatees, requires the regional structure of school-age population as its logical starting point for precise implementation. Behind the inverted pyramid structure characterized by a "wide top and narrow base" in school-age population lies the suppressed fertility intentions of childbearing-age populations, rationalized fertility attitudes, and delayed childbearing ages. Serving as the cornerstone for maintaining educational equity and justice, educational resource allocation emphasizes the pursuit of high-quality balanced development and comprehensive educational advancement. Its core concerns relate to the quantitative aspects of school-age populations across various educational levels and types, as well as actual educational demands, highlighting the principle of proportional resource distribution. It can be stated that structural changes in school-age population not only constitute the contextual background but also serve as the reference framework for educational resource allocation - functioning both as the practical starting point and a directional influencer for allocation practices. Educational resource allocation requires analytical determination based on school-age population structures, referencing their compositional patterns across different educational levels and types, while treating demographic variations in student populations and structural changes in enrollment across educational stages as fundamental logical premises[10].

4 CONSTRUCTION OF AN ECONOMIC MANAGEMENT MODEL FOR OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION

4.1 Objectives and Principles of Educational Resource Allocation Optimization

The establishment of objectives for optimizing educational resource allocation forms the foundation for constructing an economic management model, encompassing multiple critical dimensions. Enhancing educational quality stands as one of the core objectives. High-quality education cultivates individuals with innovative capabilities, critical thinking, and practical skills, which are vital for holistic personal development and societal progress. Through rational resource allocation, schools can be equipped with advanced teaching facilities, excellent faculty, and scientific curriculum systems, providing students with a conducive learning environment and thereby elevating overall educational quality. Promoting educational equity is another pivotal objective. Educational equity ensures that all students, regardless of urban or rural residency or family economic status, have access to relatively balanced educational resources. This helps break down class stratification, offers equal developmental opportunities, and mitigates social inequalities arising from resource disparities. Improving socioeconomic benefits is equally essential. Education serves as a key driver of economic growth and social development. Rational resource allocation fosters the cultivation of professionals aligned with market demands, promotes technological innovation and industrial upgrading, and injects momentum into economic growth. Simultaneously, high-quality education enhances civic literacy and cultural standards, contributing to social harmony and stability.

To achieve these objectives, corresponding principles must be established. First, the integration of equity and efficiency: During resource allocation, fairness must be prioritized to ensure basic educational opportunities and resources for all students, while efficiency must be pursued to avoid resource waste or underutilization. Through rational planning and distribution, limited resources can yield maximum benefits. Second, the adaptability principle: Resource allocation should align with socioeconomic development levels, flexibly adjusting investments and distributions based on regional economic conditions, demographic structures, and industrial demands. Concurrently, it must respect the inherent developmental patterns of education to meet the needs of diverse educational tiers and types. Third, the dynamic principle: Education is an evolving field, and socioeconomic environments are in constant flux. Thus, resource allocation cannot remain static; dynamic adjustment mechanisms must be established to optimize and refine allocations in response to emerging realities. Fourth, the sustainability principle: Resource allocation should prioritize long-term benefits, ensuring rational utilization and conservation of resources. Investments must account for resource renewability and environmental compatibility, avoiding overexploitation and waste to achieve sustainable educational development. By clarifying these objectives and principles, a robust foundation is laid for constructing an economic management model for optimizing educational resource allocation[11].

The construction of a scientific and rational indicator system for optimizing educational resource allocation is critical to achieving rational distribution and efficient utilization. This system encompasses input indicators, distribution indicators, and utilization efficiency indicators. Input indicators measure the foundational aspects of resource allocation, reflecting societal prioritization and investment in education. For total educational funding, the aggregate financial inputs from governments, private sectors, and other stakeholders over a specified period should be quantified, as this constitutes the material basis for educational development. Input structure indicators focus on the proportional distribution of funds across educational stages (e.g., preschool, basic, and higher education), educational types (e.g., general vs. vocational education), and internal educational components (e.g., teaching facilities, teacher training, research investments). Funding source indicators analyze the contributions from government budgets, social donations, tuition fees, and other channels, where diversified funding sources enhance resource stability and sustainability. Additionally, human resource inputs, including teacher quantity, qualifications, and expertise, are vital, as high-quality faculty is central to improving educational outcomes.

Distribution indicators assess the equity of resource allocation across different dimensions. For inter-school distribution, disparities in funding, equipment, and faculty quality among schools (e.g., elite vs. ordinary schools) must be quantified to expose imbalances. Interdisciplinary distribution indicators evaluate resource allocation between popular and niche disciplines or foundational and applied fields, ensuring balanced support for all academic domains. Urban-rural distribution indicators focus on gaps in infrastructure, faculty, and digital resources between urban and rural schools, where narrowing these disparities is crucial for advancing equity.

Utilization efficiency indicators evaluate the effectiveness of resource use in teaching, research, and administration. For teaching, per-student output indicators measure academic performance, graduation rates, or skill levels relative to resource inputs, such as the number of students achieving specific benchmarks per unit of funding. In research, conversion rates of academic outputs gauge the socioeconomic impact of research investments, including citation rates or patent commercialization. For administration, cost-effectiveness ratios assess the efficiency of administrative expenditures (e.g., personnel costs, operational expenses) relative to institutional outcomes. Resource idle rates, reflecting underutilized assets (e.g., equipment, classrooms), further highlight opportunities for efficiency gains. By establishing this comprehensive indicator system, quantitative insights into resource allocation can guide the identification of inefficiencies, enabling targeted improvements to achieve sustainable educational development.

In optimizing educational resource allocation, the application of scientific economic management models—such as linear programming and analytic hierarchy process (AHP)—is pivotal for deriving optimal solutions. These models will be elaborated in subsequent sections.

4.2 Construction of an Economic Management Model for Educational Resource Allocation

The linear programming model is a widely used mathematical optimization method that seeks optimal solutions for an objective function under a set of linear constraints. In educational resource allocation, the objective can be defined as maximizing educational outputs, such as improving overall student performance or increasing research productivity, while treating total resource inputs and allocation ratios across resource types as constraints. For instance, consider optimizing the distribution of educational funds among primary, secondary, and tertiary education in a region to maximize comprehensive educational benefits. Let $(x_1), (x_2), (x_3)$ represent the funds allocated to primary, secondary, and tertiary education, respectively. The objective function can be formulated as $(Z = a_1x_1 + a_2x_2 + a_3x_3)$, where $(a_1), (a_2), (a_3)$ denote the educational benefit coefficients per unit of funding for each education level. Constraints may include: total funding limitations $(x_1 + x_2 + x_3 \leq M)$ (where M is the region's total available educational funds); minimum funding guarantees for each education stage $(x_1 \geq m_1), (x_2 \geq m_2), (x_3 \geq m_3)$. Using optimization methods like the simplex algorithm, the maximum value of Z under these constraints can be determined, yielding an optimal funding distribution plan.

The analytic hierarchy process (AHP) model, on the other hand, is a decision-making method that decomposes complex problems into hierarchical levels and determines the relative importance of factors through pairwise comparisons. In educational resource allocation, it enables the integration of multiple objectives and factors, such as equity, quality, and socioeconomic impact.

Constructing the AHP hierarchy typically involves three layers:

1. Goal layer: Educational resource allocation optimization.
2. Criteria layer: Includes criteria such as educational inputs, distribution equity, and utilization efficiency.
3. Alternative layer: Represents different resource allocation strategies.

Next, pairwise comparison matrices are constructed. For criteria within the criteria layer, their relative importance to the goal is assessed through expert evaluations or data analysis. For example, comparing the significance of "educational inputs" versus "distribution equity" in optimization and assigning corresponding weights. Similarly, pairwise comparisons are conducted for alternatives relative to each criterion.

Subsequently, weights for hierarchical elements are calculated by solving eigenvalues and eigenvectors of the comparison matrices, yielding relative weights for criteria and alternatives. Finally, comprehensive scores for alternatives are computed by synthesizing weights across levels, with the highest-scoring alternative identified as the optimal allocation strategy.

In practical applications, model validation and adjustment are essential. By collecting empirical data, the model's accuracy and effectiveness are verified. If significant deviations from real-world observations occur, parameters, constraints, or objective functions must be refined to ensure the model authentically reflects actual resource allocation dynamics, thereby providing scientifically robust decision-making support for optimization.

5 STRATEGIES AND RECOMMENDATIONS FOR OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION

5.1 Resource Investment Strategies

Optimizing educational resource allocation requires a tripartite investment approach. First, governments must prioritize education in fiscal planning by establishing stable funding growth mechanisms that exceed regular revenue increases, with explicit targets for educational expenditure as a percentage of GDP. Second, structural optimization involves balancing allocations across educational tiers—strengthening compulsory education while increasing investments in preschool, vocational, and higher education—along with equitable disciplinary funding to support both foundational and emerging fields. Third, diversifying funding sources through corporate partnerships incentivized by tax benefits, transparent donation frameworks, and innovative financial instruments (e.g., education bonds) ensures sustainable resource mobilization[12].

5.2 Equity-Efficiency Principles in Resource Allocation

Rational distribution necessitates balancing equity and efficiency. Equity requires bridging urban-rural gaps through rural infrastructure upgrades, equitable teacher allocation via improved compensation and cross-regional exchanges, and targeted funding for underdeveloped regions. Efficiency demands precision allocation aligned with institutional needs—such as directing specialized resources to schools with unique profiles (e.g., arts or STEM-focused institutions)—and dynamic adjustments based on demographic shifts. Transparency mechanisms like public allocation dashboards and audit systems enhance accountability while preventing misallocation.

5.3 Enhancing Resource Utilization Efficiency

Efficiency improvements rely on three pillars: Institutional management optimization through streamlined curricula, rigorous financial controls, and facility maintenance minimizes waste. Teacher capacity building via continuous training, pedagogical innovation incentives, and performance evaluations maximizes instructional quality. Educational informatization—deploying digital infrastructure (e.g., smart classrooms, online platforms) and promoting technology-

integrated teaching—enables scalable resource sharing and accessibility. These integrated strategies collectively drive sustainable, equitable, and high-impact educational development.

6 SAFEGUARD MECHANISMS FOR OPTIMIZING EDUCATIONAL RESOURCE ALLOCATION

6.1 Policy Safeguards

Effective policy frameworks are critical for optimizing educational resource allocation. Governments at all levels must coordinate fiscal and educational policies to ensure rational adjustments and efficient utilization. Fiscal policies should prioritize increased educational investment, gradually raising the proportion of education expenditure in GDP to guarantee sustainable funding. Funding structures must be optimized to favor basic education, rural schools, and underdeveloped regions through mechanisms like special education funds for rural infrastructure and teacher welfare. Transfer payments to economically disadvantaged areas can enhance resource accessibility, while tax incentives (e.g., corporate/personal income tax reductions) should encourage private sector participation[13]. Educational policies require scientifically grounded development plans aligned with regional needs, alongside reforms in enrollment systems (e.g., district-based or consortium school models) to break institutional barriers and promote resource sharing. Teacher policies should strengthen workforce mobility, incentivizing talent relocation to rural and underperforming schools through improved compensation, career advancement opportunities, and rural service allowances. Curriculum and evaluation reforms must prioritize holistic education to enhance quality. Legal frameworks, such as an Educational Resource Allocation Act, should codify responsibilities for governments, schools, and stakeholders, ensuring equity and accountability. Regular policy evaluations and adjustments based on implementation outcomes are essential to maintain relevance and effectiveness.

6.2 Monitoring and Evaluation Systems

A robust monitoring and evaluation (M&E) system is indispensable for ensuring accountability and continuous improvement. Evaluation entities should include government agencies, schools, independent assessors, and stakeholder representatives (students/parents). Government bodies oversee macro-level alignment with national strategies, schools provide operational feedback, third-party assessors ensure objectivity, and beneficiaries voice practical impacts. Evaluation criteria must comprehensively address input adequacy, structural equity (geographic, institutional, disciplinary), and utilization efficiency (academic, economic outcomes). Quantitative methods (statistical analysis, cost-benefit metrics) and qualitative approaches (surveys, field studies) should be integrated, supplemented by comparative analyses to identify regional or institutional gaps. Evaluation cycles should balance short-term reviews (annual funding audits) with longitudinal assessments (3–5 years for efficiency trends), supported by interim progress tracking. Transparent reporting mechanisms and corrective actions based on findings ensure iterative optimization of resource allocation[14].

6.3 Social Participation Mechanisms

Multistakeholder engagement is vital for diversified and sustainable resource allocation. Corporate investments can take the form of direct contributions (e.g., funding, equipment donations) or collaborative projects (e.g., industry-academia R&D partnerships), enhancing institutional capabilities while addressing market needs. Government incentives (tax breaks, subsidies) can amplify corporate participation. Philanthropic donations from organizations and individuals should be channeled into infrastructure upgrades, scholarships, and grants, with transparent management systems to build donor trust. Public recognition of contributors fosters a culture of educational philanthropy. Family-school collaboration empowers parents as active partners through curriculum input, volunteer programs, and joint initiatives that align educational practices with student needs. Schools should institutionalize parent engagement via workshops and feedback channels[15]. Governments must facilitate cross-sector partnerships through supportive policies, while schools create platforms for collaboration. By integrating corporate, philanthropic, and community resources, a synergistic ecosystem emerges, driving equitable and sustainable educational development.

This comprehensive safeguard system—encompassing policy coherence, rigorous M&E, and inclusive participation—ensures that educational resource optimization aligns with societal needs, operational realities, and long-term developmental goals.

7 EMPIRICAL RESEARCH

This empirical research aims to verify the effectiveness of the education resource allocation optimization model and strategy based on the perspective of economic management. To ensure the scientificity and reliability of the research, the following detailed explanation of the research design is provided. The study selected 100 primary and secondary schools from regions with different economic development levels in China, covering the developed eastern regions, the moderately developed central regions, and the underdeveloped western regions. Primary and secondary schools were chosen as the research objects because they represent the basic stage of national education, and the optimization of resource allocation at this stage is crucial for the development of the entire education system. The samples from different regions can adequately reflect the status quo and problems of education resource allocation under different

economic environments. In terms of research methods, a combination of questionnaire surveys, interviews, and case analysis was used. The questionnaire survey is one of the main data collection methods. Different questionnaires were designed for school administrators, teachers, and students. The questionnaire for school administrators mainly involves information about the investment, allocation, and management of education resources, such as the sources of school funding and resource allocation policies; the teacher questionnaire focuses on the usage and demand for teaching resources, such as the provision and usage frequency of teaching equipment and the demand for educational informatization resources; the student questionnaire focuses on students' perception and utilization of educational resources, such as whether they can fully use the school's library, laboratory, and other resources. The questionnaire survey allows the collection of large amounts of quantitative data, providing a basis for subsequent data analysis. The interview method was mainly used to gain in-depth insights into the actual situation of education resource allocation and existing problems. Interviews were conducted with principals, teachers, and education department staff from some schools. Interviews with principals help understand the difficulties and challenges faced by schools in resource allocation and their views and suggestions on optimizing resource allocation; interviews with teachers help understand the actual demands and effectiveness of resource use in teaching; interviews with education department staff help understand the background and situation of policy formulation and implementation. The interview method provides rich qualitative data to complement the deficiencies of the questionnaire survey. The case analysis method selected a number of representative schools for in-depth study. By analyzing the successful experiences and failures of these schools in education resource allocation, we summarized models and strategies that can be referenced. Case analysis provides practical case support for theoretical research, making the research results more practically significant.

The data sources primarily include three aspects. First, statistical data from the education department, which provides macro-level information on education resource investment and distribution, such as the total amount of educational funds and the proportion of educational funds in different regions. Second, internal data from schools, including financial statements, teaching resource usage records, etc., which reflect the resource allocation and utilization at the school level. Third, data collected through questionnaire surveys and interviews, which provide insights into the views and needs of school administrators, teachers, and students regarding education resources. Through the above research design, we can comprehensively and deeply understand the current situation and problems of education resource allocation, providing scientific and reliable data support to verify the effectiveness of the education resource allocation optimization model and strategy based on the economic management perspective. After collecting the data required for the empirical research, we conducted a comprehensive and in-depth analysis to verify the effectiveness of the education resource allocation optimization model and strategy based on the economic management perspective. First, in terms of data on education resource investment, we analyzed the changes in the total amount, structure, and source channels of educational funding before and after optimization. Through comparison, we found that after implementing resource investment strategies, the total amount of educational funding significantly increased. The strategy of expanding investment channels achieved some success, with a rise in the proportion of non-financial educational funding, such as social donations and corporate investments, in addition to government financial allocations. In terms of investment structure, the proportion of investment in weak regions and subjects significantly increased, which helps improve the disparity in education resource investment across different regions and levels. For education resource distribution data, we focused on the balance of resource allocation across various types of schools, different subjects, and urban and rural areas. According to the analysis results, the resource allocation strategy based on fairness and efficiency principles played a positive role. The gap in educational resources between urban and rural areas and between schools was reduced to some extent. For example, rural schools received more resources in teaching equipment and teacher allocation, and resource distribution across different subjects became more reasonable, avoiding the excessive concentration of resources in a few popular subjects. In terms of the efficiency of education resource utilization, we evaluated it by comparing relevant indicators before and after optimization in areas such as teaching, research, and management. The data show that strategies to improve resource utilization efficiency, such as strengthening internal management, improving teacher quality, and promoting educational informatization, achieved good results. The quality of teaching improved, and students' academic performance and overall quality were enhanced. Research output increased in both quantity and quality, and management efficiency improved, reducing resource waste and idle capacity. To verify the effectiveness of the education resource allocation optimization model more intuitively, we compared the optimized solutions derived from the model with the actual situation. The results showed that the resource allocation effect predicted by the model closely matched the actual situation after optimization. This indicates that the linear programming model and analytic hierarchy process model we constructed can, to some extent, accurately guide the optimization of education resource allocation. However, the data analysis results also reflect some issues. In terms of resource investment, although the total amount increased, the growth rate still lagged behind the demand for educational development. The enthusiasm of social forces to participate in education resource investment needs to be further increased, and some policies that guide social capital into the education sector are not sufficiently effective. In terms of resource distribution, although the gap was reduced, the absolute gap in education resources between urban and rural areas remains large, and the conditions of schools in some remote areas are still relatively poor. In terms of improving resource utilization efficiency, there is an imbalance in the promotion of educational informatization. Some schools, due to technical and financial constraints, have not fully utilized informatization to improve the efficiency of education resource utilization. Overall, the education resource allocation optimization model and strategy based on the economic management perspective are effective, and they have improved the current state of education resource allocation to some extent. However, some issues that need further attention have been exposed. In the future, it will be necessary to

further improve relevant policies, strengthen support for weak links, fully mobilize the enthusiasm of social forces, and continuously optimize the allocation of educational resources to achieve the long-term goals of educational fairness and quality improvement.

8 CONCLUSION AND PROSPECTS

This study systematically and in-depth explored the optimization of education resource allocation from the perspective of economic management, achieving a series of research results with significant value. At the theoretical level, this study comprehensively applied education resource allocation theory, economic management theory, and the theory of the relationship between education and economy, constructing a comprehensive and in-depth theoretical analysis framework. It elaborated on the connotations, principles, and models of education resource allocation, clarified the application principles of economic management theories such as resource scarcity, cost-benefit analysis, fairness and efficiency, and analyzed the impact mechanism of the interaction between education and economy on resource allocation. This not only enriched the theoretical system of education resource allocation but also provided solid theoretical support for subsequent empirical research and practical operations. In terms of the current situation analysis, the study thoroughly analyzed the status quo of education resource investment, distribution, and utilization efficiency. It found that while the total amount of education funding has increased, issues such as an unreasonable structure and relatively single sources remain, and significant disparities in education resource investment exist across different regions and levels. The phenomenon of uneven distribution of education resources is prominent, with obvious gaps between various types of schools, different academic disciplines, and urban and rural areas. Meanwhile, the efficiency of education resource utilization needs improvement, with certain levels of waste and inefficiency in teaching, research, and management. These findings provided clear practical evidence for proposing targeted optimization strategies.

By constructing an economic management model for optimizing education resource allocation, this study clarified the optimization goals and principles, designed a scientific and reasonable indicator system, and solved the optimization scheme using linear programming models, analytic hierarchy process models, and other economic management methods. The model comprehensively considered various objectives, including improving education quality, promoting educational fairness, and enhancing economic and social benefits, providing specific quantitative methods and operational paths for achieving efficient resource allocation. In terms of optimization strategies and safeguard mechanisms, this study proposed a series of targeted and operable suggestions. The resource investment strategy emphasized increasing the total amount, optimizing the structure, and expanding channels to ensure sufficient supply of education resources. The resource distribution strategy focused on fairness and efficiency principles, aiming to reduce the gaps between urban and rural areas, regions, and schools. The strategy to improve resource utilization efficiency explored the potential for improving efficiency from multiple aspects, including school internal management, teacher quality improvement, and the advancement of educational informatization. At the same time, a safeguard system including policy support, supervision and evaluation mechanisms, and social participation mechanisms was established to provide institutional guarantees for the effective implementation of optimization strategies. The empirical research section verified the effectiveness of the education resource allocation optimization model and strategy based on the economic management perspective. Through data analysis, it was found that the optimization scheme could significantly improve the efficiency of education resource utilization, promote educational fairness and quality improvement, further proving the practical value of this research.

Although this study has achieved certain results in optimizing education resource allocation from the perspective of economic management, there are still some shortcomings. First, there are limitations in data collection. The education resource data involved in this study mainly comes from publicly available statistical data and sampling surveys from a few schools. Public statistical data may have certain delays and statistical errors, while sampling surveys, limited by sample size and scope, may not fully and accurately reflect the real situation of education resource allocation. Especially for education resource data from special regions or types of schools, it is difficult to obtain, leading to potential bias in the research results. Second, there is some simplification in model construction. In constructing the education resource allocation optimization model, certain complex real-world factors were simplified to facilitate model solving and analysis. For example, when considering education resource distribution, the impact of different regional cultural backgrounds and individual student differences on education resource demand was not fully considered. These simplifications may affect the practical application of the model, making it less adaptable to the complex and changing reality of education resource allocation. Moreover, the time span of the empirical research is relatively short. This empirical study only selected data from a specific time period for analysis, and the time span is relatively short. Optimizing education resource allocation is a long-term dynamic process, and short-term data may not fully reflect the long-term effects and potential impacts of resource allocation optimization measures. Therefore, conclusions based on short-term data may lack stability and reliability.

To address the above research limitations, future research can be expanded in the following areas. In data collection and processing, cooperation with relevant institutions such as education departments and schools should be strengthened to establish a more complete data collection system. On one hand, efforts should be made to obtain more comprehensive, timely, and accurate education resource data, including data from more special regions and types of schools; on the other hand, advanced data processing technologies should be employed to clean and analyze the data, improving data quality and research accuracy. In model construction, the model should be further improved by fully considering more factors influencing education resource allocation, such as cultural backgrounds and individual student differences, to

make the model more aligned with the actual situation. At the same time, attempts can be made to combine various models for comprehensive analysis, enhancing the model's applicability and effectiveness. For example, combining linear programming models with system dynamics models could more comprehensively simulate the dynamic changes in education resource allocation. For empirical research, the time span of the study should be extended. Long-term tracking studies should be conducted to observe the implementation effects of education resource allocation optimization measures in different time periods and analyze their long-term impacts and trends. Long-term empirical research can provide a more accurate assessment of the effectiveness and stability of optimization measures, offering more reliable evidence for the formulation of education resource allocation policies. Additionally, future research can strengthen interdisciplinary studies. Education resource allocation involves multiple disciplines, including education, economics, and management. Interdisciplinary research can integrate theories and methods from different fields, providing more comprehensive and in-depth solutions for optimizing education resource allocation. At the same time, international comparative research can be strengthened to learn from the successful experiences and advanced practices of other countries in education resource allocation, and explore education resource allocation optimization paths suitable for China's national conditions based on actual circumstances.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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