Research on the Management of Educational Resources Based on Big Data Technology

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Abstract. This paper presents a quantitative analysis and comparative study of the allocation of educational resources in China during the 13th Five-Year Plan period (2016–2020) in the context of big data, based on three dimensions and five indicators: human resources, financial resources and material resources, in order to measure the scientific part of educational resource management. The results show there is a significant gap in the allocation of compulsory educational resources between city and countryside and a lack of precision in the management of educational resources. The use of big data technology can provide immediate monitoring, dynamic monitoring and data analysis of educational resource management, so as to achieve refinement of educational resource management, and to realize intelligent educational management and improve quality of service.

Keywords: big data · educational resource management · urban-rural gap · quantitative analysis · comparative study

1 Introduction

1.1 Background and Significance of the Study

In recent years, China's compulsory education has improved significantly in terms of information construction and teacher provision. But the problem of uneven distribution of educational resources between city and countryside is still prominent. Investment in rural compulsory educational funding grew rapidly after 2005, but slowed down around 2017 [5]. A scientific structure of educational resources can alleviate the imbalance education and improve the quality of educational resource management. The correlation of big data technology changes the internal structure of rural educational resources [6]. Applying big data technology to educational resource management is an essential initiative to achieve optimal allocation of educational resources and improve management service. Data modelling based on big data technology can facilitate the transformation of service provision decisions from "empirical" to "data-driven", reducing errors in the provision of educational services [1] and improving service quality.

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Table 1. Evaluation index system of educational resources allocation

Primary index	Secondary index
Human resources	The number of teachers
	Qualification rate of teachers
Financial resources	Total value of fixed assets
Material resources	The number of books
	The number of computers

1.2 Research Methods and Innovation

The balance of educational resources includes the balance of "soft conditions" such as the number of teachers and academic qualifications, as well as the balance of educational funds, equipment, books and other facilities [10]. The allocation of educational resources can be measured from three aspects: the allocation of teachers, fund investment and hardware resources [9]. So this paper selects indicators from the perspectives of human resources, financial resources and material resources to establish an evaluation index system for the allocation of urban and rural educational resources, as shown in Table 1. And it uses a quantitative analysis and comparative research method to analyse the distribution of educational resources in city and countryside from 2016–2020 by selecting three dimensions and five indicators. The data used in this paper are from the official data released by the Ministry of education. The aim is to use big data technology to promote the optimal allocation of educational resources and improve the quality of educational management services.

2 Distribution of Resources Between City and Countryside

2.1 Human Resources: Unbalanced Allocation and Weak Strength in Rural Schools

The data analysis of human resources indicators shows that there is a gap between rural schools and urban schools in terms of the number of teachers and the allocation of highly educated teachers. It can be seen from Fig. 1 that, at the primary level, the number of teachers in rural schools has decreased by 190,600 in five years, with a growth rate of negative 10.42%; and that in urban schools has increased by 420,300, with a growth rate of 28.07%. It is 38.49% points more than that in rural schools. In the junior middle school, the number of teachers in urban areas increased by 299,000, while that in rural schools decreased by 51,600 with a negative growth. In terms of academic level, it can be seen from Fig. 2 that in 2020, at the primary school stage, the qualification rate of teachers in rural schools is 2.2% points lower than that in urban schools. And at the junior high school stage, the qualification rate of full-time teachers in rural schools is 8.3% points lower than that in urban schools. Undoubtedly there is still a gap.

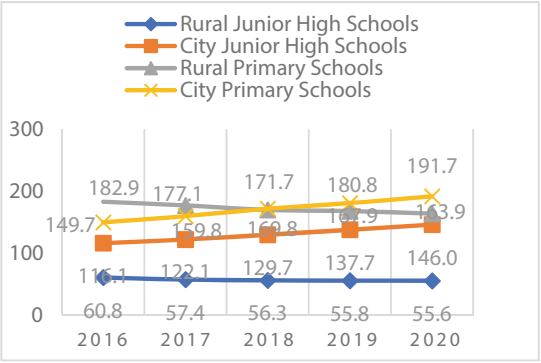

Fig. 1. The number of teachers (in 10,000) Data source: Educational Statistics 2016 to 2020 published by the Ministry of Education

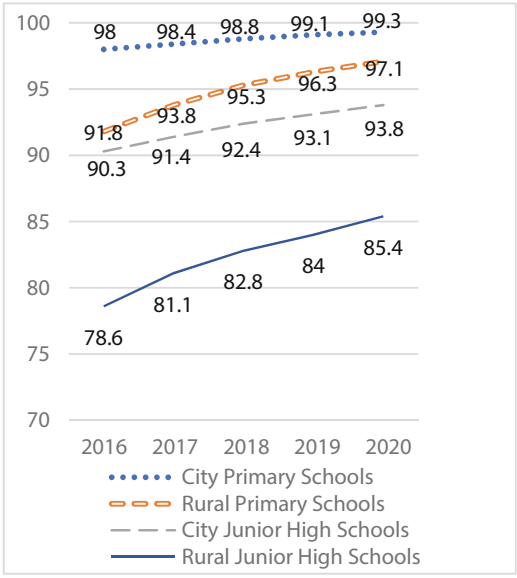

Fig. 2. Qualification rate of teachers (unit: %) Data source: National Educational Development Status 2016–2020 published by the Ministry of Education

2.2 Financial Resources: Relatively Insufficient and Slow Investment in Rural Compulsory Education

It can be seen from Fig. 3 that, at the primary school stage, the total value of fixed assets in rural schools increased by 99 billion yuan during the 13th Five-Year Plan period, with a growth rate of 35.51%; that in urban schools increased by 205.7 billion yuan, with a growth rate of 67.22%. It is 31.71% points higher than that of rural schools. At the junior high school level, the total value of fixed assets in rural schools increased by 44.8 billion yuan, and that in urban schools increased by 187.1 billion yuan. It is 4.18 times

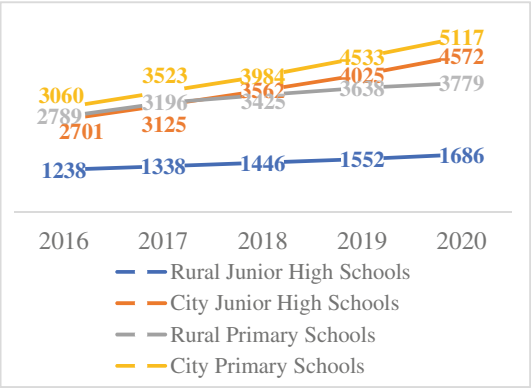

Fig. 3. Total value of fixed assets in compulsory education schools (in billion RMB) Data source: Educational Statistics 2016 to 2020 published by the Ministry of Education

as much as that of rural schools. It shows the total value of fixed assets in rural schools grew slowly, while that in urban schools grew rapidly. Therefore, the gap between urban and rural areas has a tendency to gradually widen.

2.3 Material Resources: Significant Disparity Between Urban and Rural Material Resource Inputs and Slow Growth of Rural Inputs

In terms of book investment, it can be seen from Fig. 4 that, at the primary level, the number of books in rural schools increased by 38.73 million in five years, with a growth rate of 5.89%. That in urban schools increased by 231.85 million, with a growth rate of 32.32%, which is 26.43% points higher than rural schools. At the junior middle school level, the number of books in rural schools increased by nearly 6.32 million, and that in urban schools increased by 174.37 million. It is about 27.6 times as many as that of rural schools. In terms of computer investment, it can be seen from Fig. 5, at the primary school level, rural schools increased by 1,045,400 computers, with a growth rate of 31.8%; urban areas increased by 1,547,700 ones, with a growth rate of 38.76%. It is 6.96% points higher than rural schools. At the junior middle school level, rural schools increased by 198,900 computers, while urban schools increased by 1,222,000 ones. And it is about six times as many as those of rural schools. It shows at both the primary level and junior middle school level, the average teaching equipment per student is low in rural compulsory education, and the gap between urban and rural areas is obvious and widening year by year.

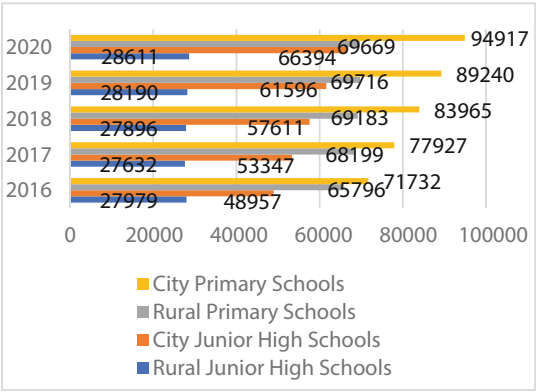

Fig. 4. The number of books (in thousands of copies) Data source: Educational Statistics 2016 to 2020 published by the Ministry of Education

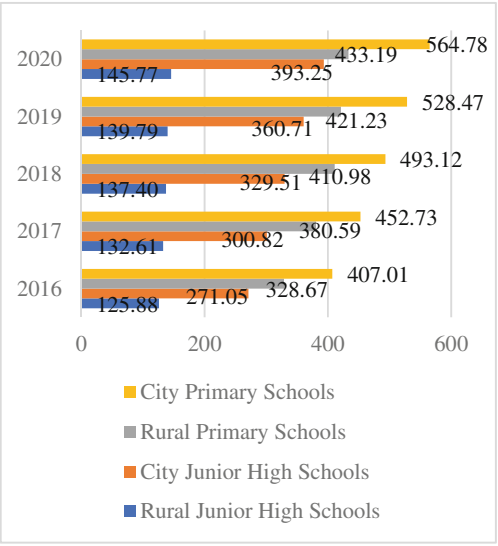

Fig. 5. The number of computers (in 10,000 units) Data source: Educational Statistics 2016 to 2020 published by the Ministry of Education

3 The Application of Big Data Technology in Educational Management

3.1 Data-Driven and Intelligent Early Warning Educational Management Can Be Realized Based on Big Data Technology

Big data technology is used to solve problems in the development of education. By constructing the educational management service decision-making model, the management transparency can be enhanced with the analysis function of big data technology, and the

predictability of decision-making can be improved with the precise positioning function of big data technology. On the other hand, big data technology is used to collect educational data from all regions in order to instantly grasp dynamic changes and build an intelligent early warning system based on key indicators [2]. When the actual situation in the educational management process does not match the present situation, this system can immediately activate to help managers adjust their plans flexibly. Then all indicators can be achieved as needed.

3.2 Intelligent Decision-Making and Intelligent Educational Management Can Be Realized Based on Big Data Technology

Big data technology is used to build an educational management system to achieve the synchronization of data between authorities, schools and students. It can fully reflect the allocation of educational resources and the state of educational development. Some needs such as the number of teachers, educational funds and equipment can be predicted for the next three years based on big data analysis technology, which provides effective support for decision-making. By analyzing the state of educational development through big data technology, educational resources can be accurately allocated according to regional differences, and the effectiveness of policies can be monitored to achieve balanced development of education. At the same time, the regional educational development trend can be predicted by using artificial intelligence algorithm. The full combination of management and information technology can realize the digitization and intellectualization of educational management [8].

3.3 Intelligent Assessment and Long-Term Educational Management Can Be Realized Based on Big Data Technology

Through the use of big data technology, a comprehensive interpretation of educational activities can be achieved. Then the management department can judge the management problems faced at each stage. The law of education can be founded by using data mining technology, which is helpful to the intelligent evaluation of decision-making. Then the mode of educational service can be optimized and the supply capacity can be improved in the smart era. Using big data technology and taking the educational content as the starting point to divide the educational management work in stages which can make the corresponding connection between each management process and each educational stage, and then a perfect educational management mechanism can be formed. This makes the management activities adapt to the changing educational environment, so as to promote the long-term development of educational management.

4 Conclusions and Suggestions

The rapid development of information technology provides more possibilities for the transformation of educational resource management, but the development of intelligent management in China still has a long way to go. In the context of big date, the relevant departments should make full use of big data technology to make educational management gradually adapt to the era of big data, so as to promote the better development of education in China. Therefore, the recommendations are as follows.

4.1 Establish a Teacher Flow Regulation System to Ensure Balanced Flow by Using Big Data Technology

The wide application of big data technology in the whole process of teacher management and school management can make the management informationize and enhance the efficiency. Using big data technology, information on the total number, structure and distribution of teachers can be comprehensively grasped, thus it can promote the formulation of scientific plans. It can also establish an efficient and stable regulation system through big data technology which can conduct comprehensive analysis of data to uncover the critical factors affecting the mobility of teachers. The it can ensure a more reasonable distribution according to the needs of teachers. By monitoring and analyzing the data, the management department can take targeted measures and formulate adjustment measures or incentive policies in time to form a reasonable guarantee mechanism. Then reasonable flow can be ensured.

4.2 Build a New Pattern of Educational Resource Management and Realize Accurate Supply by Using Big Data Technology

Using big data technology can build a new pattern of high-quality and fair educational resource management, so as to make up for the deficiencies in the weak areas of educational resources and strengthen the pertinence of resource investment. In order to promote the optimal allocation of data-driven educational resources, the management department should deeply mine and analyze the data to compare the regional economic development, population status and the current situation of educational resources. Then it can judge the use and idle status of educational equipment and analyze whether there is a structural imbalance in educational resources. Therefore, educational demand can be accurately positioned and targeted measures can be formulated. In the end, different supply can be implemented to achieve supply balance. At the same time, the reform of educational management mode based on big data technology should be promoted to realize scientific decision-making, scientific management process and more accurate supply of educational resources. Then the modernization of educational management system can be realized [7].

4.3 Upgrade Resource Search Engines to Facilitate Inclusive Sharing by Using Big Data Technology

Big data technology and resource sharing are the key to realize the scientific management of educational resources. Make full use of big data technology to establish a unified, standardized and interconnected educational resource data center and build an educational resource database covering all educational stages and disciplines to realize the effective integration of high-quality educational resources. Strengthening the real-time dynamic update and multi-mode display of educational resources can effectively promote innovative construction and inclusive sharing [4]. Using big data technology can standardize massive resources and realize intelligent management, which provides a basis for optimizing search functions and upgrading the quality of search engines. Big data technology can also realize the intelligent recommendation of network resources,

which can promote the transformation from "people looking for resources" to "resources looking for people" [3]. Then the service system of educational resources can be further optimized.

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