

Research Article

Research on the Model of Balanced Development of Compulsory Education and Difficult Problems of Rural Education Based on a Deep Learning Algorithm

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The equity of CE is an important issue in the whole educational cause. Its level has a significant impact on China's overall quality and economic and social progress. The BDCE is the basic realization of educational equity in China. It also promotes the sustained and healthy growth of economy and society and provides a strong guarantee for building a well-off society in an all-round way. In this paper, the PageRank algorithm of deep learning is used to collect data related to rural education and deeply analyze the problems existing in rural education, providing data support for the development of rural education. Firstly, this paper introduces the BDCE, expounds the problems and reasons in the progress of rural education, and studies the application of data analysis. Then, this paper uses the method of questionnaire to investigate and analyze the difficult problems and current situation of rural education. Finally, the result is that the quality balance of students needs to be further improved. Although the resources of rural education are unbalanced, more than 70% of teachers have bachelor's degree or above, and there is no significant difference among schools. It can be seen that highly educated teachers have become the norm in the stage of CE. Teachers are generally satisfied and recognized with the teaching process. In rural school education, the degree of dissatisfaction with the school curriculum and course selection system is greater than the degree of satisfaction. This shows that there is a lack of diverse and rich teaching courses in rural CE.

1. Introduction

The issue of CE is the basis for the progress of a country's education. It is also an important way to protect the people's basic right to survival, progress, and equal access to education. It is of great significance for China to build a well-off society in an all-round way and achieve the goal of modernization [1, 2]. However, at this stage, there is a large gap between urban and rural (UAR) economic and cultural levels, and there are many problems in rural areas in China. For example, the serious dual governance structure between UAR areas, the large difference between UAR economic

levels, and the acceleration of urbanization have become the factors restricting the improvement of teaching quality in rural schools [3, 4]. World Bank research shows that education is the single most powerful variable in explaining inequality in China. By increasing the accumulation of human capital, education improves individual production capacity and allocation capacity, makes important contributions to national income creation and economic growth, and then affects the income distribution gap. Improving education input and optimizing the efficiency of education resource allocation are of great significance for effectively alleviating the income gap between urban and rural areas

and realizing inclusive growth. Therefore, to accelerate the process of educational equalization, we need to solve the problem of “the last kilometer.”

Foreign studies on rural CE mainly focus on two aspects: one is to explore the differences in investment in UAR education. Countries such as the United States and Japan have clearly stipulated that different regions should bear the same responsibilities, obligations, and rights. American scholars propose that schools, families, and communities can cooperate to realize resource sharing [5, 6]. German scholars also believe that teachers and students should share educational opportunities. British writers analyzed the economic distribution gap between countries from the perspective of public finance and made an in-depth study on the inequality of CE, so as to provide a theoretical basis for narrowing the gap between UAR areas. The second is to put forward suggestions on the school running conditions and teacher allocation. At present, there are many improvements in the construction and layout planning of teaching facilities in urban primary and secondary schools in China. It is necessary to improve the quality of teachers, strengthen the hardware infrastructure construction of rural CE, and improve the equipment and management system of rural basic education [7, 8]. Some scholars believe that China’s urban-rural dual structure is an important reason for the economic backwardness, serious brain drain, and deteriorating poverty in rural areas. To solve this problem, we must start with the transformation of government functions, strengthen the construction of rural teachers, and improve the income level and welfare treatment of farmers. These measures need a perfect and powerful guarantee mechanism, so as to effectively promote and implement the BDCE. Other scholars pointed out that one of the reasons for the low teaching quality of rural primary and secondary schools in China is the serious imbalance of UAR education progress. At the same time, they proposed to strengthen government management, increase financial investment, and improve the construction of a relevant law and regulation system to improve the level of rural basic education [9, 10].

CE is the foundation of China’s education system. It plays an important role in improving national quality and promoting economic progress. However, there are great differences between UAR areas and between rural schools. There are many reasons for these problems. The BDCE is not only an important problem in China’s education but also an indispensable topic in the process of realizing China’s educational equity, promoting social harmonious and stable progress and building a socialist harmonious society. Based on data analysis, this paper studies the current situation of school running conditions of UAR basic schools in rural areas and points out the main reasons.

2. Discussion on the BDCE and the Difficult Problems of Rural Education Based on Data Analysis

2.1. Overview of BDCE. Due to the great differences in China’s regional economic progress, the teaching environment and

educational resources show an unbalanced progress trend, and the “BDCE” is to make up for this expanding educational difference. The BDCE mainly includes three meanings: the first is the equal opportunity of school-age children to enter school. The state guarantees everyone equal access to education in the form of law. The second is the equality of educational process. The equality of the educational process mainly includes teaching content, teaching equipment conditions, educational capital investment, teaching teachers, etc. In terms of hard conditions, ensure that school-age children have relatively equal protection with others in terms of educational conditions. The third is the equality of educational results. The BDCE is a beautiful vision put forward by people based on the current realistic problems of uneven educational demand and supply. Its purpose is to provide equal opportunities and rights to receive education for the educated, that is, “equal education,” which is to reasonably allocate educational resources, run every school, and teach every student well. Specifically, the government formulates policies and adjusts the allocation of resources to provide relatively equal opportunities and conditions for CE to the educated, so as to realize the relative equality of educational effect and success opportunity and promote educational equity. It can be seen that educational equity is not only the ultimate goal of the BDCE but also the yardstick to measure the quality of CE, and the BDCE is one of the important means to achieve educational equity. After receiving the same education, every school-age child can obtain better educational results in morality, intelligence, physique, and beauty, reach a basic standard, and realize real quality education. In different stages of CE, the BDCE in UAR areas has different meanings. When the popularization rate of CE is low, the balanced progress of UAR CE is to ensure that every school-age child can receive education [11]. When UAR CE can be popularized on a large scale, the government needs to continuously optimize the school running conditions to a greater extent, strengthen and improve the teaching staff, maximize the teaching quality, and equalize the UAR teaching environment and educational opportunities. Then, on the premise of meeting the basic CE, we should ensure the balanced progress of teaching resources in the allocation. From the perspective of China’s compulsory progress, it is still in the second stage, and the teaching quality and teaching environment need to be further improved. The equalization of educational opportunities for school-age children reaching the legal age is the ultimate goal of the balanced progress of UAR CE. Promoting the BDCE here does not mean that CE should be carried out simultaneously and developed evenly, but mainly to enhance the self-progress ability of areas with weak education.

2.2. Problems and Reasons in the Progress of Rural Education

2.2.1. Problems. The age structure and educational level of rural teachers are uneven, especially the professional titles below bachelor’s degree account for the vast majority. In some remote areas, due to limited economic conditions and shortage of educational resources, backward school hardware facilities, outdated teaching equipment, and other

factors have led to the problem of weak teachers, which has also become one of the biggest bottlenecks restricting the progress of CE. On the other hand, the overall quality of rural teachers is low, the educational level is not high, and there is a lack of relevant professional skills training, resulting in many young talents unwilling to teach in rural areas or simply unwilling to stay in cities or stay in remote areas. The progress of rural education has been limited, and many schools have been built on the basis of urban suburbs. These phenomena are mainly reflected in the following: first, there are great differences in the construction level of economic and social infrastructure between different regions and cities. Second, because the government does not pay enough attention to rural basic education, the unequal distribution of resources is becoming more and more obvious. The third is the lack of hardware conditions for CE, especially in some remote mountainous areas or remote places, which are not perfect enough, with high availability, beautiful, clean, and convenient environment, and unobstructed rural roads. Due to insufficient capital investment and poor site conditions, it is difficult to attract students to school and the construction of teachers. The teachers in rural areas are weak, so it is difficult to form a strong teacher team. At the same time, the lack of a professional talent training mechanism also leads to the inability of rural primary schools to meet the social needs. What is more, the teaching equipment in some remote and poor mountainous areas is backward or even seriously damaged. There are a series of factors such as the decline of education quality, resulting in the waste of a large number of high-quality resources, which hinders the balanced progress process of CE [12, 13].

2.2.2. Causes

- (1) The progress of rural education starts late and has a low starting point. There are deficiencies in many aspects; in particular, the hardware facilities are imperfect. Due to the limitations of economic conditions, the gap between UAR areas and other factors, and the insufficient support of national policies, the teaching equipment in some remote areas is backward or even not. At the same time, the low quality of some teachers also restricts students from receiving formal and systematic scientific and cultural knowledge learning. The construction of teachers is not in place, which makes the progress of rural CE slow, the investment of education funds is limited, and the teaching resources are short
- (2) The rural education progress is imbalance. Due to the backward rural economic conditions, there are great differences between UAR areas, so there is a serious imbalance in the BDCE. Unreasonable distribution of rural schools, outdated teaching equipment, and low quality of teachers are the important reasons for students to drop out of school in poor areas. Secondly, the problem of left behind children is also more prominent. There are many left behind families with small scale and scattered residence [14–15].

2.3. Data Analysis

2.3.1. Concept. Data analysis refers to studying and mastering the relationship and laws between things by using mathematical, statistical, and other means, describing the valuable information and classifying and sorting all the collected data by using scientific methods, so as to achieve the purpose of optimization, so as to get a new problem or a group of new things. It takes probability theory as the basic theory, transforms many complex systems into simplicity and high accuracy in a certain way, and can explain the internal relationship of things and quantitatively describe them.

2.3.2. Features

(1) *Diversification.* The diversity of data analysis mainly refers to the obvious differences in education in different regions and different age groups. Therefore, when carrying out the BDCE, we need to fully consider the problems and gaps between rural and urban areas. There are regional and urban-rural differences and internal differences between schools in rural CE. Therefore, when designing teaching, we should consider the gap between rural and urban students in terms of education time and opportunities in combination with the actual situation.

(2) *Comprehensive.* Education is a very complex system. In order to achieve fairness and justice, all aspects need to coordinate and cooperate with each other. The BDCE is a deeper analysis on this basis. In the process of education, we not only analyze and study the number and quality of school students but also pay attention to the gap between UAR areas and the gap caused by the income difference in different regions due to the influence of socioeconomic factors such as the schooling situation of rural population and the income level of farmers and put forward corresponding measures to solve these problems, so that everyone can fairly enjoy the fruits of the progress of CE.

(3) *Timely and Dynamic.* Data analysis is a dynamic process. Its application in education and teaching includes not only education policy, teaching materials, and learning situation. The dynamic and timely effectiveness of data analysis must be paid attention to in the research of educational equity. It requires us to master the required information at the first time and realize its value by effectively processing and using this information.

2.3.3. Related Technologies

(1) *PageRank Algorithm.* PageRank (PR) is a link analysis algorithm. It is an algorithm used to rank search engine results pages in Google Search. This is a method to measure the importance of web. The PageRank algorithm determines the importance of a site by counting the number and quality of links on it. The algorithm is based on the assumption that a website is more important if it links to many other websites. When a page links to an important page, it means that page is more important. The PageRank algorithm simulates

TABLE 1: Quality of education input.

	Very consistent with	Compare in line with	Basically in line with	Inconformity
The school has sufficient students, and the overall basic quality is good	48%	30%	12%	10%
Satisfied with the quality of the students recruited by the school	33%	45%	12.1%	8.9%
Students are excellent in admission	17%	15%	31%	37%

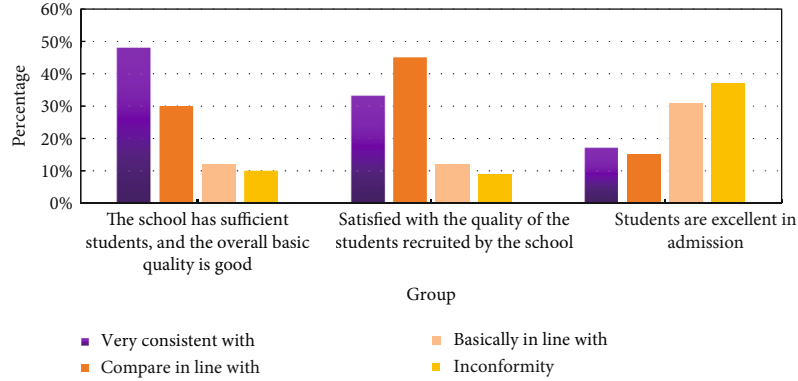


FIGURE 1: Quality of education input.

the process of users browsing web pages, and the calculation formula is shown in

$$\text{PageRank}(p_i) = \frac{1-q}{N} + q \sum_{p_j} \frac{\text{PageRank}(p_j)}{D(p_j)}, \quad (1)$$

where PageRank (P) is the PR value of page PI, n is the total number of all pages, and D (PI) is the number of linked pages of page P1. Q is the damping factor, usually set to 0.85, which is similar to the probability that users browse according to web links, and $1-Q$ refers to the probability that users randomly jump to a new page.

(2) *Spearman Correlation Coefficient*. Spearman correlation coefficient is a way to measure the correlation between two orders. The calculation formula is as follows:

$$\rho = 1 - \frac{6 \sum (x_i - y_i)^2}{N^3 - N}. \quad (2)$$

In the above formula, for a set with n objects, X_i and Y_i are divided into the sorting digits of object I in the sorting X and Y obtained by the two measures. P is the value of correlation coefficient, belonging to the range of -1 to 1. If the two orders are consistent, that is, they have completely positive correlation, $P = 1$. If the two orders have completely negative correlation, $P = -1$.

TABLE 2: The allocation of teachers.

	Postgraduate	Undergraduate	Junior college	Technical secondary school or high school
School A	5%	71%	10%	14%
School B	2%	75%	14%	8%
School C	2%	79%	11%	18%
School D	3%	74%	13%	10%

2.4. *The Role of Data Analysis in the BDCE*. Educational equity is not only the most basic condition for the realization of CE but also an important symbol of social justice and progress. Data analysis plays a leading role in education balance. The role of data analysis in the BDCE cannot be ignored. It provides a factual basis for formulating specific policies through a comprehensive and objective investigation and research on the current situation of CE in rural areas. Through the statistical investigation of school teaching quality, student enrollment rate and other indicators in rural areas, and the application of the survey results to relevant policies and regulations, it has promoted the progress process of urban-rural integration, narrowed the economic gap between regions, and effectively improved the uneven distribution of resources. At the same time, using data analysis, we can learn more about the influencing factors, current situation, and reasons of the fairness of CE, so as to improve the balanced level of education.

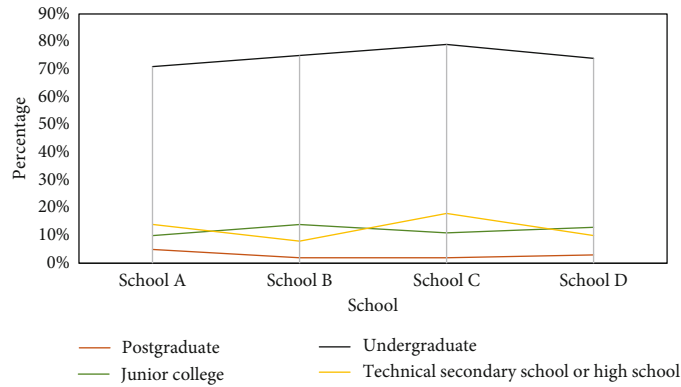


FIGURE 2: The allocation of teachers.

TABLE 3: Teaching form and quality status.

	Very consistent with	Compare in line with	Basically in line with	Inconformity
Teaching attitude is enthusiastic and serious	45%	50%	4%	1%
Pay attention to every student's progress, respect and love the students	40%	57%	3%	0%
Teaching active reform, the teaching process link is diverse	34%	62%	3%	1%

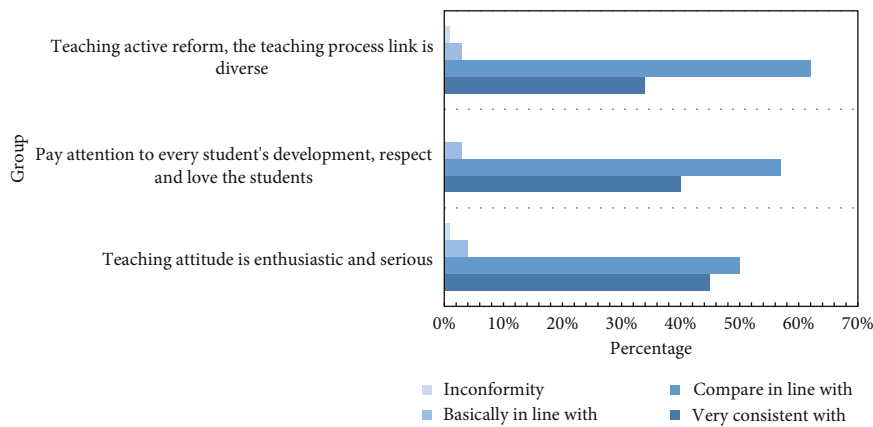


FIGURE 3: Teaching form and quality status.

3. Experimental Investigation on BDCE and the Difficult Problems of Rural Education Based on Data Analysis

The data analyzed in this paper come from the questionnaire sent and recovered by myself. The details of the questionnaire survey are as follows.

3.1. Investigation Purpose. The purpose of the survey is to understand the gap between the equity of rural CE and the level of urban education. By analyzing the questionnaire data, we can better understand the obvious differences between UAR areas in all aspects and put forward corre-

sponding countermeasures. This will help the government, schools, and students' parents start from themselves, improve their quality, and jointly solve these problems. It can also provide some reference and policy suggestions for the further progress of CE in the new era. Therefore, this study is aimed at understanding the current situation of rural education equity and the gap between cities and how to narrow the gap.

3.2. Respondents. The questionnaire survey object of this paper is the balanced progress status of rural CE. When selecting samples, in order to ensure that the data source is reliable and true, the results are accurate and representative. In this paper, random sampling was carried out. Some of

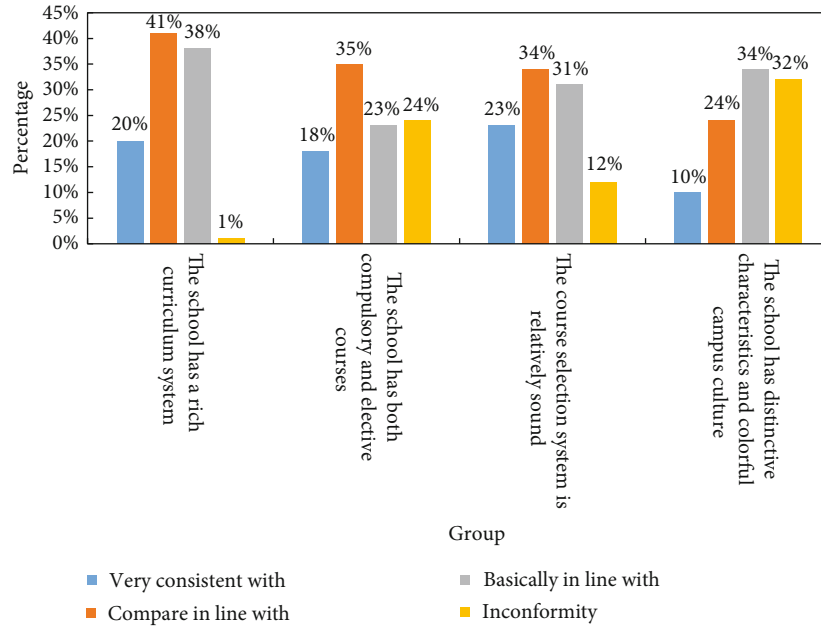


FIGURE 4: Teaching form and quality status.

them came from poor students in local schools and some parents, teachers, and other relevant institutions. Others chose from a boarding primary school to participate in the survey. The questionnaire was filled in and distributed to school leaders and teachers. Finally, 100 valid samples were recovered.

3.3. Investigation Contents. This questionnaire is mainly distributed through the Internet and then anonymous in the school classes and students’ parents to ensure the quality of the questionnaire. (1) Understand the satisfaction with the input quality of rural CE. (2) This paper studies the current distribution of rural teachers in China. (3) Analyze the form and quality of rural teaching. (4) Understand the perfection of the rural teaching curriculum system. It mainly focuses on rural schools, analyzes the current situation of the BDCE, understands the situation of CE in rural areas, and puts forward corresponding measures according to these specific reasons, so as to promote the process of urban-rural integration, improve teaching quality, and promote the concept of fair education to go deep into the hearts of the people.

4. Investigation and Analysis of BDCE and the Difficult Problems of Rural Education Based on Data Analysis

4.1. Education Input Quality Satisfaction. Table 1 is the data on the quality of education input of the schools investigated in this paper.

In this survey, it can be seen from Figure 1 that in the survey of “sufficient school students and good overall quality of students,” 78% of teachers chose “very stable” and “relatively stable.” In the “student quality satisfaction” survey, 78% of parents chose “very stable” and “relatively

consistent.” It can be seen that teachers and parents are more satisfied with the distribution and overall quality of school students. But at the same time, 22% of teachers still choose “dissatisfied,” and 21% of parents choose “relatively dissatisfied” and “very dissatisfied.” Although this proportion is low, it is worth mentioning that the quality balance of school students needs to be further improved. It should be noted that in the “very consistent” and “relatively consistent” surveys, only 32% of students agree with “very consistent.” Compared with the higher satisfaction of teachers and parents, students’ satisfaction with their own performance is significantly lower. This result is obviously related to the students’ own pressure. Few students dare to show themselves as “excellent.” Admission results reflect students’ learning ability and performance to a certain extent but should not be used as the only standard to evaluate students’ prejudice. Moral performance, physical and mental quality, innovative thinking, practical skills, and other qualities are all manifestations of students.

4.2. Distribution of Teachers. Table 2 shows the distribution of teachers among the respondents.

The teachers’ law stipulates that primary school teachers must have a technical secondary school degree or above, and junior middle school teachers must have a college degree or above. The state stipulates that teachers with a bachelor’s degree or above in primary and secondary schools are highly educated teachers. CE is a basic and universal education, which plays a more “foundation” role. In addition, the stage of CE is in the golden period of teenagers’ growth and progress, and it is also the key moment most vulnerable to environmental impact. There is no doubt that highly educated teachers can teach scientifically and reasonably according to the law of youth progress, so as to promote students’ personality progress and personality play. According to the

survey in Figure 2, although rural education is not balanced in resources, more than 70% of the teachers have a bachelor's degree or above, and the differences between schools are not significant. It can be seen that highly educated teachers have become the norm in the stage of CE. In addition, an average of 3% of teachers has a master's degree, about 10% have a junior college degree, and about 12% have a technical secondary school degree.

4.3. Teaching Form and Quality. Table 3 shows the data of teaching form and quality of this survey.

It can be seen from Figure 3 that 95% of teachers choose "very consistent" and "relatively consistent" in terms of "enthusiasm, pragmatism and serious responsibility for education," and 1% choose "inconsistent." In the two projects of "listening to students' opinions" and "respecting and caring for students" focusing on the progress of each student, 97% of teachers chose "very consistent" and "relatively consistent," and 3% chose "very consistent" and "relatively consistent." Teachers chose "most" and "consistent," and the selected teachers did not match. 96% of teachers chose "very consistent" and "relative," and 1% chose "positive teaching reform, creative innovation, diversified curriculum design, process connection, lively image" and "cornerstone inconsistent with teachers." The above data show that the majority of teachers have professional identity and are satisfied with the current teaching process. At the same time, it also shows that most of the teachers' teaching is effective.

4.4. Perfection of the Teaching Curriculum System. CE courses shall include subject courses and experience courses. There are not only traditional subjects such as language and number but also various types such as art and sports courses, moral courses, local courses, and school courses. A reasonable and appropriate proportional relationship shall be maintained between various courses. In the survey on "the school has a rich curriculum system," 61% of teachers choose "very consistent" and "relatively consistent," and 40% choose "basically consistent" and "inconsistent." With regard to the "colorful school curriculum," 53% of the students chose "very consistent" and "relatively consistent," and 47% chose "basically consistent" and "inconsistent." As can be seen from Figure 4, in rural school education, the degree of dissatisfaction with the school curriculum and course selection system is greater than the degree of satisfaction. This shows that there is a lack of diverse and rich teaching courses in rural CE. Students are individuals with potential, difference, and personality. Only rich and diversified curriculum can help to cultivate students' ability, emotion, attitude, values, and sound personality. Therefore, we should pay attention to enriching the curriculum system of rural CE.

5. Conclusion

CE is the foundation of education, and its progress level has a direct impact on the sustainable, healthy, and stable progress of China's whole national economy and society. It is of great significance for China to build a well-off society in an

all-round way and improve people's living standards. However, there is a big gap between rural areas and cities in terms of economic conditions and teachers. In this study, we can see that there are many problems in the progress of rural CE, which need to be solved by educators. First of all, we should strengthen the construction of hardware facilities. The second is to increase capital investment. Finally, we should improve the infrastructure service system and relevant supporting systems to improve the level of teachers, improve the quality of teachers, and improve teaching methods. Only in this way can we ensure the better implementation of the balanced progress policy and also give UAR residents the opportunity to contact new things in rural areas, so as to promote the realization of the fairness of CE and the continuous improvement and progress of education quality.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

There is no potential conflict of interest in our paper.

Authors' Contributions

All authors have seen the manuscript and approved to submit for publication.

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