Construction of a Matching Model for Supply and Demand of Rural Community Education in the Rural Revitalization Strategy

Lixuan Li

Beijing No.2 Middle School, Beijing, 100010, China
Lily2786@outlook.com

Abstract. In order to solve the imbalance between supply and demand of rural community education under the background of rural revitalization, this paper is based on the actual situation in rural my country, and is supported by matching market design foundation, bilateral matching theory, allocation model and priority mechanism to construct a matching model of rural community education supply and demand. The model clarifies the components such as demand side, supply side, information platform and matching rules, designs the operation process of information collection, processing, preference sorting, matching operation, result feedback and evaluation, and is supplemented by guaranteed mechanisms such as policies, funds, personnel and supervision. The model can accurately connect the diversified educational needs of rural residents with resource supplies and effectively optimize resource allocation. The conclusion shows that this model can improve the quality of rural community education services, provide strong support for promoting rural revitalization, and is of great significance to achieving sustainable development of rural community education.

Keywords: Rural Revitalization Strategy, Rural Community, Education Supply and Demand Matching Model, Bilateral Matching Theory.

1. Introduction

1.1 Research Background and Research Topic

As the rural revitalization strategy is being promoted, rural areas are increasingly demanding talent, culture and social development [1]. Rural community education plays a key role in improving residents' quality, promoting industrial upgrading and social harmony, and its quality affects the effectiveness of rural revitalization. At present, there is a significant mismatch between supply and demand in rural community education, which is reflected in the fact that residents' demand is developing in a diversified way, such as digital technology and vocational skills, while the supply has problems such as outdated content and single form, which has become a shortcoming of rural revitalization [2]. The theme of this study is to

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construct a rural community education supply and demand matching model based on relevant theories to solve the problem of supply and demand imbalance. This model will provide scientific guidance for rural community education practice by accurately capturing the dynamics of residents' demand and optimizing the education supply system. The development of this study is expected to provide strong support for breaking the bottleneck of rural community education development and consolidating the talent and cultural foundation of rural revitalization.

1.2 Research Purpose and Research Significance

Research purpose: To construct a scientific and feasible rural community education supply and demand matching model to solve the problem of supply and demand imbalance. By integrating the demand survey mechanism, supply adjustment path and dynamic adaptation strategy, a complete system covering demand identification, resource allocation and effect feedback is formed to ensure that the model can not only fit the actual rural scene, but also have the flexibility of long-term application, and effectively break through the obstruction between education supply and residents' needs.

Research significance: The theoretical significance lies in enriching the theoretical system of rural public service supply and demand matching. Including the specific field of community education in the research field can provide new case support for the study of the supply and demand relationship of rural public services; by constructing a targeted matching model, it can improve the application framework of existing theories in grassroots practice scenarios. The practical significance is to improve the utilization rate of educational resources, enable rural residents to obtain appropriate educational services, and help rural revitalization.

1.3 Research Methods and Research Structure

The research method adopts the literature research method to systematically sort out the domestic and foreign research results in related fields such as rural community education, public service supply and demand matching, and rural revitalization, and summarize the core viewpoints, research paradigms and deficiencies of existing theories; using the theoretical deduction method, combined with the actual economic and social characteristics of rural areas, the characteristics of residents' education needs, etc., gradually derive the core elements and operation logic of the rural community education supply and demand matching model to ensure its rigor and applicability.

The research structure is divided into four parts: the introduction introduces the basic situation, including the research background and research topic, research purpose and theoretical and practical significance, research methods and structure; the theoretical basis explains the matching market design basis, bilateral matching theory, allocation model and priority mechanism; the construction and operation of the rural community education supply and demand matching model are carried out, and the model construction goals, main components and operation processes are clarified; the conclusion summarizes the main results of the research, analyzes the existing limitations and future prospects of the research.

2. Theoretical Basis

2.1 Matching Market Design Basis

The matching market design basis aims to build appropriate market rules and mechanisms to achieve the best match between market participants. In the matching market, both the supply and demand sides have unique characteristics and preferences [3]. For example, in the scenario of educational resource allocation, the supply side may include different types of educational institutions, which provide different course teaching methods, content, and teachers; the demand side is rural residents with various learning needs. The key task of market designers is to formulate more scientific and effective prices, information transmission mechanisms, transaction rules, etc., to reduce information asymmetry and promote matching efficiency.

2.2 Bilateral Matching Theory

Bilateral matching theory focuses on the matching problem between two different groups. Its core goal is to explore stable and effective matching results, that is, there is no pair of participants who are more inclined to match each other than the current matching object. The theory emphasizes the construction of matching algorithms to achieve optimal matching by deeply analyzing the preference rankings of both parties [4]. In rural community education, rural residents and the providers of educational services form a bilateral group. Residents have preferences for learning time, location, teachers, etc., and educational service providers also have certain preferences for the acceptance, type, and scale of service recipients. With the help of bilateral matching theory, the preferences of both parties are analyzed, and a suitable matching algorithm is constructed. This will not only enable rural residents to obtain educational resources that are more in line with their actual needs but also improve the service efficiency and quality of educational service providers.

2.3 Allocation Model and Priority Mechanism

The allocation model is used to solve the resource allocation problem for different demanders. It is necessary to comprehensively consider the total amount of resources, allocation fairness, demand intensity of demanders, etc. to achieve the goal of reasonable resource allocation [5]. In the process of allocating rural community educational resources, the priority mechanism can clarify the priority of different demanders according to various factors such as rural residents' family status, education level, age, etc., to ensure that resources flow to the groups that need them more. The coordinated use of the allocation model and the priority mechanism can achieve fair and efficient resource allocation under the conditions of limited rural community educational resources and maximize the social benefits of educational resources [6].

3. Construction and Operation of Rural Community Education Supply and Demand Matching Model

3.1 Model Construction Objectives

The goal is to achieve accurate, efficient and fair matching between the supply of rural community education resources and the education needs of rural residents [7]. Accurate matching requires that the supply of education resources is highly consistent with the actual needs of rural residents; efficient matching requires that supply and demand be matched at a lower cost of manpower, time, etc.; fair matching requires that the differentiated needs of different groups be taken into account. Ultimately, rural community education will achieve the goal of high-quality development and provide strong support for education development in rural revitalization.

3.2 Main Components of the Model

Demand and Supply. Residents of rural communities include rural populations of different ages, occupations and educational backgrounds [8]. The specific composition is shown in Table 1:

Table 1. Composition of the demand side of the model.

Group classification standards	Demand division of each group
Age	Age Children: interest cultivation, basic cultural knowledge
	Youth: subject knowledge
	Adults: psychological, economic, financial knowledge
	Old people: leisure and entertainment, health and wellness knowledge
Career	Farmers: pest control, new agricultural technology
	Individual business operators: e-commerce operations, marketing
Educational Background	High education level: more in-depth and professional knowledge
	Low education level: practical and easy-to-understand knowledge

Suppliers include government departments, educational institutions, social organizations, enterprises and other entities that provide educational services. Government departments provide basic and inclusive educational resources; educational institutions provide cultural courses and vocational skills training education; social and public welfare organizations, volunteer teams, popular science propaganda, and teaching; enterprises provide skills training related to their industry in combination with their own business.

Information Platform and Matching Mechanism. The information platform is the core medium for model construction, and specifically undertakes the following tasks: collecting information, collecting residents' educational needs through different methods, connecting with suppliers, and obtaining course information; information processing, classifying and screening the collected information, and building a

demand and supply database based on vocational skills, agricultural technology, etc.; publishing information, accurately pushing information to both supply and demand parties through community announcements, APPs and websites, etc., to improve docking efficiency.

Based on the three major theories in the theoretical foundation part, the matching mechanism of the model is designed, which specifically includes the core rules of thought, as follows: (1) Information screening, eliminating outdated and false information to ensure data validity and authenticity; (2) Preference sorting, guiding residents to choose the required courses according to the priority of their needs; (3) Matching algorithm, automatically calculating and generating preliminary matching results based on the total amount of resources, the intensity of needs and preferences of both parties. (4) Priority selection, based on the urgency of needs and family situation, such as sick elderly people and children from poor families have priority in obtaining educational resources, taking into account fairness.

Figure 1 is a diagram of the matching model constructed by combining demand and supply, information platform and matching mechanism:

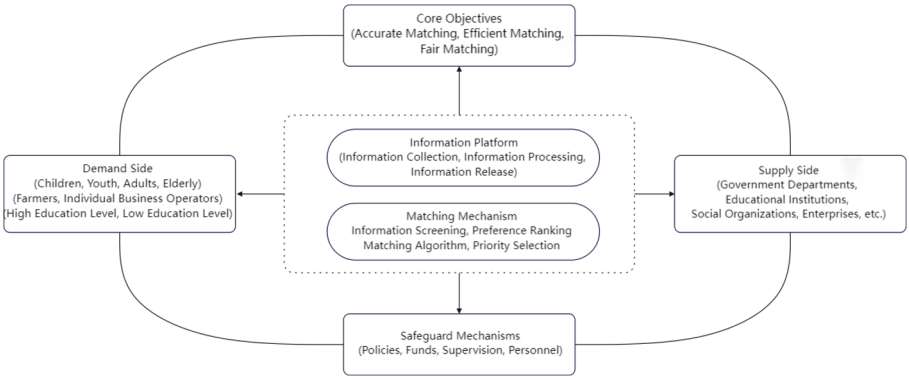

Fig. 1. Rural community education supply and demand matching model.

3.3 Model Operation Process

After clarifying the main components of the matching model, the model operation process should be refined to ensure that it can play an application role.

Information Collection and Processing Process. Information collection uses a combination of online and offline dual-channel models. Online, with the help of the information platform smart form, basic information fills in name, contact information, etc.; the demand details column is subdivided into preferred teaching methods, available learning time, skills that need to be mastered urgently, etc., and other demand supplementary text boxes are added to collect rural residents' education needs; offline, village information liaisons visit farmers, hold village representative seminars, etc. to collect information, focus on obtaining the needs of special groups such as left-behind children and the elderly, and use the "one question and one answer" method to record needs. Actively connect with suppliers, collect course lists and

supporting information, and require suppliers to fill in core knowledge points of courses, teacher qualification certificates, site equipment certificates, etc.

Information classification should follow the dual characteristics of demand dimension and supply attribute. The demand side is divided into four categories: agricultural production, such as fruit tree pruning technology; vocational skills, such as e-commerce marketing technology; cultural life, such as square dance teaching; rights protection, including knowledge of protective measures that rural residents can take when their legitimate rights and interests are infringed. The supply side is divided into three labels: suitable population, teaching method, and course market. The information format needs to be standardized, for example, the learning time is standardized to 19:00-21:00 every Monday, Wednesday, and Friday to ensure that the information in the database can be directly used in subsequent matching operations.

Preference Sorting and Matching Operation. The two-way autonomous empowerment mechanism is introduced into the preference sorting link [9]. The demand side can assign values and scores to the courses they are interested in through the platform, such as 5 points for 100% interest and 1 point for 100% disinterest. The system automatically generates a personal preference sequence. The supply side sets screening conditions for rural community residents based on the course objectives. For example, e-commerce operation courses require learners to be proficient in using smartphones. For qualified demanders, suppliers can sort them according to the comprehensive evaluation results of the order of registration + basic level test scores, give priority to demanders with higher scores, and the sorting results should be updated to the platform database in real time.

The matching operation is based on the dynamic weight algorithm. The basic weight value is set according to the preference scores of both parties, accounting for 60%. For example, the matching weight of the 5-star interest course given by the demander and the priority group of the supplier will be automatically increased. The adjustment weight accounts for 40%, increasing the scarcity of resources, such as the course related to planting Chinese medicinal materials is taught by a well-known expert and only one session is offered. The weight value is set to 20%, and the urgency of demand accounts for 20%, such as the flood prevention knowledge course in the early stage of flood prevention. During the operation of the algorithm, the records that meet the conditions of the supplier should be extracted from the demand database, sorted by weight, and the demand-supply matching list should be obtained.

Matching Results and Implementation. Through the three-level feedback confirmation, the information platform first pushes the preliminary matching results to the supply and demand parties, and can notify them through SMS [10]; the demander can apply for adjustment within 48 hours; the supplier marks the course as full and needs to be supplemented later, etc. The platform conducts secondary matching of courses based on feedback from both the supply and demand sides, and finally generates a "matching confirmation form" with a unique code. Learners can scan the code to view information such as course time, previous student evaluations, and instructor qualifications. At the same time, it is linked to the schedule of the village information liaison officer, who will notify the learner by phone one day in

advance to participate as a certificate for the learner to participate in the study. In the implementation stage of the matching results, the supply and demand are tracked in a dual-track manner. The supply side needs to report the preparation of the course three days in advance according to the confirmation form, and the village information liaison officer is responsible for organizing the demand side to participate in the course and provide feedback on the demand side's classroom performance, attendance records, and classroom effects. After the event, both the supply and demand sides fill in the satisfaction on the platform, which is an important basis for the formulation of the next round of matching algorithm optimization measures [11].

3.4 Model Operation Guarantee Mechanism

Policy guarantee, the implementation effect of the rural community education supply and demand matching model is included in the county-level rural revitalization assessment indicator system, and the responsibilities of different departments such as the Ministry of Agriculture and Rural Affairs and the Ministry of Education are clarified in the form of laws and policy provisions. For example, the Ministry of Agriculture and Rural Affairs needs to coordinate agricultural machinery experts to participate in lectures, and the Ministry of Education needs to coordinate the course system. The "Management Measures for Matching Education Resources in Rural Communities" was issued to further standardize the rights and obligations of both supply and demand parties.

Funding guarantee: A government-led and socially supplemented funding pool is established. The county finance allocates special funds from the funding pool every year to maintain the information platform and subsidize liaison officers. Public welfare organizations and enterprises are encouraged to donate educational resources, such as encouraging e-commerce companies to sponsor special courses for rural anchor training, and the use of funds is announced on platform [12].

Supervision mechanism: A supervision team composed of village representatives, township cadres, and education experts is established to randomly check the quality of courses [13], such as whether the course is taught according to the syllabus and the teaching quality of the teachers. The platform sets up a "complaint channel" to suspend the entry of suppliers who have been complained about three times in a row.

Personnel guarantee: Each village is equipped with a full-time information liaison officer who is responsible for operation training and demand collection; regular platform administrator training courses are held to improve their data processing and conflict mediation capabilities; a local expert database is established to absorb planting experts and intangible cultural heritage inheritors as part-time teachers to enrich the supply side.

4. Conclusion

The conclusion shows that the rural community education supply and demand matching model constructed can achieve accurate matching of supply and demand, optimize resource allocation, and help rural revitalization. However, the model has limitations, does not consider the impact of regional differences on supply and demand, and lacks practical verification. In the future, the model can be optimized in

combination with the characteristics of different rural areas, and field pilot applications can be carried out to verify the effectiveness of the model and improve it. At the same time, new technologies can be introduced to improve matching efficiency and intelligence.

The model constructed in this study does not fully consider the differences in rural areas in different regions. For example, there is a significant gap between rural areas in the east and west in terms of economic foundation and education demand types, and the universality of the model needs to be verified. At the same time, the cost accounting after the model is implemented is not involved, and the actual expenditures such as information platform maintenance and personnel training are not considered enough, which may affect the feasibility of promotion. In addition, the research is mainly based on theoretical deduction and lacks large-scale empirical data support. The stability and effectiveness of the model in actual operation need to be further tested.

In the future, differentiated sub-models can be designed for rural areas in the east, middle and west, and regional characteristic variables can be added to optimize the matching algorithm to improve the adaptability of the model in different regions. Pilot applications can also be carried out to revise model parameters through actual operation data, introduce cost-benefit analysis, and explore a sustainable model that combines government subsidies with market-based operations. At the same time, artificial intelligence technology can be combined to improve the efficiency of information processing and matching operations, so that the model can better meet the needs of rural community education development.

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