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Analysis of the Factors Influencing the Participation of University Students in Rural Education for Poverty Alleviation

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Abstract: The principle of "poverty alleviation first helps the poor" is fundamental to poverty alleviation through education in rural areas. It serves as an important foundation for improving the soft power of rural culture and promoting the development of rural cultural construction. However, college students, being one of the main participants in educational poverty alleviation, have not been equipped with a well-established institutionalized participation mechanism and a sufficient awareness of participation. To enhance college students' awareness and participation in rural education and poverty alleviation and to improve the institutionalization, this research focuses on college students as a group, delves into the current situation and willingness of college students to participate in rural education and poverty alleviation, and analyzes the influencing factors affecting college students' participation in rural education and poverty alleviation by means of a questionnaire and a computerized statistical algorithm. Lastly, based on mathematical and statistical analysis, the research puts forward corresponding optimization countermeasures and suggestions from the perspectives of the government, colleges and universities, and villages, so as to provide decision-making guidelines for solving the problems of rural education development and talent constraints.

Keywords: Rural education; Rural construction; Influencing factors; Statistical algorithms; University students

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1. Introduction

In recent years, with the deepening understanding of the urban-rural gap [1] problem and the intensification of efforts to alleviate poverty in rural education [2], the willingness and actions of college students to participate in rural education and poverty alleviation have gradually increased. College students' participation in rural education can not only provide assistance to the educational development of rural students, but also help to cultivate their sense of social responsibility and civic awareness, as well as improve their social participation

and comprehensive quality. Unfortunately, although some college students actively participate in rural education and poverty alleviation work, there are still a considerable number of them who hold a wait-and-see attitude. Therefore, to explore the reasons behind this phenomenon, the influencing factors of college students' willingness to engage in rural education and poverty alleviation have become a popular issue with profound research significance.

Meanwhile, due to the rapid development of information science, massive or complicated research data can be extracted from data of different scales with the help of various computer statistical research methods [3], which can capture more complex relationships and patterns and make more accurate analyses and decision-making.

Since there are fewer correlation studies on the current situation of university students' participation in rural education for poverty alleviation and its influencing factors, this study is significant to enrich the current research situation in this field and provide some theoretical support for this research problem. This study aims to systematically analyze the influencing factors of college students' willingness to participate in rural education for poverty alleviation through computerized statistical research methods and to explore methods to provide guidelines for promoting college students' active participation in rural education and poverty alleviation in the future, as well as to provide a more complete response to the formulation and practice of related policies.

2. Data and methods

2.1. Data material

The data material for this paper was derived from a collection of data obtained through a questionnaire. The questionnaire was designed and distributed through the Questionnaire Star platform. To guarantee the unity and certainty of the data set, all the questionnaires were distributed to university students. The cumulative number of questionnaires issued was 260, and 244 questionnaires were recovered, including 220 valid questionnaires and 24 invalid questionnaires, with an effective rate of 90.16%.

Meanwhile, to comprehensively explore the influencing factors of college students' participation in rural education for poverty alleviation, the questionnaire was designed to cover 21 aspects of evaluation factors. According to the method of main idea categorization, it mainly encompasses influencing factors in six dimensions: rural development evaluation, parental attitudes, self-awareness, policy awareness, college course content, and college organization and propaganda situation. The influencing factors statistically determined by this research are shown in **Figure 1**.

2.2. Validity analysis of data

To evaluate and ensure the quality and credibility of the questionnaire, this research analyzed the data of the above questionnaire in terms of reliability analysis [4] and validity analysis. Among them, the reliability analysis focuses on the internal consistency and reliability of the questionnaire [5], while the validity analysis focuses on the correlation and consistency of the questionnaire with other known valid instruments and whether the questionnaire accurately measures the target concepts. These analyses aid in assessing and improving the quality of the questionnaire and ensure the reliability and accuracy of the data obtained.

2.2.1. Reliability analysis

Reliability analysis allows the assessment of the internal consistency between the questions or items in the questionnaire, and if the questionnaire has high internal consistency, it can be considered reliable and the results can be trusted. In this research, the internal consistency and reliability of the resulting questionnaire were examined by using Cronbach's alpha modeling tool [6], which is mathematically defined in equation (1) below.

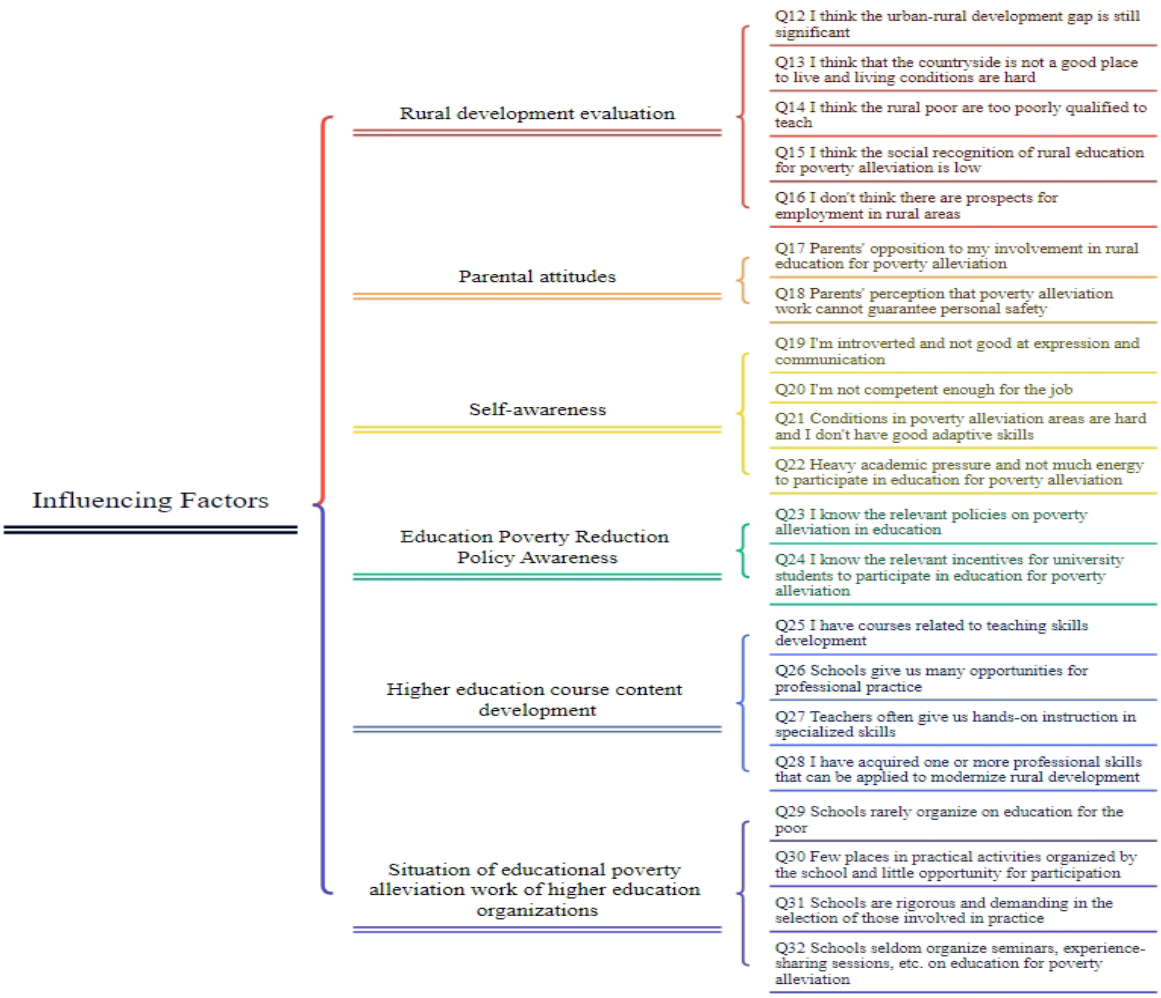

Figure 1. Statistical indicators for each influencing factor

$$Cronbach's\ \alpha = \frac{K}{K-1}\left(1 - \frac{\sum S_i^2}{S_x^2}\right) \quad (1)$$

Where α is the reliability coefficient, K denotes the number of test questions, S_i^2 denotes the variance of the score obtained for question i, and S_x^2 denotes the variance of the total score obtained for the test question. Generally, the higher the value of the reliability coefficient, the higher the reliability. In basic research, the reliability should be at least 0.80 to be acceptable; in exploratory research, the reliability can be accepted as long as it reaches 0.70, and between 0.70 to 0.98 is considered high reliability, while lower than 0.35 is considered low reliability and must be rejected.

2.2.2. Validity analysis

Through validity analysis, it can verify whether the results of the questionnaire measurement tool are consistent with other widely accepted measurement tools. Additionally, validity analysis can assess whether the questionnaire measurement tool truly reflects the target concepts and is supported in other studies. In this research, the Kaiser-Meyer-Olkin test (KMO) [7] and Bartlett's test of sphericity were used for the validity analysis, and the following formula (2) is the calculation formula of the KMO model.

$$KMO = \frac{\sum i \neq j r_{ij}^2}{\sum i \neq j r_{ij}^2 + \sum\sum i \neq j r_{ij1,2,\ldots k}^2} \quad (2)$$

Where the *KMO* statistic is taking values at [0,1], when the *KMO* value is closer to 1, it means that the correlation between the variables is stronger.

2.3. Characterization of data

In research addressing the factors influencing the participation of university students in rural education for poverty alleviation, analyzing the characteristics of the questionnaire data helped to better understand the data, identify anomalies, provide data preprocessing strategies, identify important characteristics, and guide the selection and evaluation of models or methods. The results of these analyses provided a basis and guarantee for the study and helped to obtain accurate, reliable, and interpretable findings.

2.3.1. Shapiro-Wilk analysis

Shapiro-Wilk test [8], a correlation-based algorithm, is also a commonly used method to test whether data form a normal distribution. It determines the normality of the data by calculating the order statistics of the sample data and comparing the difference between the observed value and the expected value of the theoretical normal distribution. The sample size of Shapiro-Wilk is usually less than 5000, and its mathematical model is shown in the following equation (3).

$$Wilk = \frac{(\sum_{i=1}^{n} a_i x_i)^2}{\sum_{i=1}^{n} (x_i - \overline{x})^2} \quad (3)$$

Where, *Wilk* denotes the statistic based on the Shapiro-Wilk test, a_1 denotes the regression coefficient, x_i is the sample value, and $\overline{x}$ is the sample mean.

2.3.2. Spearman's correlation analysis

Spearman's test [9] is a non-parametric statistical test used to assess the degree of association between two variables. It is a test based on Spearman's rank correlation coefficient, which is suitable for cases where the data do not satisfy a normal distribution or where there is a nonlinear relationship. When studying the influencing factors of college students' participation in rural education for poverty alleviation, the use of Spearman's test can be better adapted to the requirements of the data type, eliminate outliers in the data, and at the same time better assess the degree of association between the influencing factors, thus improving the reliability and accuracy of the research results. The following equation (4) is the definition of the mathematical model of Spearman's correlation coefficient [10].

$$\delta = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)}, d_i = x_i - y_i \quad (4)$$

Where d_i is denoted as the rank difference between x_i and y_i, the Spearman correlation coefficient $\delta \in [-1,1]$.

3. Results and discussion

3.1. Results of the validity test of the questionnaire and data

To verify the reliability and consistency of the experimental materials and statistical data, this research used reliability analysis and validity analysis to assess and improve the quality of the questionnaire and ensure the reliability and accuracy of the data.

The result of Cronbach's α coefficient of the model is shown in **Table 1**, which includes Cronbach's α

coefficient value, standardized Cronbach's α coefficient value, number of items, and number of samples, used to measure the level of reliability quality of the data. The Cronbach's alpha coefficient value of 0.87 showed that the reliability of the survey material in this research is more satisfactory.

Table 1. Cronbach's α coefficient statistics

Cronbach's α coefficient	Standardized Cronbach's α coefficient	Number of items	Sample size
0.87	0.87	21	220

The results of KMO test and Bartlett's spherical test are shown in **Table 2**, and it can be found that the value of KMO is 0.813 through the calculated data values in **Table 2**. Meanwhile, the results of Bartlett's spherical test show that the *P* value is 0.00001, which is significant at the level of < 0.05, and the rejection of the original hypothesis, the correlation between the variables, and the validity of the factor analysis, and the degree of for suitability.

Table 2. KMO test and Bartlett's test statistic table

KMO test and Bartlett's test		
KMO values		0.813
Bartlett's test of sphericity	approximate chi-squared (math.)	2957.259
	df	210
	P	0.00001

3.2. Results of the analysis of data characteristics

3.2.1. Results of Shapiro-Wilk-based ordinality analysis

To verify the data characteristics of this research, this paper used the normality correction algorithm to test the normality of the influencing factors under the six dimensions, as shown in **Table 3** below, which is the overall description of the results of the normality test. From the results obtained based on the Shapiro-Wilk (S-W) test in **Table 3**, it can be seen that the significance of the six dimensions of the influencing factors under the *P* value is less than 0.05 as the level of significance, the original hypothesis is rejected, so the data do not meet the normal distribution.

It can be seen that in the process of analyzing the influencing factors of college students' participation in rural education to alleviate poverty, it is not possible to choose the Pearson correlation factor research method, followed by the Spearman test in the analysis of the correlation of influencing factors.

Table 3. Descriptive results of the normality test for influencing factors

Variable name	Sample size	Median	Mean	Standard deviation	Skewness	Kurtosis	S-W test
Rural development evaluation	220	3	3.044	0.803	0.329	0.131	0.978
Parental attitude	220	3	3.166	0.932	0.168	0.113	0.956
Self-awareness	220	3.375	3.341	0.907	0.121	0.436	0.975
Knowledge of education poverty reduction policies	220	3	2.93	0.929	0.345	0.161	0.926
Curriculum content setting of higher education institutions	220	3	2.94	0.914	0.156	0.103	0.971
Education for poverty alleviation organized by colleges and universities	220	2.75	2.744	0.841	0.022	0.276	0.972

3.2.2. Results of Spearman-based correlation analysis

The result is clearly demonstrated by the color attribute features presented in the Spearman value and matrix heat map as shown in **Figure 2**. Among the 21 statistical factors, the Spearman value between Q12 and Q13 is 0.7, the correlation value between Q20 and Q19, Q21 floats above and below 0.7, and there is a significant correlation between Q23 and Q24 with a Spearman value of 0.85. Meanwhile, the Spearman value of the influencing factors between Q25 and Q28 is higher than 0.7 on average, which indicates that the influencing factors of the content of the university curriculum in education for poverty alleviation are more significant. The mean Spearman value of the statistics between Q29 and Q32 is found to be greater than 0.7, which also proves that there is a sufficient degree of correlation between the influencing factors in the dimension of the organization of educational poverty alleviation in universities.

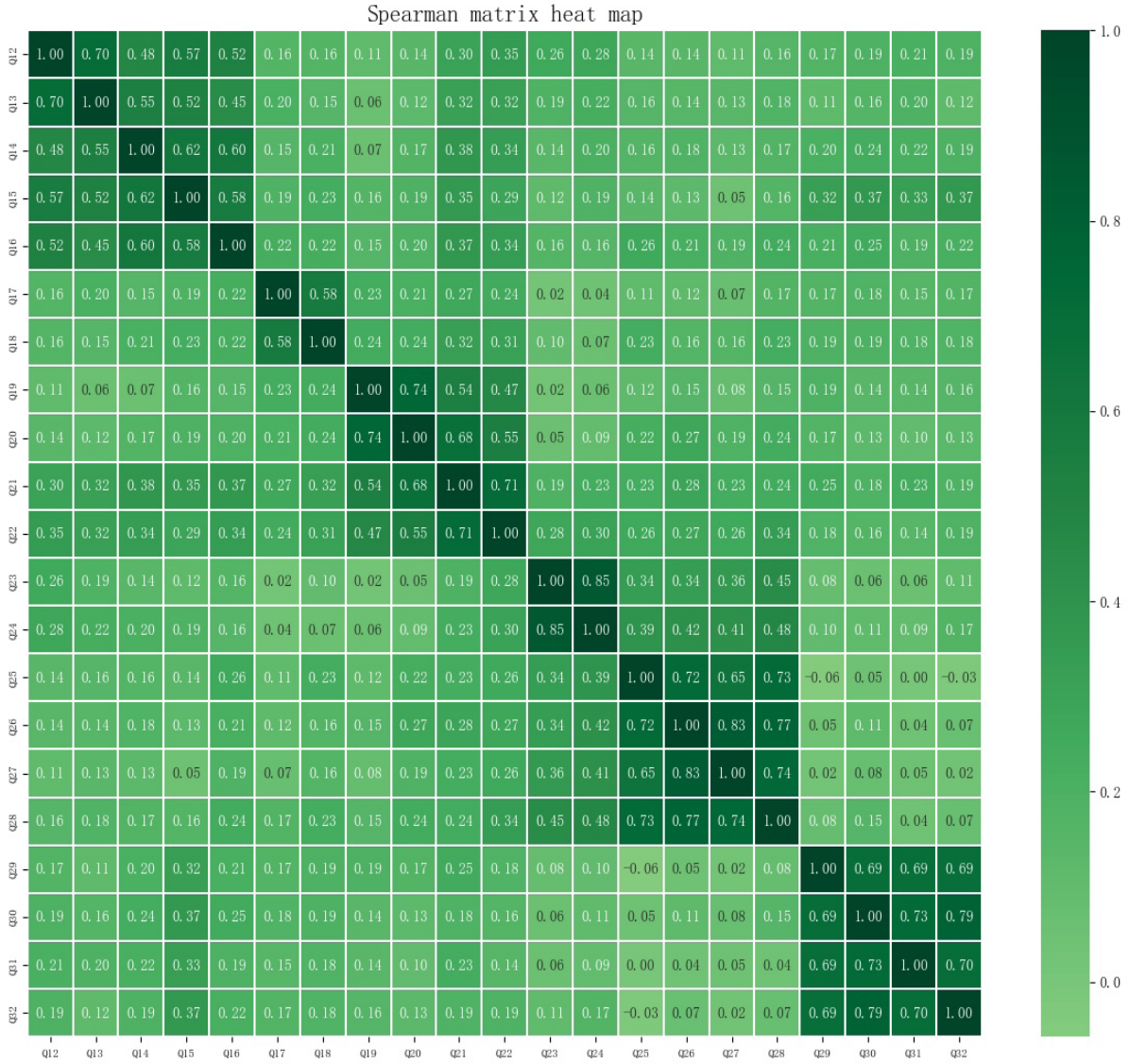

Figure 2. Spearman matrix heat map for each influencing factor

4. Conclusion

Based on the development and promotion of rural education poverty alleviation work, this research focuses on college students as the main body of practice, as well as the six dimensions, including rural development

evaluation, parental attitudes, self-awareness, awareness of education poverty alleviation policies, curriculum content setting in colleges and universities, and organization of education poverty alleviation in colleges and universities, to explore the essence of the reasons affecting the willingness of college students to participate in rural education poverty alleviation and its status.

According to the results of the statistical research analysis based on this research, there is a strong correlation between the influencing factors and the overall tendency of the mean value of each factor is neutral, but there is still a certain degree of bias, such as college students' lack of confidence in their professional ability and time and energy in their self-awareness, and at the same time they have insufficient knowledge of the policy of poverty alleviation in education, and college teachers should make more efforts in the cultivation of professional skills and the implementation of poverty alleviation activities in education, etc. For this reason, in terms of synthesizing the results of various statistical research methods, this paper makes the following suggestions:

(1) Effective government guidance and the establishment of a sound incentive mechanism

The government should continue to improve the incentive and guarantee mechanism for all types of teachers and students to engage in compulsory education and training in poverty-stricken areas. In addition to granting a certain number of subsidies, it is recommended that non-material incentives, such as honorary positions and honorary titles, be awarded to them so that they can gain the respect, recognition, and support of society.

The government can appropriately increase the number of places on the premise of guaranteeing the comprehensive quality requirements of the personnel involved in education for poverty alleviation, broaden the scope of choice, and provide the opportunity for more willing outstanding college students to participate in rural education for poverty alleviation.

(2) Focusing on educational practice and building innovative poverty alleviation models

Colleges and universities should improve the curriculum content setting and focus on the cultivation of professional practice ability. Colleges and universities should scientifically plan the participation time for college students to engage in rural education and poverty alleviation activities, and arrange the time within the vacation as much as possible. Colleges and universities can rely on cross-advantageous disciplines and join hands with enterprises or social organizations to set up distance education platforms such as "smart education." Colleges and universities should vigorously carry out the propaganda and organization of rural education poverty alleviation policies, and actively advocate and encourage college students to participate in rural education poverty alleviation.

(3) Rural gathering and civilization of countryside, school-enterprise-village linkage for co-teaching and co-education

In the construction of villages, efforts should be made to promote the civilization of rural customs, strengthen rural governance, create an ideal living field for living and working in peace and happiness, and enhance the sense of well-being of villagers and volunteers involved in rural poverty alleviation work. Organizations at all levels should strengthen school-enterprise-village linkages, build a new road leading to cooperative development based on the development of characteristic industries, and help revitalize the countryside, education, and talents.

In summary, the participation of university students in rural education for poverty alleviation is a beneficial activity in the context of rural revitalization, which is conducive to the accumulation of university students' experience in social practice activities and the speedy realization of the goal of rural education for poverty alleviation. Therefore, the government, colleges and universities, villages, and other social organizations and

citizens should pay full attention to college students' participation in rural education for poverty alleviation, and actively guide and encourage college students to participate in rural education for poverty alleviation.

Disclosure statement

The authors declare no conflict of interest.

Author contributions

Y.C. conceived the idea of the study and wrote the paper. X.L. performed the experiments. P.S. analyzed the data. Y.H. performed data collation and analysis.

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