Exploring the optimization path of rural geriatric education under the threshold of empowerment: An empirical study in Zhejiang Province

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Abstract. Synchronizing the improvement of rural elders' happiness with economic and social development has become an urgent issue driving rural construction, comprehensive rural revitalization, and the decisive victory in building a moderately prosperous society. The enhancement of rural elders' spiritual satisfaction, as a systematic project,requires high attention and concerted efforts for exploration and resolution. This study aims to assess the significant opportunity presented by actively responding to the aging population strategy through empowerment and enhancement, thereby optimizing the development of elderly education in rural China. This study delves into the optimization path of rural elderly education. It systematically evaluates the existing problems and development status of elderly education in rural areas, proposes improvement measures, and constructs a path for the development of rural elderly education, analyzing and assessing the current implementation status and shortcomings in sample villages. Through the comprehensive empowerment and enhancement education theory, it summarizes the optimization path for rural elderly education. Through empirical analysis result show that three key findings emerge. Firstly, cognitive needs exert a direct positive influence on the level of elderly education. The perception among the elderly regarding the necessity of elderly education significantly impacts their participation and subsequently influences the overall level of elderly education. Moreover, enhancing the elderly' s sense of self-efficacy holds considerable importance in this regard. Secondly, geographical transportation emerges as a critical determinant, positively affecting cognitive needs and the level of elderly education. Proximity to educational institutions, coupled with efficient transportation options, significantly influences the willingness of the elderly to engage in educational activities, thereby elevating the overall level of elderly education. Lastly, the quality of curriculum setting is identified as another crucial factor affecting cognitive needs and the level of elderly education. Aligning course offerings with the demands of the elderly population enhances their satisfaction with elderly education. By integrating insights from successful practices in both rural and elderly education, particularly from developed countries, this study offers a specific path for rural elderly education, thereby guiding the educational development in rural areas, such as Zhejiang Province. This paper focuses on the actual situation in Zhejiang Province and holds practical significance.

Keywords: Rural revitalization; Education for the elderly; Rural education; Optimization path; the perspective of empowerment.

1. Introduction

Mulberry and elm are bright, joyful learning is boundless. As the aging of Chinese society continues to deepen, rural elderly education is facing an increasingly severe situation (S. Batara, et al., 2021). The traditional family education model has been affected by factors such as rural population loss and family structure changes, and it is difficult to meet the diverse learning needs of the elderly. At the same time, educational resources in rural areas are scarcer than in cities, including education for the elderly (Z. Douglas, 2019). The lack of sufficient education resources and facilities for the elderly restricts the learning opportunities and improvement of the elderly (T. Antonios, 2021). There is a lack of professional education institutions and teachers for the elderly (S. Gabriele et al., 2017). The education level in rural areas is generally low, resulting in limited learning channels for the elderly (T. Antonios, 2021). Rural elderly people generally face the problem of insufficient social cognition and respect. Their learning needs and rights are often not paid enough attention and

protection, causing the elderly to feel marginalized in the process of learning and social participation, making the current rural elderly people feel marginalized. The development of education is not optimistic (K. Hyunwook, 2015). There are problems such as uneven educational resources, imperfect service systems, and insufficient policy support. These problems have restricted the healthy development of rural elderly education. Actively exploring practical paths to optimize education for the elderly in rural areas is an important issue for in-depth study and implementation of the spirit of the 20th National Congress and for promoting the high-quality development of various undertakings in rural areas (M. Dirk, J. McCutheon., 2019).

With the continuous incidents of elderly education problems in China in the past two decades, rural elderly education is also a social pain point in current research on rural elderly education, which helps to identify the problem of insufficient resources and propose solutions (Y.X. Zhao, 2024). Rural elderly education is an important issue that cannot be ignored in the process of elderly education services. Optimizing the path of rural elderly education is the prerequisite for exploring education models and mechanisms suitable for rural characteristics (S. Nelma & B. Crawford, 2009). With the rapid growth of the elderly population and the deepening of aging in China, rural areas are facing increasingly severe aging issues. The increasing number of elderly and "empty-nest" elderly populations, along with the rising demand for mental well-being, highlight the urgency and importance of developing rural elderly education(H. Hany et al., 2017). However, the current development of rural elderly education lags behind and faces numerous challenges, requiring urgent attention and efforts from the government and society.

Firstly, the development of rural elderly education lags behind mainly due to inadequate management mechanisms. In urban areas, elderly education institutions and management systems are relatively well-established, offering diverse and abundant educational activities. However, in rural areas, due to the lagging and imperfect management mechanisms, organizing and managing elderly education faces significant difficulties (L. C. Jill., 2004). The lack of effective management mechanisms leads to irrational resource allocation, uneven service quality, and an inability to meet the diverse needs of rural elderly people.

Secondly, the development of rural elderly education faces insufficient funding. Due to the relatively underdeveloped economy in rural areas, limited fiscal expenditure results in a lack of financial support for rural elderly education (T. Antonios, 2021). Compared to urban areas, rural areas suffer from severe underinvestment in elderly education, resulting in inadequate resources, outdated facilities, insufficient teaching staff, and hindering the development and improvement of rural elderly education.

Additionally, the development of rural elderly education is hindered by the low participation rate of the elderly. The general low level of education among rural elderly people, coupled with a lack of enthusiasm for learning among some, leads to inadequate learning motivation. Furthermore, factors such as inconvenient transportation and limited access to information pose challenges for many elderly people to participate in elderly education activities, limiting the coverage and impact of elderly education in rural areas.

The development of rural elderly education lags behind and faces numerous challenges, necessitating increased investment from the government and society. Efforts should be made to improve management mechanisms, increase financial support, boost elderly participation rates, and promote the healthy development of rural elderly education. Particularly, in the current context of rural revitalization strategy implementation, seizing this opportunity to support and assist rural elderly education is essential in helping rural elderly people achieve the goal of lifelong learning and enjoyment, and in promoting the realization of a comprehensive well-off society.

In this context, how to promote the development of rural elderly education and improve the quality of learning and life of the elderly through effective optimization paths. This is not only an important social pain point faced by the current society, but also an urgent problem in the field of rural education (H. Marianne., 2003). Therefore,this paper in-depth analyzes and evaluates the implementation and shortcomings of the existing elderly education in the villages, obtain relevant economic data to

conduct quantitative research methods to supplement the functions and value expressions of social organizations participating in elderly care services. On this basis, the optimization paths for elderly education in rural areas are summarized to improve the ability of social organizations to provide elderly care services. It is of great theoretical and practical significance to conduct research on the optimization path of rural elderly education.

2. Literature review

Gerontology is an emerging discipline, and different scholars have different research contents and methods (I. Hachem, 2020; K. Liat, 2024). Most of the existing literature on the development of elderly education in the context of population aging, especially in rural areas, focuses on policy establishment, shortcomings correction and development suggestions. In 1976, D.A. Peterson of the University of Southern California, Los Angeles, defined elderly education as follows: providing education for the elderly so that they can understand and integrate into society through learning, adapt to changes in social roles, and educate people who are about to enter old age but have not yet entered old age, using the aging process as a course to help them understand the aging process and prepare for old age (V. Esmeraldina, and P.Guimarães., 2014). The so-called elderly education specifically includes two aspects: one is to provide planned, purposeful and organized learning activities for the elderly over 55 years old, with the purpose of increasing knowledge, acquiring skills, changing feelings and attitudes, achieving self-realization and serving the society; the second is to provide the general public with knowledge about aging, so that they can change traditional concepts, correctly understand and treat aging, and ultimately achieve active aging.

The earliest definition of "empowerment" was given by American scholar Solomon, who believed that empowerment is aimed at the powerlessness of discriminated groups, oppressed groups and marginalized groups in the target community (B. Elijah & S. Dickin, 2019; M. I. Yousafzai, et al., 2024). "Empowerment" has a good balancing effect on the education and innovative education of social groups in a specific period (S. Gabriele et al., 2017). For example, O. Mohammad et al. (2019) elaborated on a core concept of empowerment theory. The core of the theory is "based on the structural contradictions in the external rights configuration, the theory advocates setting scientific demand conditions so that individuals can obtain the resources they need in a timely manner" (M. Dirk, & J. McCutheon, 2019). Instead of making individual rights unevenly distributed under the same conditions, people who should have rights cannot obtain the rights and benefit resources they deserve in social network groups. "Gradually, the cohesive role of individuals in the entire social network group is lost, and the ability to continue to obtain the resources they deserve is lost (T. Antonios, 2021). Therefore, the empowerment function is to evenly distribute the rights and interests that individuals or groups deserve, so as to realize the normal operation of social functions.

From a deeper perspective, the empowerment theory has been widely used in the research on the protection of the rights of vulnerable groups in society, namely the elderly in this study (S. Christoph et al., 2014; A. Garces-Ozanne et al., 2016; M. Núñez et al., 2019). At present, there are not many related studies on the application of empowerment theory in the fields of elderly education and active aging involving the vulnerable group of rural elderly people, and the academic community is still lacking in the research on empowerment theory based on rural elderly education (Z. Douglas, 2019). In addition, there are many factors investigated in previous studies, and this study will focus on the elderly group to clarify that it actually belongs to the scope of empowerment theory research (I. Hachem, 2020; Y. X. Zhao, 2024). From the perspective of the development of elderly education, the analysis provides theoretical support for the protection of the rights and interests of vulnerable groups in society and the optimization of education development paths.

3. Research hypotheses

This study aims the optimization path of rural elderly education through the lens of empowerment theory, the research question guiding this study is:

What are the factors that affect the education level of the elderly in rural areas, and what are the direct relations between these factors?

Based on previous research in China, four influencing factors are selected: Insufficient cognitive demand factors; Geographic traffic disadvantage factors; Economic Conditions Unsuitability Factors; Unreasonable Curriculum Setting Factors.

Therefore, the literature review was organized accordingly and employs semi-structured, in-depth interviews to explore the factors influencing the level of elderly education development in rural areas. Three main questions guide the interviews: (1) Causes: What factors contribute to negative psychological and behavioral reactions among rural elderly regarding elderly education? (2) Psychological reactions: How do these factors influence the psychological feelings of rural elderly towards elderly education? (3) Behavioral response: What coping behaviors do rural elderly adopt in response to these factors and negative psychological feelings?

Interview samples were selected based on criteria such as experience participating in elderly education and clear perceptual experiences. The interviews were conducted face-to-face in two stages: pre-interview and formal interview. Data analysis involved three stages of coding: first-level coding for initial concepts extraction, secondary coding for clustering related dimensions, and tertiary coding for further refinement into six dimensions: insufficient cognitive demand, geographical transportation inconvenience, financial constraints, unreasonable curriculum, continuous participation intention, and behavior.

Through this three-stage coding process, four core variables were identified: objective factors, subjective factors, non-continuous participation intention, and non-continuous participation behavior. The coding process is illustrated in Figures 1.This structured approach enables a comprehensive understanding of the factors influencing the implementation of rural elderly education, shedding light on strategies to enhance empowerment and optimize educational outcomes for older adults in rural communities.

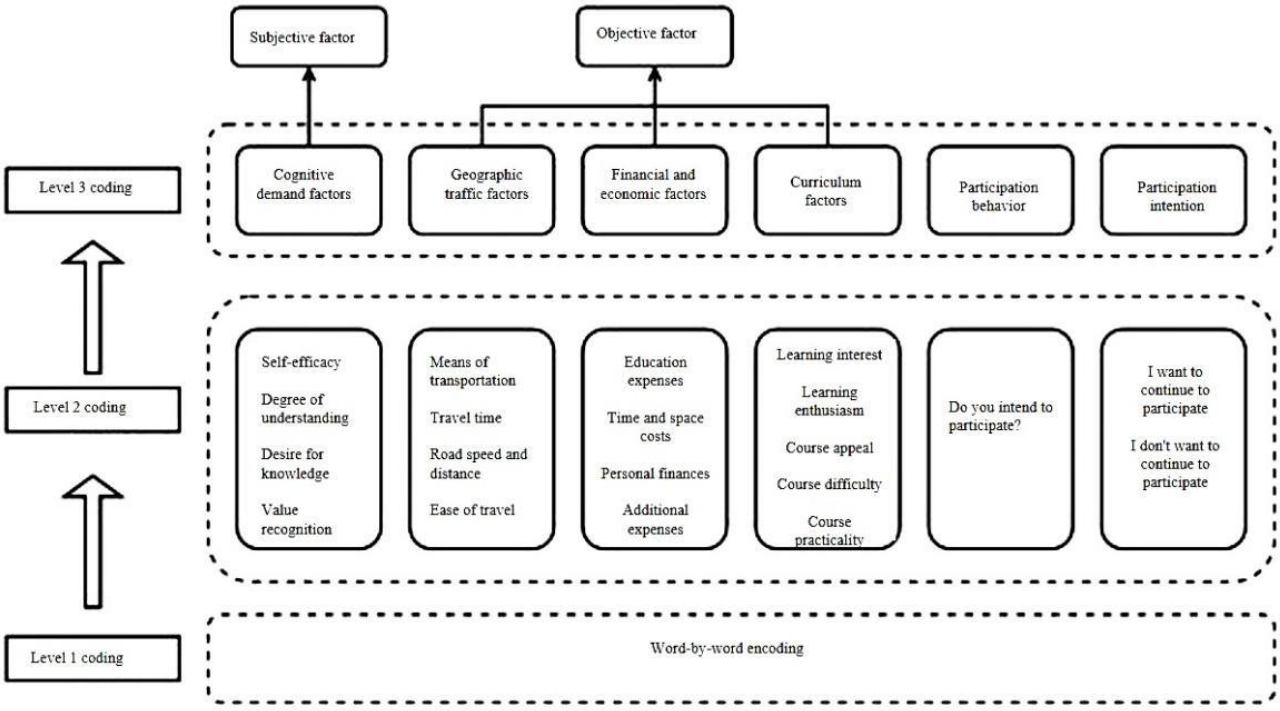

Figure 1 Three tertiary encoding

By checking the relevant keywords,past studies have shown that insufficient cognitive demand may be an important factor affecting the participation of the elderly in education. For example, Lee-Ann et al. (2001) found that the cognitive characteristics of the elderly affect their acceptance of education. Insufficient cognitive demand may lead to a decrease in the elderly's interest in learning, thereby reducing their willingness and level of participation in geriatric education. In addition, B. Elijah & S. Dickin. (2019) pointed out that the cognitive level of the elderly has an important impact on their acceptance of education. Therefore, insufficient cognitive demand may be an important factor affecting the level of education of the elderly.

Based on this, the first hypothesis is proposed.

Hypothesis 1. Insufficient cognitive demand factors has a negative impact on the level of geriatric education received by the elderly.

Geographical inconvenience may be a key issue restricting the participation of the elderly in education in rural areas. H.T. Antonios (2021) pointed out that geographical factors affect the convenience of the elderly in accessing educational resources. Being far away from educational institutions or lacking convenient means of transportation may make it difficult for the elderly to obtain educational services, thereby reducing their educational level. L. Ashley et al. (2020) analyze financial support or reduction of education costs to promote participation among older adults. Therefore, improving geographical transportation conditions may help improve the educational level of the elderly.

Based on this, the second hypothesis is proposed:

Hypothesis 2. Geographic traffic disadvantage factors has a negative impact on the level of geriatric education received by the elderly.

Past studies have shown that economic factors are one of the important factors affecting the participation of the elderly in education. For example, S. Gabriele et al. (2017) pointed out that economic difficulties may limit the opportunities for the elderly to receive education. Poor economic conditions may make it impossible for the elderly to afford education, thereby limiting their learning opportunities and levels. Therefore, providing financial support and reducing education costs may help improve the educational level of the elderly.

Based on this, the third hypothesis is proposed:

Hypothesis 3. Economic Conditions Unsuitability Factors has a negative impact on the level of geriatric education received by the elderly.

Unreasonable curriculum setting may affect the willingness and level of participation in education of the elderly. F. Lee-Ann (2001) found that the course content that does not meet the actual needs of the elderly may reduce their interest in education. Therefore, setting the course content reasonably and taking into account the needs of the elderly may help improve their educational level.

Based on this, the fourth hypothesis is proposed.

Hypothesis 4.Unreasonable Curriculum Setting Factors has a negative impact on the level of geriatric education received by the elderly.

4. Materials and Methods

4.1. Research Design

With the development of social economy and the aging of the population, the importance of rural education for the elderly has become increasingly prominent. In Zhejiang Province, optimizing the development path of rural education for the elderly is of great significance to improve the life quality and quality of the elderly and promote social harmony and stability. In order to understand the actual situation and needs of education for the elderly in rural areas and formulate reasonable and feasible development paths, the research team designed paper questionnaires and distributed them to the village residents to understand the basic situation and status of the education level of the elderly in the investigated villages, so as to provide reference for the data analysis of this paper.

4.2. Questionnaire design

Four influencing factors were included as independent variables, the rural elderly received the level of geriatric education as dependent variables and demographic variables as control variables. According to the mature scale compiled by domestic and foreign scholars, the questionnaire mainly focuses on the demographic variables, whether they have received education for the elderly, the intention to participate in education for the elderly under the influence of different subjective and objective factors, and the views on the implementation of education for the elderly. The questionnaire included 30 items, covering six parts: demographic variables, cognitive insufficiency factors, geographical transportation inconvenience factors, unsupportive factors of economic status, unreasonable curriculum factors and the level of education for the elderly.

4.3. Reliability analysis and Validity analysis of the scale

To ensure the reliability and validity of the survey instrument used in this study, a Kaiser-Meyer-Olkin (KMO) measure and a Cronbach' s Alpha test were conducted(L. Paula, 2015; C. Karla A.,& L. Cosio-Lima., 2019). These analyses are crucial for determining the consistency and accuracy of the survey questions in measuring the constructs they are intended to.

Table 1 Reliability and validity analysis

Variable	Crorbach's a	KMO (significant level)	Bartlett sphericity test	Item
Insufficient cognitive demand factors	0.939	0.768 (0.000)	859.044	5
Geographic traffic disadvantage factors	0.982	0.875 (0.000)	686.353	4
Economic Conditions Unsuitability Factors	0.887	0.861 (0.000)	328.375	4
Unreasonable Curriculum Setting Factors	0.906	0.854 (0.000)	631.601	4
Elderly Education Level	0.934	0.897 (0.000)	576.365	4

As you can see from Table 1 above, each variable demonstrates high internal consistency, as indicated by Cronbach's alpha values ranging from 0.887 to 0.982. The KMO measures of sampling adequacy are all above 0.75, indicating that the variables are suitable for factor analysis. Additionally, Bartlett's test of sphericity yields significant results ($p < 0.05$), confirming the suitability of the data for factor analysis. Each variable comprises a different number of items, ranging from 4 to 5, capturing distinct dimensions related to education factors such as cognitive demand, geographic disadvantages, economic conditions, curriculum setting, and elderly education levels.

4.4. Sampling rules and data collection

In order to make the samples more representative, we adopted various sampling methods such as cluster sampling, PPS sampling and simple random sampling in three stages, as shown in Table 2:

Table 2 Sampling Methods

	sampling unit	sampling method
Stage I	prefecture-level city	cluster sampling
Stage II	Under the jurisdiction of counties / districts	PPS sampling (Hillary method)
Stage III	village	simple random sampling
Stage IV	resident	Encounter sampling

Stage 1: Investigate cluster sampling at the municipal level

We studied the relevant policy documents on elderly education in my country in a time series. Combined with the list of Zhejiang Province's high-quality (demonstration) senior education schools and "Study in Zhejiang" citizen lifelong learning experience bases announced by the Office of the Zhejiang Provincial Department of Education on December 20, 2021, we used the municipal clusters as sampling units and selected 8 cities, including Hangzhou, Jiaxing, Huzhou, Ningbo, Wenzhou, Taizhou, Lishui, and Quzhou, by cluster sampling.

Stage 2: PPS sampling of subordinate cities (counties)/districts

In the second phase, the number of subordinate cities (counties)/districts of the prefecture-level cities was counted, and the number of villages to be sampled in each district was determined in proportion to the number of subordinate cities (counties)/districts (K. Neal, & T. Calasanti, 2006). Four subordinate cities (counties)/districts were sampled in Hangzhou, and two subordinate counties/districts were sampled in Ningbo, Wenzhou, Huzhou, Lishui, Quzhou, Taizhou, and Jiaxing. The Lahiri method was then used to conduct PPS sampling according to the population size of each street to determine the specific towns (streets) to be sampled in each district. We selected Jiande City, Qiantang District, Xiaoshan District, and Chun'an County under Hangzhou; Ningbo City, Ninghai County, and Fenghua District; Wenzhou City, Yongjia County, and Yueqing City; Huzhou City, Changxing County, and Wuxing District; Lishui City, Jinyun County, and Bohai Town; Quzhou City, Longyou County, and Kaihua County; Taizhou City, Sanmen County, and Linhai City; Jiaxing City, Jiashan County, and Haining City.

Stage 3: Simple random sampling of villagers

To understand the general situation of the administrative villages in each selected city (county)/district, simple random sampling was used. According to the number of villages contained in the selected city (county)/district, 1-3 villages were randomly selected, and a total of 24 villages were selected.

Stage 4: Chance sampling

The villagers of each village were used as the final sampling units, and the chance sampling method was used. Questionnaires were randomly distributed and simple interviews were conducted.

4.5. Sample Size

Sample size is defined as the number of observations used to determine a given population estimate. Based on the literature, we developed a questionnaire, the survey conducted from 2023 January to January 2024 by field questionnaires, A total of 720 questionnaires were distributed, of which excluded 28 invalid questionnaires and 692 valid questionnaires were collected..To make the sample more representative, this time we used a variety of sampling methods such as cluster sampling, PPS sampling, simple random sampling, etc. The sampling results showed that the number of females exceeded that of males, and the age was mostly concentrated between 60 and 70 years old, with 70-80 years old people second; most of the survey subjects were from Zhejiang Province, and the marital status was mainly married; monthly income (including pension) was mainly concentrated between 2501 and 5000 yuan.

4.6. Research framework

Based on the empowerment theory, this study explores how the rural elderly education path the empowerment threshold. Based on Figure 2, the conceptual system of empowerment was summarized, and the hypotheses mentioned above were selected to form a research framework to explore the influencing factors of the education level of the elderly in rural areas.

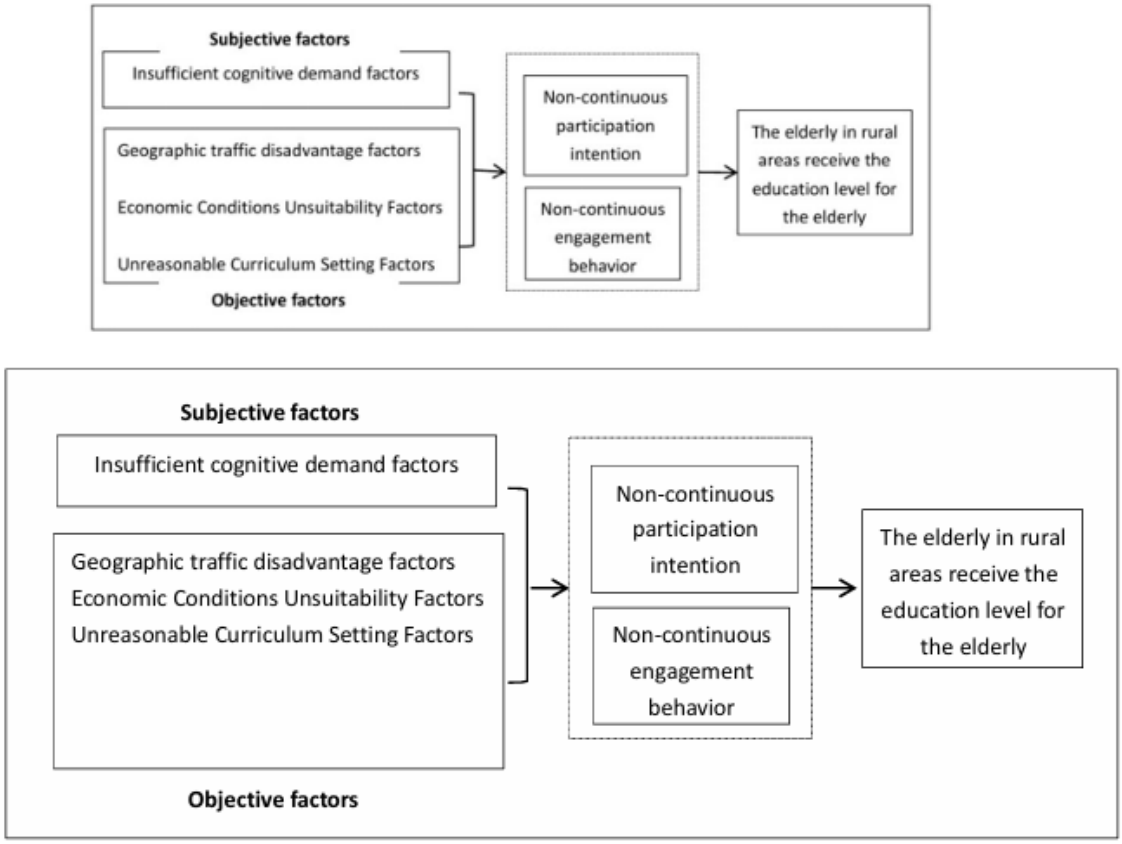

Figure 2 Research framework

In this research framework, the independent variables were cognitive needs, geographical transportation convenience, economic status, and curriculum setting, and the dependent variables were the level of geriatric education received by older adults. Specifically, the independent variables include: Cognitive needs: refers to the degree of cognitive needs for education, including knowledge, skills, attitudes and self-actualization. Geographic transportation convenience: refers to the relationship between the geographical location of the elderly in rural areas, including the distance of educational institutions, the accessibility of transportation means and other factors. Economic status: refers to the economic ability and economic disadvantage of the elderly, including income level, financial support and education cost burden and other factors. Curriculum: refers to the course content and Settings provided by educational institutions for the elderly, including the degree of course difficulty and the degree of meeting the needs of the elderly. The dependent variable is the level of education of the elderly, which can be measured by the degree of education participation and education quality assessment. Studying the relationship between these independent and dependent variables, we can deeply understand the influence mechanism of elderly education level in rural areas and provide scientific basis for formulating improvement measures.

5. Analysis of the results

5.1. Sample feature analysis

The sample population was analyzed from the valid questionnaire,the data presents the distribution of participants across various variables.The distribution of participants across different variables

provides valuable insights into the landscape of senior education programs. The majority of participants attended village and town senior education facilities (63.58%), with fewer opting for public senior universities (26.45%) or private senior universities (9.97%). The majority of participants favored village and town senior education facilities over public and private senior universities, indicating a preference for local and community-based educational initiatives. This preference could be attributed to factors such as convenience, accessibility, and possibly affordability.Education durations were predominantly shorter, with 80.49% completing their education in less than a year, while 13.44% and 6.07% pursued education for 1-2 years and 2-3 years, respectively. Regarding outcomes, most participants reported either great gains (37.86%) or moderate gains (41.76%), while a smaller proportion experienced very small gains (20.38%).

Table 3 Description of the characteristics of the educated group

Variables	option	frequency	%
Education location	Public senior university	183	26.45%
	Village and town senior education facilities	440	63.58%
	Private senior university	69	9.97%
Education time	Less than 1 year	557	80.49%
	1-2 years	93	13.44%
	2-3 years	42	6.07%
Education results	Great gains	262	37.86%
	Moderate gains	289	41.76%
	Very small gains	141	20.38%
	Total	692	100 .00%

5.2. Construction of the development level of elderly education in rural areas—Based on structural equation model

5.2.1 Model study hypothesis

The factors that affected the level of education of the elderly were divided into cognitive demand factors, geographical transportation factors, financial and economic factors, and curriculum factors. These factors directly affect the participation intention and participation behavior of rural elderly, and then affect the development level of education of rural elderly. Furthermore, we got a structural equation model of the relationship between the elderly education level and the expectation degree, as shown in the figure 3:

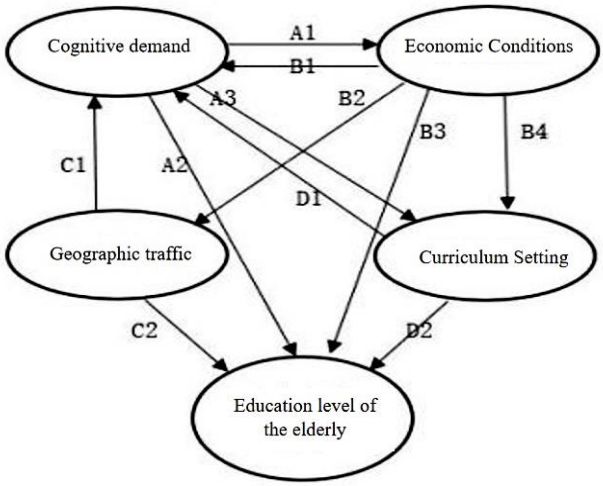

Figure 3 Structural equation model of the relationship between the level of elderly education and expectations

(1) The influence of cognitive needs

The cognitive needs factor refers to the subjective needs of the elderly themselves for whether they want to receive elderly education. Due to the limitations of publicity and communication effects, the subjective needs of the elderly for elderly education are often low, which affects the level of their elderly education. The subjective needs of the elderly themselves for whether they want to receive elderly education often determine whether they are willing to consume for elderly education, which is related to their financial economy. Through the above analysis, the following hypotheses are drawn:

A1: Cognitive needs have a positive impact on financial economy;

A2: Cognitive needs have a positive impact on the level of elderly education.

(2) The impact of financial economy

Financial and economic disadvantages are that some regions only have private elderly education institutions, and their fees are relatively high, which most elderly people cannot afford. In addition, the children of the elderly are unwilling to bear the cost of their parents' elderly education, so even if the motivation and demand are sufficient, they have to terminate due to economic reasons. Personal economic ability will also affect the ownership of personal means of transportation, thereby affecting geographical transportation, hindering the participation of the elderly in education, and further affecting cognitive needs. Through the above analysis, the following hypotheses are obtained:

B1: Financial economy has a positive impact on cognitive needs; B2: Financial economy has a positive impact on geographical transportation;

B3: Financial economy has a positive impact on the level of elderly education; B4: Financial economy has a positive impact on curriculum setting.

(3) The impact of geographical transportation

The inconvenient factors of geographical transportation are that the elderly education venue is far away from the elderly' s residence, and the elderly have difficulty in walking and traveling. When it becomes difficult to reach the education venue, the level of elderly education received by the elderly will naturally be affected and decline. Through the above analysis, the following hypotheses are obtained:

C1: Geographical transportation has a positive impact on cognitive needs;

C2: Geographical transportation has a positive impact on the level of elderly education;

(4) The impact of curriculum setting

The unreasonable factors of curriculum setting are that the courses implemented in elderly education are too difficult or too easy, which is inconsistent with the actual needs of the elderly. Such content cannot attract the elderly, reduce their enthusiasm for learning, and thus reduce their level of education. Through the above analysis, the following hypotheses are obtained:

D1: The curriculum setting has a positive impact on cognitive needs;

D2: The curriculum setting has a positive impact on the level of education for the elderly.

5.2.2 Model variable processing

Under the guidance of this structural model, this study combined relevant literature and previous research results to establish a measurement model for each latent variable.

First, According to existing research, the project team preliminarily identified four latent variables, namely cognitive needs factors, geographical transportation factors, financial and economic factors, and curriculum setting factors. Then, through the specific analysis of the questionnaire information and further retrieval of the interview content, the observed variable indicators of the four latent variables were preliminarily determined.

Table 4 Measurement model indicator system

Latent variables	Observed variables
Cognitive needs	Popular science, need recognition, significance recognition, value recognition, degree of understanding
Geography and transportation	Means of transportation, distance, travel difficulty, public transportation
Finance and economics	Education fees, personal finances, family funding
Course settings	Learning enthusiasm, interest, course difficulty, supply and demand matching

5.2.3 Preliminary establishment of the model

This part will be based on the structural equation model, analyzing whether the assumed relationship between different variables holds, and the degree of model fit. Next, the relationship between the variables was analyzed by the structural equation model, and the hypothesis was verified, and tested for the degree of fit of the model. Use AMOS25.0 software to draw the structural equation model diagram, and import the questionnaire data into it to test the fit degree of the theoretical model. The theoretical model diagram is shown in the figure:

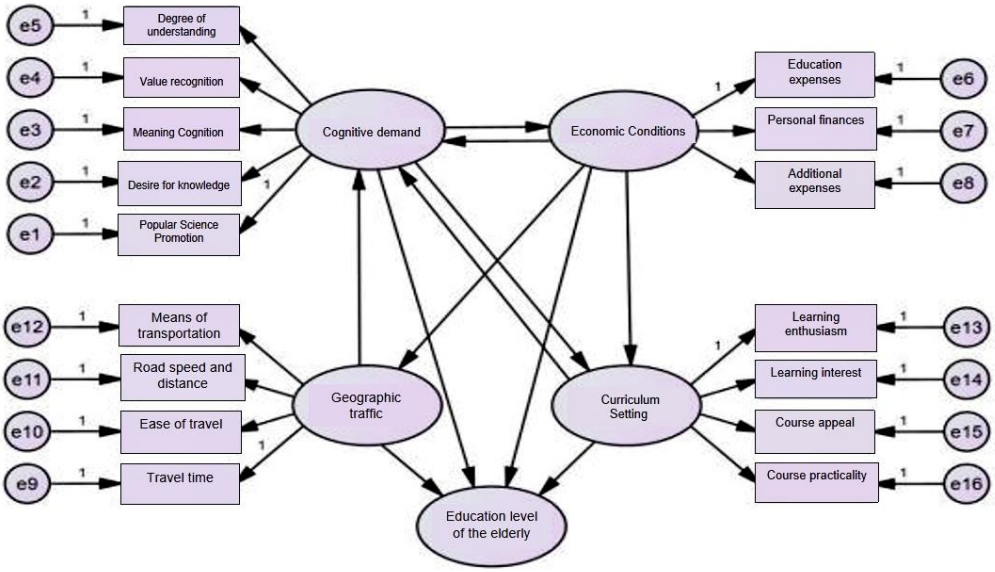

Figure 4 Structural equation model of factors influencing education level in the elderly

5.2.4 Preliminary model evaluation

(1) Evaluation of the model fit degree

There are multiple reference indicators to consider when examining the fit of the overall theoretical model. The evaluation indexes of the overall model fit include three types: absolute fit index, value-added adaptation index and parsimony adaptation index. CMIN / DF and RMSEA are two most commonly used absolute matching moderate indicators for evaluation; the value-added adaptation index is comparing the hypothesis model with the independent model, including CFI, IF1 and TLI for evaluation.

Table 5 Model fit test

Indicator type	Index	Reference standard	Measured value
Absolute fit	CMIN/DF	1-3 is excellent, 3-5 is good	1 .395
	RMSEA	<0.05 is excellent, <0.08 is good	0 .026
	ITL	>0.9 is excellent, >0.8 is good	0 .968
Value-added fitness	TLI	>0.9 is excellent, >0.8 is good	0 .982
	CFI	>0.9 is excellent, >0.8 is good	0 .974

According to the results of model fit test, CMIN / DF (chi-square degree of freedom ratio) =1.395, within the range of 1-3, RMSEA (root error) =0.026, within the excellent range of <0.05; besides, the test results of CFI, IF1 and TLI all reached the excellent level above 0.9. Therefore, combining the results of this analysis can show that the model has a good fit. (2) Model validity test The factor load in the measurement model represents the load fit of the latent variable to the observed variable, i. e., the degree to which the latent variable explains the observed variable. From the perspective of parameter fitting results, on the one hand, the highest standardized factor load is "cognitive demand understanding" (Estimate =0.946), and the lowest is "cognitive demand value recognition" (Estimate = -0.014,), indicating that the potential variables in each measurement model have strong explanatory power for their observed variables. The convergent validity (AVE) and combined reliability (CR) of each dimension will be further tested under the premise that the model has a good fit. Through the established structural equation model, check the standardized factor load of variables, and then pass the calculation formula of AVE and CR:

$$AVE = (\sum \chi^2)/n$$

$$CR = (\sum \chi)^2/(\sum \chi)^2 + \sum \delta$$

χ: factor loading N: the number of measurement indicators of this factor δ: residual variance Convergent validity values and combined reliability values were calculated for each dimension. According to the standard, the AVE minimum requirement is up to 0.5 and the CR minimum requirement is 0.7, obtained from the table below, the model has good convergent validity and combination reliability.

Table 6 Convergent validity and combined reliability of the educational level model for older adults

Path relationship			Estimate	AVE	C .R .
Popular science publicity	<---	Cognitive needs	0 .598	0 .5213	0 .893
Need recognition	<---	Cognitive needs	0 .616		
Degree of understanding	<---	Cognitive needs	0 .946		
Value recognition	<---	Cognitive needs	-0 .014		
Meaning recognition	<---	Cognitive needs	0 .987		
Public transportation	<---	Geography and transportation	0 . 139	0 .5476	0 .793
Distance of travel	<---	Geography and transportation	0 .965		
Ease of travel	<---	Geography and transportation	0 .953		
Means of transportation	<---	Geography and transportation	0 .576		
Supply and demand matching	<---	Course setting	0 .96	0 .7351	0 .9164
Course difficulty	<---	Course setting	0 .93		
Interest	<---	Course setting	0 .771		
Learning enthusiasm	<---	Course setting	0 .748		
Personal finances	<---	Financial economics	0 .683	0 .6684	0 .8554
Education fees	<---	Financial economics	0 .971		
Family funding	<---	Financial economics	0 .772		

As can be seen from Table 7, the standardized correlation coefficient between each dimension is less than the square root of the AVE corresponding to the dimension, thus indicating that there is good discriminatory validity among the dimensions.

Table 7 Results of the differential effect of the geriatric education level model

	Cognitive needs	Geography and transportation	Course settings	Finance and economics
Cognitive needs	0 .521			
Geography and transportation	0 .097	0 .548		
Course settings	0 .074	0 .936	0 .735	
Finance and economics	0 .914	0 .097	0 .075	0 .668
AVE value square root	0 .722	0 .740	0 .857	0 .818

(3) Pway coefficient test

Table 8 Pathway test results

Path relationship			Estimate	S .E .	C .R .	P
Finance and economics	<---	Cognitive needs	0 .965	0 .267	0 . 104	0 .917
Old people's education level	<---	Cognitive needs	0 .946	0 . 155	19 .658	***
Cognitive needs	<---	Geography and transportation	0 .616	0 .095	14 .682	***
Old people's education level	<---	Geography and transportation	0 .953	1 . 193	-3 .884	***
Cognitive needs	<---	Course settings	0 .93	0 .016	55 .292	***
Old people's education level	<---	Course settings	0 .771	0 .024	31 .01	***
Geography and transportation	<---	Financial economics	0 .748	0 .019	29 .077	***
Cognitive needs	<---	Financial economics	0 .683			
Old people's education level	<---	Financial economics	0 .971	0 .073	25 .064	***
Course settings	<---	Financial economics	0 .772	0 .06	20 .383	***

(Note: "***" means p<0.001)

Model evaluation should first examine whether the estimated parameters in the model results are statistically significant, and it is necessary to conduct a statistical significance test on the path coefficient or load coefficient.

From the results, it can be seen that the estimated coefficients of two paths in the structural equation are not statistically significant at the significance level of 0.01.

5.2.5 Model modification

From the results of the hypothesis test in the previous article, it can be seen that the direct impact of cognitive demand on fiscal economy and fiscal economy on cognitive demand is not significant, so these two paths are removed, and the structural equation model is constructed as shown in Figure 5, and the corresponding path coefficients of the model are shown in Table 9.

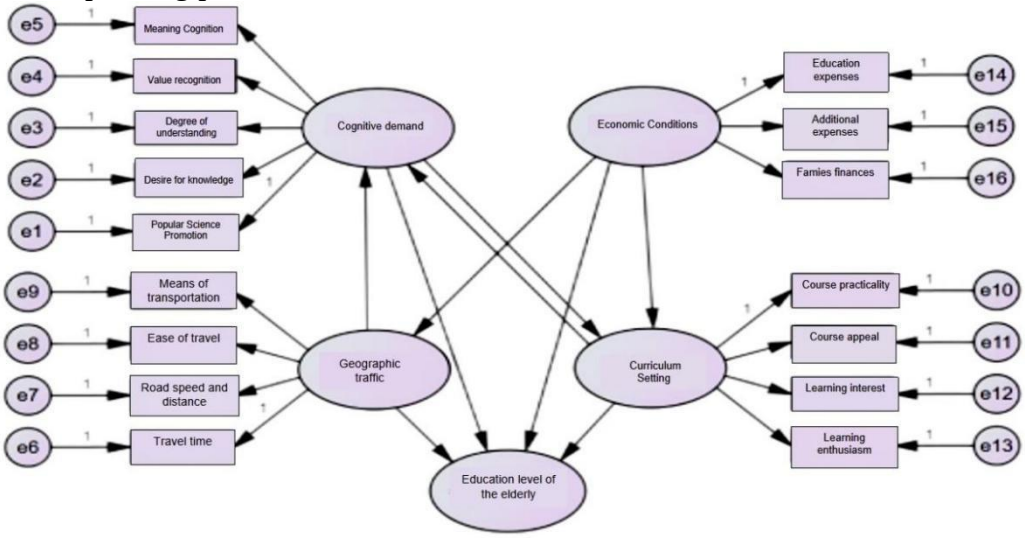

Figure 5 Structural Equation Model for Factors influencing Elderly Education Level (Revised)

Table 9 Results of the modified pathway tests

Path relationship			Estimate	S .E .	C .R .	P
Elderly education level	<---	Cognitive needs	1 .391	0 .095	14 .682	***
Cognitive needs	<---	Geography and transportation	3 .053	0 . 155	19 .658	***
Elderly education level	<---	Geography and transportation	3 .285	0 . 163	20 . 14	***
Cognitive needs	<---	Course setting	0 .905	0 .016	55 .292	***
Elderly education level	<---	Course setting	0 .736	0 .024	31 .01	***
Geography and transportation	<---	Finance and economics	0 .566	0 .019	29 .077	***
Elderly education level	<---	Finance and economics	1			
Course settings	<---	Finance and economics	1 .826	0 .073	25 .064	***

Note: "* * *" indicates p <0.001

5.3. Empirical analysis results

First, cognitive needs have a direct positive impact on the level of elderly education.The elderly' s cognition of whether they need to receive elderly education directly determines whether the elderly participate in education and greatly affects the level of elderly education. The improvement of the elderly' s sense of self-efficacy is of great significance.

Second, geographical transportation has a direct positive impact on cognitive needs and the level of elderly education.As one of the objective influencing factors, geographical transportation factors have important reference value. The elderly are close to the elderly education university, have public transportation or private means of transportation, and the commuting time is not long. Naturally, they are more willing to go to educational places to receive education, which has a greater impact on the improvement of the elderly education level.

Third, the curriculum setting has a direct positive impact on cognitive needs and the level of elderly education.The quality of the curriculum setting is one of the important guarantees for students' learning enthusiasm. Offering courses needed by the elderly to achieve supply and demand matching will greatly improve the elderly' s satisfaction with elderly education.

In general, based on reality, the above research inherited the valuable experience of rural education and education for the elderly in different periods, draws lessons from the good practices of farmers' education and elderly education in developed countries, and further defines the core goals and development direction. This direction and specific path of rural elderly education guide the development of rural education in Zhejiang Province. Improve the supply of education for older adults to improve the quality of education for them to achieve a better life and satisfaction.

6. Conclusions and Recommendations

6.1. Conclusions

In conclusion, this study has employed a comprehensive research methodology, integrating case analysis with empirical research, to investigate the status quo of elderly education in rural areas of Zhejiang Province. Through in-depth analysis of elderly education institutions and current practices in rural villages, valuable insights have been gained. The findings underscore the importance of addressing cognitive needs, improving geographical accessibility, and enhancing curriculum offerings to elevate the level of elderly education. Moreover, this research offers innovative perspectives by bridging theoretical frameworks such as empowerment theory with practical strategies for optimizing rural elderly education.

Through empirical analysis, several key findings have emerged. Firstly, the recognition of cognitive needs among the elderly significantly influences their participation in education and subsequently impacts the overall level of elderly education. Strengthening the sense of self-efficacy among older adults is identified as crucial in this regard. Secondly, the accessibility of educational facilities, particularly in terms of geographical transportation, plays a pivotal role in meeting cognitive needs and improving the level of elderly education. Proximity to educational institutions and efficient transportation options positively influence elderly individuals' willingness to engage in educational activities. Thirdly, the quality of curriculum offerings directly impacts cognitive needs and the level of elderly education. Tailoring courses to meet the specific needs and interests of older adults enhances their satisfaction with educational programs.

In summary, this research builds upon the rich experiences of rural education and elderly education across different contexts, drawing insights from successful practices in developed countries. By delineating core objectives and development pathways for rural elderly education, this study provides a practical guide for advancing educational initiatives in Zhejiang Province. By emphasizing the significance of cognitive empowerment, addressing transportation challenges, and enhancing curriculum relevance, by prioritizing the provision of education for older adults and enhancing the quality of educational offerings, contributes to the broader discourse on elderly education and underscores its importance in promoting social well-being and lifelong learning among older populations in rural areas,thereby fostering social cohesion and sustainable development in rural communities.

6.2. Recommendations

6.2.1 Policy mechanism support - improve the system and escort

In the new era, to promote the development of rural elderly education, it is necessary to increase the top-level design and play the role of policy promotion and guarantee. The vigorous development of elderly education cannot be separated from the support of local party committees and governments. The county (district) committees and district governments should speed up the establishment of an elderly education work leading group composed of civil affairs, education, finance, culture and other departments, implement government coordination, hierarchical management, clarify work responsibilities, and implement specific implementation at the township and village levels to build a framework for the elderly education activity system. It is necessary to incorporate elderly education into the content of laws and regulations, such as setting up the "Elderly Education Law", etc., and make clear provisions in the law on funding support for rural elderly education and school conditions, so as to solve the difficulties faced by rural elderly education as soon as possible and protect the legitimate rights and interests of the elderly.At the same time, it is necessary to strengthen and improve the construction of policy guarantee mechanisms, regularly check the effectiveness of rural elderly education policy promotion, and promptly find problems in policy promotion in order to supervise policy implementation.

6.2.2 School conditions support - attach importance to infrastructure and activate resources

Relying on the existing site conditions in rural areas, including schools, leisure squares and other resources, it is possible to share elderly education resources and make full use of vacant places to set up elderly schools or learning points. Implement "two combinations", namely, combine senior citizen universities with adult schools, and combine village schools with cultural halls, nursing homes, senior citizen associations, etc., to achieve resource sharing and complementary advantages. Encourage multi-party crowdfunding, set up special funds through industry authorities, or strive for senior citizen education funds from third departments, and form a mechanism for joint fundraising by multiple subjects such as government, society, and the market. Develop infrastructure construction, focus on improving and utilizing rural senior citizen education facilities, such as senior citizen activity centers, provide venues, educational equipment and supplies, standardize management and open them on a regular basis.

6.2.3 Teaching design, teacher resource supporting engineering support - enrich content, improve quality and efficiency

According to the team's research, at present, some rural senior citizen education courses are relatively single, and there is still the problem of copying urban senior citizen education courses to rural senior citizen education. Therefore, we should adhere to the concept of "rural senior citizens as the center" and "serving national strategic development" to optimize the rural senior citizen education curriculum. First, courses that help improve the moral cultivation of rural senior citizens should be offered. Through the opening of such courses, we can not only improve the ideological and moral sentiments of rural elderly people, but also enhance the positive role of rural elderly people in raising offspring, maintaining families and uniting neighbors. Second, mainstream ideological courses should be opened and organically integrated into all other courses. Timely publicize and popularize the rural revitalization strategy, the strategy of actively coping with population aging, and the latest developments of the Party and the country to rural elderly people, and spread positive energy. Third, courses on traditional Chinese farming culture should be opened. Traditional farming culture is the soil and root system for the formation and development of China's excellent traditional culture. Rural elderly people enjoy the spiritual influence of traditional farming culture in their long-term production and life, and have a strong emotional outpouring for traditional farming culture. By opening such courses, the rural elderly people's inseparable emotions for traditional farming culture can be satisfied. Fourth, courses on health care, leisure and entertainment should be opened. Some rural elderly people do not know much about health care knowledge, and lack healthy leisure and entertainment methods, which is not conducive to their physical and mental health. Through the opening of such courses, rural elderly people can develop a healthy lifestyle and help them achieve health care. Due to the limited academic level, the contents of the questionnaire design process and scope is small, makes the research depth, at the same time, for different regions, different groups of elderly education needs and the actual situation, lead to the lack of policy and implementation of the project precision, affect the quality and effect of the elderly education. Therefore, the countermeasures and suggestions will be put forward more targeted, such as expanding the research scope, comparative analysis of the two cities, long-term follow-up and evaluation, and evaluation combined with other theories.

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