Education And Environment-Friendly Behavior: The Mediating Role of Environmental Concern

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Abstract. Under the background of China's "carbon peaking and carbon neutrality goals" and the reform of global environmental governance, environmental behaviors of citizens are more deeply integrated into the national ecological environment governance system. Furthermore, individual environmental behaviors are gradually occupying an increasingly important position in the national ecological environment governance. Using the data of Chinese General Social Survey in 2021 (CGSS2021), this study investigates the relationship between an individual's educational attainment and environment-friendly behavior conduct, as well as the mediating function of environmental concern. The study finds that, first, after controlling for the major social and demographic variables that affect an individual's environment-friendly behavior, there are valid evidences illustrating positive relationship between education level and environment-friendly behavior. Second, when the education level of individuals is given, the stronger the environmental perception of individuals, the higher the severity of environmental problems, and the more obvious the positive effect of education on environment-friendly behaviors. Third, the individual's education level affects the environment-friendly behavior by influencing the individual's environmental concern to some extent. Last but not least, this paper has certain implications for individual environmental participation and ecological civilization construction of "beautiful China".

Keywords: Education; environmental-friendly behavior; environmental concern.

1. Introduction

Over the past decade, "promoting green development and building a beautiful China" has gradually become one of China's top development priorities, and the construction of ecological civilization has become an important part of such goals. The construction of ecological civilization is a large systematic project, which should be considered from two aspects: social environmental behavior and individual environmental behavior. China attaches great importance to the cultivation of individual environment-friendly behavior from the policy level. In 2015, the Ministry of Environmental Protection issued the "Implementation Opinions on Accelerating the Promotion of Green Lifestyle", putting forward a series of suggestions and requirements for green life, and environmental friendliness has become people's life choices. There is a lot of discussions on environment-friendly behaviors in academia. Some studies have pointed out that individual environment-friendly behaviors are affected by various factors of society and individuals, including economic development and environmental pollution on the macro level, and individual characteristics such as education level, income and socioeconomic status on the micro side [1]. Among them, educational factors have become the focus of academic research on individual environment-friendly behavior.

Education, as an important socialization process in one's life, will have a huge impact on all aspects of individual behavior. However, whether environment-friendly behavior will be influenced by education and the extent of such impact is still debated. Some scholars point out that an individual's education level will affect environment-friendly behavior, and people with higher education level has a stronger tendency to be environment-friendly. Some scholars contend that there is even a negative association, if not a negligible one, between education and environmentally responsible conduct [2]. Individuals in different stages of education, different contents of education will affect the cultivation of their environment-friendly behavior. Existing studies have made a lot of discussion on the role of education on environment-friendly behavior, but the answer to its influence relationship is not clear.

Most of the research focuses on a specific stage of education on environmentally friendly behavior, and the discussion lacks from the whole level of education.

In addition, environmental concern has attracted considerable attention in studies on education and environment-friendly behavior, and some studies have pointed out that education has a positive impact on environmental concern [3]. Environmental concern has been shown to encourage the development of environment-friendly behaviors. Both domestic and international researchers have discovered that environmental concern has a significant impact on people's environmental behaviors during consumption, and that consumers with varying levels of environmental concern will purchase products with varying degrees of green [4]. Moreover, concern for the environment acts as a sort of bridge between environmental principles and the promotion of eco-friendly conduct [5]. The promotion effect of education on environmental concern will be more conducive to individual environment-friendly behavior.

Most of the existing studies focus on the influence of either education or environmental concern on environment-friendly behavior, while there is a lack of research on the influence of the combination of these on environment-friendly behavior and the mediating role of environmental concern in the relationship between education and environment-friendly behavior. Based on the survey data of Chinese General Social Survey in 2021 (CGSS2021), this study offers more evidence in favor of the idea that education has an impact on environment-friendly behaviors by examining the mediating function that environmental concern plays in the relationship between education and environment-friendly individual actions.

2. Literature Review and Hypothesis

Environmentally friendly behavior generally refers to the positive behavior that is beneficial to the protection of ecological environment. This kind of behavior can be seen from two aspects. On the one hand, it is to do no harm to the environment in work and life, such as not wasting various resources, not discarding garbage at will. On the other hand, it is actively implementing behaviors that promote environmental-sustainable development, such as taking public transportation and advocating green consumption. In the current academic research, there are many similar terms, such as pro-environment behavior, environmental protection behavior and so on. Environmentally friendly behaviors are usually emotional and consciously adopted by residents based on their sense of responsibility and values, and the results emphasize the need to protect resources and improve the ecological environment [6]. At first, the academics studied the environmentally friendly behavior as a whole without subdividing it. However, with the deepening of the discussion on the environment-friendly behavior, scholars gradually differentiated the environment-friendly behavior and divided it into different types from a more scientific perspective.

In the field of environmental consumption behavior, which is the main concern of this study, Hines and other scholars defined it as the behavior of not buying products that will cause pollution or actively buying products that are beneficial to the environment to safeguard the environment [7].The study of the effects of environment-friendly behavior was not expanded upon in the early years of environmental sociology, as the discussion of environment-friendly behavior primarily concentrated on factors that were directly related to the environment, such as the connection between environmentally friendly conduct and environmental attitude, knowledge, and experience, etc. [8]. With the continuous development of the understanding of environmentally friendly behavior, the study of environment-friendly behavior has gradually stepped out of the original perspective of the environment itself, and other external factors have been continuously included in the study of environment-friendly behavior, such as population flow, national policies, etc. [9]. Some scholars believe that there is a positive correlation between education level and individual environment-friendly behavior. In an attempt to provide additional context for the relationship between education level and environmental behavior, other scholars contend that those with higher education levels tend to feel more positively about the environment and are more involved in ecological issues, which will

keep them from engaging in activities that pollute the environment [10]. Environmental pedagogy studies the impact of education on environmentally friendly behaviors from the perspective of environmental knowledge. Some scholars point out that only residents with certain environmental knowledge and information can understand the connotation of environmentally friendly behaviors and actively adopt them [11]. Education can increase residents' environmental knowledge, improve their awareness of actual environmental problems, and promote residents to adopt environmentally friendly behaviors. Therefore, this paper proposes the first hypothesis.

Proposition 1: Groups with different levels of education have different environment-friendly behavior, and the more educated, the stronger the tendency of environmentally friendly behavior.

How does education affect environmentally friendly behavior? Domestic and foreign studies have found that environmental concern is an important explanatory factor for environmentally friendly behavior [5, 12]. Environmental concern, also known as environmental awareness, has roughly the same meaning in various literatures at home and abroad. "The degree to which people are willing to contribute to the resolution of issues pertaining to the ecological environment and the degree to which they are aware of and support those solutions" is what Dunlap and Jones define as environmental concern [13]. The degree of environmental concern a person has will determine how environmentally conscious they are. Customers that are more concerned about the environment, for example, are more likely to buy environmentally friendly products [12]. At the same time, there is a direct correlation between education and environmental concern; the more the educational attainment, the greater the environmental care [3, 14, 15].

From the aspect of mechanism, the socialization of education and the consequences of education are the main aspects that affect environmental concern. First, education socializes people. Education can help people gradually understand how people and the natural environment interact, and the degree to which this socialization occurs also determines how people differ from one another. The more educated a person is, the more deeply they understand this relationship and the more concerned they are about the environment. Second, according to the hierarchy of needs theory, people with higher education have higher income and pay more attention to spiritual and ecological pursuits, so they may also have higher environmental concern. The third explanation is based on the occupational characteristics of people with high education levels. People with high education levels tend to be engaged in jobs that do not require the destruction of the natural environment, such as researchers or scientific and technological workers, which means that they do not have strong economic incentives to destroy the environment, so they have higher environmental concerns. To sum up, the level of education affects the level of individual environmental concern from many aspects, and then affects the input of environment-friendly behavior. From this, this paper proposes the second hypothesis.

Proposition 2: Education level will affect individual environment-friendly behavior by strengthening individual environmental concern level, that is, the higher the education level, the higher the individual environmental concern level, and the higher the input in environment-friendly behavior.

3. Data

3.1. Data Sources

The data used in this paper are from the CGSS2021 implemented by the National Survey Research Center of Renmin University of China. CGSS2021 adopts multi-stage stratified cluster probability sampling design, and the survey content covers various socio-economic characteristics and family information of respondents, with a total sample of 8,148 people. In the environment module of CGSS2021, which is carried in the survey, there were 2,741 respondents. After screening, the sample size of the final analysis is 2735, which conforms to the scope of this study, and the control variables such as marital status and household registration status do not have missing values or are not applicable.

3.2. Dependent Variable

This study takes environment-friendly behavior as the dependent variable, combined with the question setting of the environmental module of CGSS2021 questionnaire and the participation reality of Chinese residents in environmental behavior, and adopts consumer-friendly behavior for operational measurement. The specific question is "Do you often choose not to buy certain products because of environmental protection?" According to the answers from "never" to "always", the values of "1" to "4" in order to represent the respondents' input in environmentally friendly behavior from low to high.

It should be noted that, with the deepening of the discussion on environmentally friendly behavior, scholars gradually distinguish environmentally friendly behavior and divide it into different types from a more scientific perspective, such as consumer behavior, civic behavior, persuasion behavior, and ecological management behavior. However, this study believes that considering the reality of Chinese residents' participation in environmental behaviors. For example, the survey of CGSS2021 environmental module shows that only 5.33% of the 2,741 respondents participate in associations for the purpose of protecting the environment. It is more objective and direct to measure residents' environmentally friendly behaviors by using consumer behaviors, which also conforms to the local characteristics of the study.

3.3. Independent Variable

The primary independent variable in this study was respondents' greatest degree of education at the time, which serves as an operational measure of education level. "What is your highest level of education?" is the precise question. This study assigns a number to each of the following: "no education," "private school, literacy class," and "primary school" (amounting to 1 for the lowest level of education), "graduate student and above" (amounting to 5 for the highest degree of education).

3.4. Mediating Variable

In order to better explain the relationship between education and environmentally friendly behavior, this paper also introduced "environmental concern" as a mediating variable. At present, the most commonly used environmental concern measurement tools are Dunlap [13, 16] proposed the New Environmental/Ecological Paradigm (NEP) scale and its revised version, which was first introduced by Hong Dayong in 2003 [17]. In recent years, more and more domestic scholars have begun to use the revised NEP scale to study the environmental concern of the Chinese public. The NEP Scale and its revised version measure the pro-environment worldview – the New environmental/ecological paradigm, which contains 15 questions on the relationship between humans and the environment. Hong Dayong believes that items 4 and 14 should be deleted according to the actual situation in China, which can significantly improve the validity and reliability of the scale. The statistical test shows that the Cronbach's Alpha value of the scale after deleting these two items is 0.9455, which can be regarded as a single-dimension cumulative scale. Therefore, this study adds the values of the remaining 13 items to obtain the value of environmental concern, which is a continuous variable. Both positive and negative questions are included on the scale. Following reassignment, the degree of environmental worry is inversely correlated with the variable's value: a larger value indicates a stronger level of environmental care, while a lower value indicates a weaker level.

3.5. Control Variable

In this study, the main social and demographic variables affecting the research object are taken as control variables, mainly age (as an age variable), gender, marital status, household registration status, and political status. It should be noted that personal income is not included in the control variable in this study because of the strong correlation between personal income and education level.

3.6. Empirical Model

In this study, the input of environment-friendly behavior is regarded as a continuous variable and the Ordinary Least Square method (OLS) is used for regression analysis, so as to make the research results concise and intuitive. The model form is set as follows.

$$action_i=a_0+a_1 education+a_2 x_i+e_i \quad (1)$$

In equation (1), $action_i$ represents environment-friendly behavior, education represents education level, x_i represents a series of control variables (such as age, gender, marital status, household registration status, and political status) and e_i represents a random error term.

In the part of robustness test, the input of environment-friendly behavior is regarded as a progressive multiple categorical variables, and the Ordered Logit Regression method (Ologit) is used for regression analysis. The model form is set as follows.

$$action_i=F(\beta_0+\beta_1 education+\beta_2 x_i+u_i) \quad (2)$$

In equation (2), F (·) is logit function, action represents the logarithmic probability, which is the logarithm of the ratio of the probability of the environment-friendly behavior to the probability of the base class when the education level takes a particular value. β1 is the model regression coefficient, reflecting the degree of impact of environment-friendly behavior on probability. Education represents education level, xi represents a series of control variables (such as age, gender, marital status, household registration status, and political status) and ui represents a random error term.

4. Result

4.1. Descriptive Satistics

The descriptive statistics of the pertinent variables for the research object are displayed in Table 1.

Table 1. Descriptive statistics of variables

Variable	Variable classification	Proportion (%)	Mean	Median	Standard Deviation
Education level	Primary education and below	33.34			
	Secondary or vocational education	45.92			
	Junior college	8.19			
	Undergraduate college	11.23			
	Postgraduate and above	1.32			
Environment-friendly behavior			2.012	2	0.966
Environmental concern			7.083	3.692	8.811
Age			53.596	55	17.618
Gender	Female (=1)	54.03			
Marital status	Unmarried (=1)	82.89			
Household registration status	Agricultural household (=1)	40.86			
Political status	Member of Communist Party of China (CPC) (=1)	12.4			

Descriptive statistics show that in the statistics on the education level of independent variables, the proportion of primary education or below is 33.34%, secondary education or vocational education is

45.92%, junior college is 8.19%, bachelor's degree is 11.23%, and postgraduate degree or above is 1.32%, indicating that most respondents have low education level. The number of people with higher education is low. In the statistics of the dependent variable environment-friendly behavior, the mean value of environment-friendly behavior is 2.012, and the median value is 2, indicating that the respondents' input in environment-friendly behavior is at a medium level. In the statistics of environmental concern for intermediate variables, the mean value of environmental concern is 7.083 the median value is 3.692, and the standard deviation is 8.810, indicating that the statistical value distribution of NEP scale reflecting environmental concern is unbalanced, and the overall value is low, but some values are high.

Descriptive statistics of the control variables are as follows. First of all, the average age of the samples is 53.60 years. Second, the proportion of male is 45.97%, and the proportion of female is 54.03%, indicating that the gender ratio of the respondents was fairly balanced. Third, the proportion of unmarried and married samples is 17.11% and 82.89% respectively, and the proportion of married samples was larger. In addition, 59.14% of the samples are agricultural household registration, 40.86% are non-agricultural household registration and others, and the proportion of agricultural household registration is larger. Last but not least, 87.6% of the sample are not member of Communist Party of China (CPC), and 12.4% are CPC members which is relatively low.

4.2. Regression Results

In Table 2, column (1) demonstrates that, in the absence of control variables, education level has a significant positive impact on the degree of environmentally friendly behavior input ($p<0.05$). In other words, the more educated one is, the more environmentally friendly behavior they engage in. OLS regression analysis shows that for every unit increase in education level, the level of environmentally friendly behavior input increases by 0.172 units.

Table 2. Estimates of environmentally friendly behaviour by educational attainment

Variable	(1)	(2)
Education level	0.030**	0.172***
	(2.07)	(8.90)
Age		-0.028***
		(-29.92)
Gender		-0.078***
		(-2.82)
Marital status		-0.331***
		(-7.73)
Household registration status		0.615***
		(21.50)
Political status		0.624***
		(14.47)
Observations	2,735	2,735
R-squared	0.028	0.489

z-statistics in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

After controlling the relevant variables in column (2), the results also show that the level of education has a significant positive impact on the degree of input in environmentally friendly behaviors ($p<0.01$), that is, the higher the level of education, the higher the degree of input in environmentally friendly behaviors. The regression coefficient shows that for every unit increase in education level, the level of input in environmentally friendly behavior increases by 0.050 units, and proposition 1 is verified.

4.3. Mediating Effect

This paper further tests the role of environmental concern as an intermediate variable, using Karlson–Holm–Breen (KHB) method and bootstrap method [18, 19]. The test results for the mediating effects of environmental concern are shown in Table 3. The test result utilizing the KHB method is shown in Column (1); the mediating ratio is 11.33%, the direct impact is 0.145, the indirect effect is 0.019, and the overall effect is 0.164. The bootstrap technique test findings for column (2) are identical. As a result, this article holds that premise 2 is proven, indicating that the degree of education is 11.33% due to the influence of environmental concern and the ultimate effect on environment-friendly conduct.

Table 3. Test of the mediating effects of environmental concern

	(1)	(2)
Effect decomposition	Environmental concern	Environmental concern
Total effect	0.164***	
	(0.019)	
Direct effect	0.145***	
	(0.019)	
Indirect effect	0.019***	0.019***
	（0.004）	（0.004）
Mediating ratio (%)	11.33	

*** p<0.01, ** p<0.05, * p<0.1

4.4. Heterogeneity Analysis

Based on column (2) in Table 2, the paper adds the interaction terms between education level and gender, marital status, household registration status and political status to investigate the heterogeneity of education level in Table 4.

In Table 4, the interaction coefficient of column (1) is 0.061 (p<0.1), indicating that the main effect is regulated by sex. Because the reference group set for the interaction item is male, specifically, for male group (gender =0), after controlling for other factors, the input of environmentally friendly behavior increases by 0.056 units for each unit increase in education level. For the female group, after controlling other factors, the input in environment-friendly behavior increases by 0.117 (0.056+0.061) units for every unit increase in education level. The paper suggests that the effect of education level on women is significantly greater than that on men.

The interaction coefficient of column (2) is 0.161 (p<0.01), indicating that the main effect is regulated by marital status. Because the reference group set by the interaction item is the unmarried group, specifically, for the unmarried group, after controlling for other factors, the input in environmentally friendly behavior decreases by 0.02 units for each unit increase in education level. For the married group, the input in environmentally friendly behavior increased by 0.141 (0.161-0.02) units for every unit increase in education level.

Table 4. Heterogeneity analysis

Variable	(1)	(2)	(3)	(4)
Gender		-0.004***	-0.004***	-0.004***
		(-2.79)	(-2.88)	(-3.03)
Marital status	0.080		0.084	0.087
	(1.39)		(1.45)	(1.50)
Household registration status	0.207***	0.191***		0.203***
	(5.04)	(4.63)		(4.94)
Political status	0.083	0.064	0.088	
	(1.39)	(1.08)	(1.47)	
Education level	0.056*	-0.020*	0.136***	0.104***
	(1.71)	(-0.50)	(4.02)	(3.78)
Edu.×Gender	0.061*			
	(1.66)			
Edu.×Marital status		0.161***		
		(3.55)		
Edu.×Household registration status			-0.084**	
			(-2.11)	
Edu.×Political status				-0.074
				(-0.146)
Observation	2,735	2,735	2,735	2,735
R-squared	0.041	0.044	0.041	0.041

t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The interaction coefficient in column (3) is -0.084 (p<0.05), indicating that the main effect is regulated by household status. Because the reference group set by the interaction item is the agricultural household registration, specifically, for the agricultural household registration group, after controlling for other factors, the input of environmentally friendly behavior increases by 0.136 units for each unit increase in education level. For the non-agricultural household registration group, the input in environmentally friendly behavior increases by 0.052 (0.136-0.084) units for each unit increase in education level. According to this study, the agricultural household registration group is considerably more affected by education level than the non-agricultural household registration group.

The interaction coefficient of column (4) is not significant, indicating that there is no evidence that the main effect is mediated by political identity.

4.5. Robustness Test

In order to test the robustness of the above findings, different variable design and model construction methods are used to recalculate the relationship between the above variables.

First of all, in column (1) of Table 5, the paper reassigns the independent variables, assigning below "primary school" as "0", which refers to very low education attainment; between "Junior high School" to "technical school" are assigned "10", which refers to low education attainment; "Junior college (adult higher education)" and "Junior college (formal higher education)" are assigned "13", which refers to medium education attainment; "Undergraduate (adult higher education)" and "Undergraduate (formal higher education)" are assigned "100", which refers to high education attainment; The value of "graduate students and above" is assigned as "1000", which refers to very high education attainment. The analysis is carried out using the sequential logit regression model, and the results showed that the main effect is established. Additionally, in column (2), the study reversely assigns the independent variable, that is, from low to high education level, 5 to 1 respectively, and continues to use the ordered logit regression model for analysis. The result shows that the regression

coefficient is opposite to the main effect, which is in line with the expected result of the reverse assignment, and the main effect is still valid.

Table 5. Robustness Test

Variable	(1)	(2)	(3)	(4)
Education level(logit)	0.001***			
	(3.88)			
Medium	-0.580***	-2.062***		0.114
	(-14.18)	(-14.08)		(1.42)
High	1.126***	-0.303**		1.872***
	(24.77	(-2.17)		(20.93)
Very high	2.136***	0.714***		2.890***
	(34.26)	(4.93)		(28.85)
Education level (reverse)		-0.363***		
		(-10.36)		
Education level			0.164***	0.363***
			(8.90)	(10.36)
Observations	2,735	2,735	2,735	2,735
R-squared			0.028	

t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Next, the paper selects the CGSS2021 environment module "Do you often deliberately separate glass, aluminum cans, plastics or newspapers for easy recycling?" Robustness test is conducted on the operationalization of the dependent variable, and the answers from "never" to "always" are assigned from "1" to "4" successively, which represent the degree of respondents' input in environmentally friendly behavior from low to high and are respectively regarded as continuous and ordered variables in column (3) and column (4). OLS regression model presented by column (3) and sequential logit regression model presented by column (4) are used for analysis. The major influence is clearly present, as seen by the results, which also indicate that greater education levels are associated with greater levels of environment-friendly behavior. Overall, this study believes that its findings have strong robustness based on the outcomes of the tests mentioned above.

5. Conclusion

In the context of the proposed "carbon peaking and carbon neutrality goals" and the reform of global environmental governance, individual environmental behaviors of citizens are more deeply integrated into the national ecological environment governance system, and individual environmental behaviors are gradually occupying an increasingly important position in the national ecological environment governance. Based on this, this paper uses the data of CGSS2021 and takes education level as the core independent variable to expand the research depth of previous studies to a certain extent, and comprehensively examines the influence of education on individuals' environmentally friendly behaviors.

To begin with, the study finds that after controlling for the major social and demographic variables that affect an individual's environmentally friendly behavior, the greater the individual's education level, the greater the level of input in environmentally friendly behavior. Apart from this, the individual's education level affects the environmental-friendly behavior by influencing the individual's environmental concern to some extent. Last but not least, the heterogeneity of covariables such as gender, marital status, household registration status and political status are analyzed to investigate the difference of environment-friendly behavior of education.

This study examines the beneficial effects of schooling on environmental-friendly behavior conduct and highlights the mediating function of environmental concern, which will help future

researchers better understand how individual environmentally friendly behavior is formed. At the same time, the study findings presented in this work also bolster the notion that environmental-friendly behavior and education go hand in hand. In practice, it also opens up ideas and provides data support for the country to cultivate citizens' environmentally friendly behaviors. Cultivating individual environment-friendly behaviors can start from the two aspects of strengthening citizens' education level, increasing publicity and knowledge popularization of environmental issues, improving citizens' overall environmental concern and perception of environmental issues, and then promoting people's actions to help build a green and environment-friendly society.

It should be mentioned that this study still has a lot of restrictions and issues. Firstly, this study does not include a longitudinal analysis; instead, the influence of education level is examined just using data from a single survey. Secondly, in terms of the selection of dependent variables, the paper hope to reflect individuals' environment-friendly behaviors more comprehensively. However, due to its wide scope of operation, it is difficult to cover all aspects of environmental behaviors, and because of the influence of questionnaire question setting, the representation of "purchasing behaviors" selected in this study on environment-friendly behaviors is still open to question. Lastly, due to the the variability of the mediational effects of environmental concern, this study does not delve further into the details of how environmental concern influences environment-friendly behavior.

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