

Original Research

An Empirical Study of the Mechanism and Path of Green Management Education Influencing University Students' Green Behaviors in China

Ji'an Yu*, Yuhang Wu, Jiali Wang

School of Economics and Management, Beijing Forestry University, Beijing 100083 P.R. China

Received: 22 February 2022

Accepted: 5 April 2022

Abstract

The construction of ecological civilization and sustainable development has been paid more and more attention by China, and green education (GE) has become an important part of university education. Green development and lifestyle have become an inevitable trend. Strengthening GE for university students and helping them establish green management (GM) awareness have become important measures to implement the national strategy of "ecological priority and green development". Many Chinese universities are also actively promoting green management education (GME), and these measures of GME influence university students' awareness of GM and strengthen the action process and mechanism of their green behavior (GB), which need to be further clarified. Therefore, Chinese university students studying at schools of economic and management of agriculture and forestry universities were taken as the research objects, and based on Theory of Planned Behavior (TPB), a model of the effect of GME on university students' GB is established to deeply explore the path and effect, which provides decision-making reference for universities to carry out GME in depth.

Keywords: green management education (GME), university students, green behavior (GB), mechanism, path

Introduction

As more and more attention is paid to environmental issues, and more people are needed to participate in ecological protection and ecological civilization construction. Environmental protection gave birth to environmental education. With a social consensus of ecological priority and green development, the impetus to develop Education for Sustainable Development

is accompanied by the integration of environmental protection rules [1], that's green education (GE), which can cultivate high-quality talents with high social responsibility and sustainable development consciousness [2], for education is of great significance for guiding people to establish correct ecological values, changing people's lifestyle, and improving people's consciousness of participating in the construction of ecological civilization [2, 3]. What's more, educational attainment is associated with higher levels of pro-environmental attitudes and behavior [4]. According to the opinion of Kupper et al. (2012) [5], Green education can contribute to solutions to different

*e-mail: yja09@tsinghua.org.cn

challenges/problems for green development by building a strong organizational structure, providing the sector with adequate and up-to-date knowledge and by offering attractive learning environments. GE can also bring competences for countries and firms, and Sacco et al. [6] analyzed European key competences with GE.

GE should comply with the nature of students and ensure their natural life safety, take care of students' social life and attach importance to their daily life in the world, improve the spiritual life of students, and constantly realize the sustainable development of their needs and realm [7]. GE is a kind of value education, pluralistic education and responsibility education. GE in universities can reshape students' ecological values [8].

The acquisition of environmental knowledge is the channel that drives the effect of education on pro-environmental attitudes and behaviors [4]. Hou et al. (2019) [9] developed a green educational model that engaged practitioners in a participatory and cooperative learning process to explore practical solutions for food safety that had social and environmental value. The implementation of GE involves green curriculum design and development, students' green knowledge exercises, practical investigation and subject research [10]. Guerra & Figueiredo [11] discussed the process of curricular greening. The integration of green chemistry teaching, e.g., with sustainable education, promoted green chemistry learning by fostering environmental consciousness and behavioral change and cognitive processes in a sustainable direction [12]. As early as 1991, the United States launched the BELL (Business Environment Learning Leadership) project, which aimed to promote business schools to carry out environmental education, so as to cultivate management talents with high environmental awareness, environmental management skills and environmental entrepreneurship ability. Since then, the concept of GE has been well promoted and developed. In China, Tsinghua University proposed GE and carried out the construction of green university in 1998. The factors that contribute towards achieving 'Green University' goals are broadly grouped into seven categories, i.e. management systems, environmental sustainability, sustainable curricula, research and development, staff development and rewards, student opportunities and social responsibility [13]. Now, more and more universities in China have taken the initiative to integrate GE and green ideas into the curriculum system.

In 2012, China put forward the concept of "promoting green development, circular development and low-carbon development" and "establishing the ecological civilization concept of respecting nature, conforming to nature and protecting nature" for the first time, placing the construction of ecological civilization in a prominent position. In April 2015, China issued the Opinions on Accelerating the Construction of Ecological Civilization, which clearly stated that China must promote the mainstream values of ecological civilization and incorporate ecological civilization into

the core values system. China further called for "green development and lifestyle" and "green families, schools, communities and travel" since 2017. To solve ecological problems, it is necessary to reflect and reconstruct human subjectivity in human nature, cultivate quasi-subjects, and get out of the crisis of possessive individual subjectivity, so as to fundamentally realize the unity of human and nature, human and society, and human and self [14].

The aim of green development requires green management (GM) to support the development and application of green technology in practice and to ensure the greening of management methods and processes. At present, GM, which includes not only green concept, but also environmental protection in production and operation process, the adoption of green technologies and the greening of management process, has become a new trend of management development. GM can help reduce the negative impact of business activities on the ecological environment, become the source of competitive advantages for enterprises, and can promote the innovation performance of enterprises [15]. Green urban development should rely on green urban management [16]. Therefore, GM has become an inevitable choice for green development.

Universities, as bases for cultivating talents, should also carry out GME, integrate the concept and skills of GM into the process of education and teaching, and cultivate GM talents, which is not only the requirement of green university construction, but also the requirement of promoting ecological civilization construction and green development. What's more, green authentic leadership have a positive and significant effect on the sustainability in higher education [17]. GME is an education model integrating the principles of sustainable business, environment and social responsibility into traditional management education. Specific courses of GME involve green marketing, green accounting, green finance and investment, green e-commerce, sustainable business environment and strategy, green development management and other aspects.

Learning objectives can be integrated with university sustainability initiatives to improve learning and student engagement [18]. Chinese universities have gradually incorporated the concept of green development into the modern education concept. Lin & Yang [19] investigated the status quo of university students' GB in Wenzhou University Town and found that green campus construction in most universities was relatively backward, and university students lacked green thinking and strong willingness of GB. Bai & Li [20] also proved that green consumption cognition and attitude would affect green consumption behavior and the mediating role of green consumption attitude. Due to the conflict between individual and social interests, current and long-term interests, the separation of green consumption attitude and behavior appears, making the attitude unable to predict behavior well [21]. In addition, Wang [22] found that university students generally have

strong green ethics and awareness of green development even though there are differences in green knowledge. However, GB lags behind green awareness and are seldom put into action. The understanding of how to deal with the relationship between social economic development and environmental protection is still vague. Based on the norm activation theory, Shi et al. [23], through questionnaire survey and structural equation model analysis, found that the PM_{2.5} emission reduction intention of university students has a positive impact on their actual behavior, while moral norms and subjective norms have a positive direct impact on the PM_{2.5} emission reduction intention of university students.

Some Chinese universities have made a lot of efforts in carrying out GME. For example, School of Economics and Management of Beijing Forestry University has carried out GME for more than 60 years and set up a series of green disciplines and majors [24]. However, these GME measures affect university students' GB and what kind of action mechanism GME has on their GB deserve further discussion and analysis. It is found that current studies lack analysis on the impact of GME on university students' GB, and existing studies have not carried out specific classification research on their GB. Undergraduate students from schools of economic and management of agriculture and forestry universities in China are taken as the research object, and through a large sample of data investigation, we conduct empirical analysis and application of structural equation model (SEM) to explore the path of GME influencing undergraduate's behaviors, and get a model in which GME influences university students' green action, which provides guidance for universities carrying out GME.

Material and Methods

Material

Research Hypotheses

Because GME involves the behavior, subjective norm, and perceived behavioral control, of course including the attitude toward them, which means Theory of Planned Behavior (TPB) [25-27], defined as an individual's perception of the ease or difficulty of performing the particular behavior [26], can be used for conduct the empirical study. TPB is based on the premise that individuals make reasoned decisions and engage in some specific behavior by evaluating the information available to them and the corresponding behavior, and the performance is determined by the individual's intention to engage in the behavior, therefore, TPB is more applicable when the probability of success and actual control over performance of a behavior are suboptimal, thus has good capability of explanation in the field of behavioral research.

Meatime, SEM, as a combination of multiple regression and factor analysis of multivariate statistical techniques, can handle multiple dependent variable and complex mediating mechanisms, and model growth trajectories of repeated measures. At the same time, SEM allows both dependent and independent variables to have measurement error, which greatly improving the overall measurement accuracy. Additionally, SEM can be adopted to complete the analysis of a complex model at one time without splitting the model, and is suitable for all kinds of data (such as non-normally distributed data and non-continuous data), and can test the stability of individuals for long-term data. In this paper, we try to build a conceptual model of the structural equation based on the framework of TPB and relative literature, and use SEM with AMOS 23.0 to analyze the impact path of GME on university students' GB. University students' GB can be divided into two aspects: one is daily life, and another is study and social practice. On the level of daily life, saving energy and water and purchasing green products can reflect university students' GB. The fact that university students choose green-related research directions and themes or companies with social responsibilities in academic competitions and practices reflects their GB in interacting with society. Since there is a great difference between these two aspects of GB, GME may also have different effects on these two aspects of GB. Therefore, we divide university students' GB into two types: green living behavior (GLB) and green social behavior (GSB).

Attitude is an individual's view and acceptance of a behavior, which to some extent determines whether an individual will take such behavior. Positive behavior attitude will promote individual behavior. Vicente-Molina et al. [28] believed that while knowledge (objective and subjective) influences pro-environmental behaviour, attitude and informal education are not relevant variables. However, Hansla et al. [29] found that residents' positive attitude towards green electricity would increase their purchase intention. De Groot & Steg [30] verified their hypotheses that environmental attitudes affect behavioral intentions, indicating that the solution of environmental problems is directly related to attitudes. Therefore, we believe that students are more willing to take relevant GB when they believe that GB is a positive and beneficial behavior and hold a positive attitude towards it. Therefore, the following research hypotheses are proposed:

H1: University students' green attitude has a significant positive impact on their GB.

H1a: University students' green attitude has a significant positive impact on their GLB;

H1b: University students' green attitude has a significant positive impact on their GSB.

Based on the multi-group model with individual characteristics of consumers, Zhang et al. [31] showed that consumers' intention to buy green products was significantly influenced by subjective norms. For university students, the perceived social pressure mainly

comes from the school atmosphere and the surrounding teachers and classmates. Students are more likely to adopt GB when encouraged to do so by others or groups that have significant influence on them. Therefore, another hypothesis is proposed:

H2: The green subjective norms of university students have a significant positive impact on their GB.

H2a: University students' green subjective norms have a significant positive impact on their GLB;

H2b: Green subjective norms of university students have a significant positive impact on their GSB.

Behavioral intention determines the generation of behaviors and reflects the motivation of individuals to implement certain behaviors and how much effort they are willing to make to implement such behaviors [19]. Scholars in the academic community have verified the positive effect of intention on behavior in many fields such as psychology and sociology, and proved that most other factors affect behavior through intention [32]. Therefore, we argue that students are more likely to adopt GB if they have a more positive behavioral intention towards GB. Therefore, the third hypothesis is proposed:

H3: University students' green behavioral intention (GBI) has a significant positive influence on their GB;

H3a: University students' GBI has a significant positive influence on their GLB

H3b: University students' GBI has a significant positive impact on their GSB.

According to TPB, both attitude and subjective norms affect behavioral intention, and subjective norms have a significant impact on attitude [33]. Zhang & Wang [34] proved that knowledge workers' energy saving attitudes have a positive impact on their energy saving intentions. The attitudes of surrounding people and their communities towards GB will affect students' own attitudes towards GB. When university students

believe that the greater the beneficial impact of GB on the environment, the more positive the attitudes of surrounding people and their communities towards GB, the stronger the students' GBI will be. Therefore, three hypotheses are proposed:

H4: Green subjective norms of university students have a significant positive impact on their green attitude;

H5: University students' green subjective norms have a significant positive impact on their GBI;

H6: University students' green attitude has a significant positive influence on their GBI.

The core of GE mainly includes environmental education, sustainable development education and life education [7]. The subject of GME is students in the schools of economics and management. Special GM courses are set, or targeted GME is integrated into various disciplines, such as green marketing, green accounting and green finance. Students receiving GME will enable them to have a deeper understanding of green and sustainable development, and will also subtly influence them to adopt more GB in their study and life. Therefore, another three hypotheses are proposed in this paper:

H7: GME has a significant positive impact on university students' green attitude;

H8: GME has a significant positive impact on green subjective norms of university students.

H9: GME has a significant positive impact on their GB.

H9a: GME has a significant positive impact on university students' GLB;

H9b: GME has a significant positive impact on university students' GSB.

TPB holds that individual, social and cultural factors ultimately affect behavioral intentions and behaviors by indirectly affecting behavioral attitudes, subjective

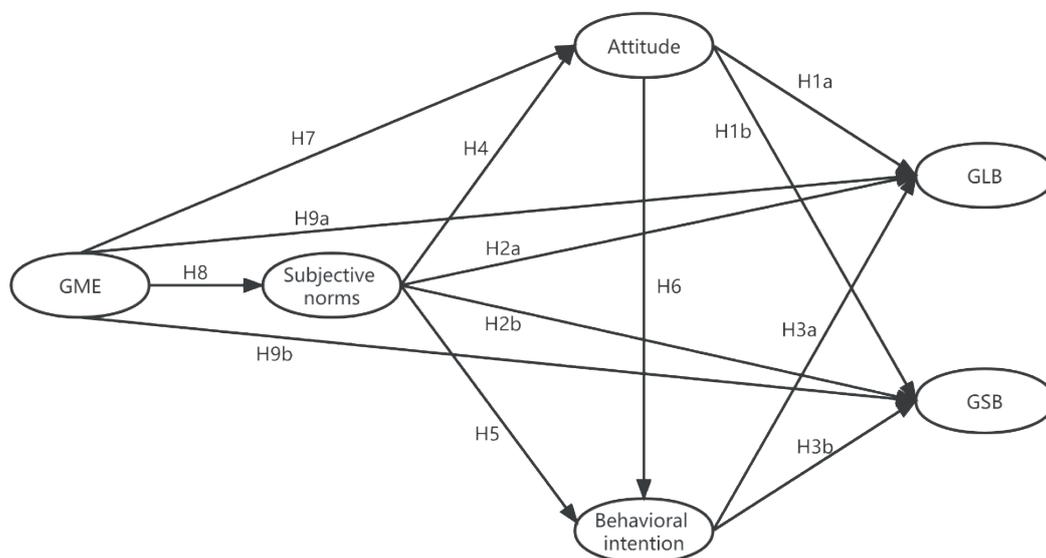


Fig. 1. Conceptual model for research hypotheses.

norms and perceived behavioral control through influencing behavioral beliefs. As perceptual behavioral control is the most controversial concept in TPB, the measurement method is not accurate enough [35]. Therefore, the variable, perceptual behavioral control, is removed from the TPB model in this paper. Based on the above research assumptions, the conceptual model in Fig. 1 is formed.

Scale and Questionnaire Design

Six variables need to be measured in this study, namely, GME, attitude, subjective norms, intention, GLB and GSB. After discussion with experts, contents and sources of various dimensions are shown in Table 1 below. The Likert five-point scale was adopted for the scale, which ranged from very inconsistent to very consistent, with values of 1, 2, 3, 4 and 5 respectively, which is the core of the design of the first draft of the questionnaire, including the content of the above six dimensions. A preliminary survey was conducted, 136 questionnaires were collected and 123 were valid, with an effective rate of 90.4%. After

analyzing the pre-survey data and communicating with the pre-survey objects, we revised the content and related expressions of the questionnaire, and finally formed the final questionnaire as shown in Table 1 below.

Sample and Data Collection

The questionnaire is conducted through the Internet that is <https://www.wjx.cn/>, widely used in China. The questionnaire is distributed by the instructors or teachers selected. The survey subjects are undergraduate students from economics and management schools of several agricultural and forestry universities in different provinces of China, and data from students from Beijing Forestry University, Nanjing Forestry University, Central South University of Forestry and Technology, Northwest A&F University, and Southwest Forestry University are collected. Most of them have received GME and learned relevant courses. By investigating the degree of these students' receiving GME and the status quo of their adopting GLB and GSB, it can be analyzed and explored whether GME has an impact on university

Table 1. Scale of GME influencing university students' GB.

Dimensions	Items	Theoretical Support
GME	In my management courses, teachers have taught the concept of GM (GME1)	Varela-Candamio et al. [36]
	In my management courses, teachers have taught cases related to green themes (GME2)	
	I did improve my knowledge of sustainability and environmental issues by taking GM courses (GME3)	
Attitude	I think it is necessary to adopt GB (ATT1)	Maloney et al. [37]
	I believe that I can bring positive changes to the environment and society if I adopt GB (ATT2)	
	Adopting GB is an active and healthy lifestyle and should be strongly promoted (ATT3)	
Subjective norm	People (teachers, friends, etc.) who influence me encourage me to adopt relevant GB (SUB1)	Beck & Ajzen [38]
	The atmosphere of my university encourages me to adopt GB (SUB2)	
	Sense of Social responsibility and moral ethics encourage me to adopt GB (SUB3)	
Intention	I'm willing to adopt GB (INT1)	Compiled by us
	After receiving GME, I will adopt more GB (INT2)	
	After receiving GME, I will encourage people around me to adopt more GB (INT3)	
GLB	I turn off the tap in time after using the water (GLB1)	Shi [39]
	When I am the last person leaving the classroom or dormitory, I turn off the air conditioning and lights (GLB2)	
	I use used paper when I need to draft (GLB3)	
GSB	I will participate in relevant competitions related to green or sustainable development (GSB1)	Compiled by us
	In course assignments and academic research projects, I will consciously incorporate green and sustainable themes and content (GSB2).	
	I will participate in social practice activities related to green, sustainable development and environmental protection (GSB3)	
	During employment and internship, I will select companies that advocate the concept of sustainable development and actively undertake social responsibilities (GSB4)	

students' GB and how to influence the path of GB of university students. A total of 1217 questionnaires were collected, among which 153 invalid ones were excluded and 1064 valid ones were obtained, with an effective rate of 87.4%.

Through the analysis of the statistical results, the survey covers the data from agriculture and forestry universities in different provinces in China. Among the respondents, 483 are from Beijing Forestry University, 226 from Nanjing Forestry University, 162 from Central South University of Forestry and Technology, 130 from Northwest A&F University and 63 from Southwest Forestry University. The percentages were 45.4%, 21.2%, 15.2%, 12.2% and 5.9%, respectively. From the perspective of gender ratio, in the sample, females accounted for 75.7% while males accounted for 24.3%, relatively small, which can be attributed to the difference in the ratio of males to females in the economics and management schools of the universities investigated in China for the ratio of males to females in the schools of economics and management of various universities is in the range (1/4,1/3). From the perspective of the grade of undergraduates surveyed, freshmen accounted for 31.7%, sophomores accounted for 31%, juniors accounted for 27.3%, and seniors accounted for 10%. The samples were representative.

Methods

Reliability and Validity Analysis

Before using the structural equation model for analysis, the reliability and validity of the questionnaire should be tested and analyzed to ensure the consistency and validity of the questionnaire. After passing the test, data analysis will be conducted with the model.

1) Scale Reliability Test

Reliability test is used to check whether the data results from the questionnaire are consistent. The commonly used test method is Cronbach's α coefficient test. The higher Cronbach's α coefficient, the better the consistency of the questionnaire. Generally speaking, the reliability of the scale with Cronbach's α coefficient lower than 0.6 is insufficient; when Cronbach's α coefficient reaches 0.7~0.8, it indicates that the scale

has certain reliability; when Cronbach's α coefficient is greater than 0.8, it indicates that the scale has good reliability. According to the results, Cronbach's α coefficient of all indicators of the questionnaire was greater than 0.65, and all indicators met the requirements, as shown in Table 2 below, indicating that the questionnaire had good reliability, reliability and consistency.

2) Test of the Scale Validity

Validity test is used to verify the reliability and stability of the questionnaire and the recovered data to prove the validity of the questionnaire. Convergence validity test in structural validity test requires that all standardized factor load coefficients greater than 0.5, composite reliability (CR) greater than 0.7, and Average Variance Extracted (AVE) greater than 0.5. In order to ensure the validity of the questionnaire items, the potential dimensions were analyzed respectively. For the dimensions that did not meet the requirements of model fit, the items with higher correction index (MI) were selected and deleted. After testing, the items GLB3 and GSB1 were deleted. The CR and AVE of each variable were calculated. It was found that CR was greater than 0.7 and AVE was greater than 0.5, as shown in Table 3 below, indicating that the scale had good convergence validity.

In the Discriminant validity test of Structural validity test, the judgment criterion is that the square root of AVE of each variable is greater than the correlation coefficient between the variable and other variables. Except that the AVE square root of subjective norms is less than the correlation coefficient between this variable and behavioral intention, other data meet all requirements, and since the gap is small, it can be ignored. The results are shown in Table 4 below, therefore, this scale still has good discriminant validity.

The above test results show that the optimized scale has good reliability and validity (including convergence and discriminant validity), with a total of 17 valid test items. Therefore, we can further study the relationship between variables.

SEM Analysis

Through the conceptual model constructed and the research hypotheses proposed in this paper, AMOS 23.0 was used to construct the path of GME affecting university students' GB, as shown in Fig. 2, and the results are shown in Table 5 below.

From the results in Table 5 it can be seen that GME has a significant positive impact on subjective norms, the same with subjective norms on attitudes and behavioral intentions, and behavioral intentions have a significant impact on GLB and GSB.

In this paper, it is considered to be more accurate whether the path is significant or not. Therefore, whether p is less than 0.05 is taken as the criterion to measure whether the path is significant or

Table 2. Cronbach's α coefficients of all variables in the Scale.

Variables	Item Quantity	Cronbach's α Coefficient
GME	3	0.807
Subjective norms	3	0.775
Attitude	3	0.822
Behavioral intention	3	0.826
GLB	2	0.685
GSB	3	0.758

Table 3. Results of convergence validity analysis of the scale.

Factor	Items	Load Factor	CR	AVE	Square Root of AVE
GME	GME1	0.887	0.8280	0.6249	0.7905
	GME2	0.880			
	GME3	0.560			
Subjective norm	SUB1	0.705	0.7879	0.5538	0.7442
	SUB2	0.791			
	SUB3	0.734			
Attitude	ATT1	0.823	0.8285	0.6176	0.7859
	ATT2	0.723			
	ATT3	0.808			
Behavioral Intention	INT3	0.801	0.8346	0.6278	0.7923
	INT2	0.835			
	INT1	0.738			
GLB	GLB1	0.752	0.7035	0.5427	0.7367
	GLB2	0.721			
GSB	GSB2	0.686	0.7593	0.5128	0.7161
	GSB3	0.748			
	GSB4	0.713			

Table 4. The results of discriminant validity analysis of the scale.

	GME	Subjective norms	Attitude	Behavioral Intention	GLB	GSB
GME	0.791					
Subjective Norms	0.531	0.744				
Attitude	0.302	0.712	0.786			
Behavioral Intention	0.381	0.805	0.722	0.792		
GLB	0.229	0.409	0.539	0.513	0.737	
GSB	0.343	0.484	0.351	0.489	0.183	0.716

not. The model results show that the path of “H9a: GME → green living behavior” is valid at the level of $p < 0.1$ and the coefficient of the standardized path is only 0.048. It can be seen that the direct impact of GME on university students’ GLB is not significant, the reason may be that university students have been influenced in the daily propaganda about thrift and family education, their green attitude, subjective norm and behavioral intention has changed a lot, while GE at the university can only strengthen their ever green attitude, subjective norm and behavioral intention, at the same time, There may be less GME in universities that directly involves common sense GE in daily life, such as turning off the tap or the light. So, we think that the results conform to actual situation, therefore this path is ignore. The normalized coefficients of the two path,

H2a and H7, are -0.110 and -0.093 respectively, which means that subjective norms have no positive influence on GLB and GME on green attitude for the coefficients are negative. H1b has no significant positive effect and cannot pass the significance test. Therefore, Research hypotheses, H1b, H2a, H7 and H9a, about the above impact path are not valid.

For the invalid assumptions, we delete these influence paths, and use AMOS 23.0 to analyze the goodness of fit and variable paths of the optimized structural equation model. The results are shown in Table 6 below.

In the study of Jackson et al. [40], he made statistics on indicators of the model fitness in previous relevant research literatures. Therefore, this paper mainly analyzes the seven most commonly used indicators of

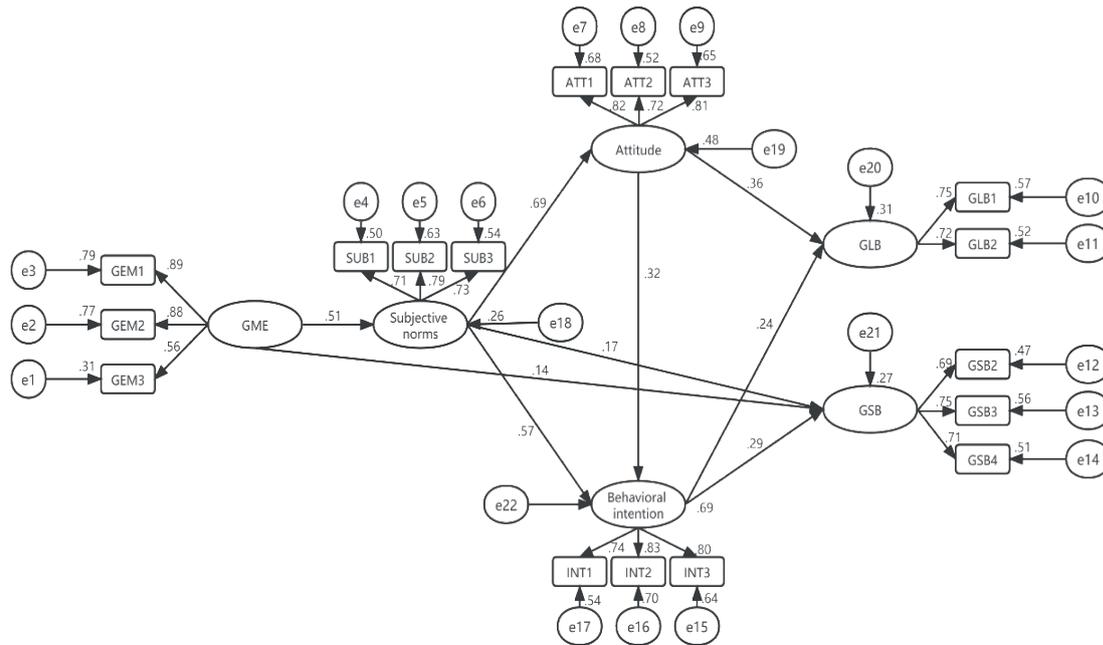


Fig. 2. Paths and coefficients in the SEM.

Table 5. Results of SEM.

Hypothesis Path	Coefficient of Normalized path	t-value	p-value	Results
H1a: Attitude → GLB	0.278	6.117	***	Supported
H1b: Attitude → GSB	-0.103	-1.200	0.230	not supported
H2a: subjective norms → GLB	-0.110	-2.230	0.026	not supported
H2b: subjective norms → GSB	0.230	2.424	**	Supported
H3a: Behavioral intention → GLB	0.182	4.164	***	Supported
H3b: Behavioral intention → GSB	0.333	3.912	***	Supported
H4: Subjective norms → Attitude	0.585	15.578	***	Supported
H5: Subjective norms → Behavioral intention	0.574	11.619	***	Supported
H6: Attitude → Behavioral intention	0.401	6.883	***	Supported
H7: GME → Attitude	-0.093	-2.675	0.007	not supported
H8: GME → Subjective norms	0.622	11.940	***	Supported
H9a: GME → GLB	0.048	1.755	0.079	not supported
H9b: GME → GSB	0.156	2.853	*	Supported

Note: *** is at the level of $p < 0.001$; ** is at the level of $p < 0.05$; * is at the level of $p < 0.01$, where italics indicate that the relevant path values assumed in this paper are not supported

goodness of fitting, χ^2/DF , GFI, AGFI, RMSEA, NFI, CFI and TLI. The results show that the optimized model fits well, and all the indicators are within the range of ideal standards.

The optimized paths in the structural equation model can all pass the significance test, and the coefficients of the standardized paths are significant at the 5% level. Among them, the standardized path coefficients of GME on subjective norms, subjective norms on attitude, subjective norms on behavioral intention, and

attitude on behavioral intention are 0.610, 0.529, 0.561 and 0.421, respectively, which shows that GME has a direct impact on subjective norms, as well as subjective norms on attitudes, subjective norms and attitudes on behavioral intentions. At the same time, attitude has a significant impact on GLB, subjective norms on GSB, and behavioral intention has a significant impact on both GSB and GLB of university students, as shown in Table 7.

Table 6. Goodness of Fit Test of Model Validation Factor Analysis.

Indicator Type	Absolute Fitness Index				Relative Fitness Index			
	Indicators	χ^2/df	GFI	AGFI	RMSEA	NFI	CFI	TLI
Results		4.994	0.939	0.915	0.061	0.933	0.946	0.933
Ideal Standard Requirements		<5	>0.9	>0.9	<0.08	>0.9	>0.9	>0.9

Table 7. Results of optimized SEM.

Hypothesis Path	Coefficient of Normalized path	t-value	p-value	Results
H1a: Attitude → GLB	0.243	5.863	***	Supported
H2b: subjective norms → GSB	0.176	2.089	**	Supported
H3a: Behavioral intention → GLB	0.125	3.991	***	Supported
H3b: Behavioral intention → GSB	0.309	3.957	***	Supported
H4: Subjective norms → Attitude	0.529	17.171	***	Supported
H5: Subjective norms → Behavioral intention	0.561	11.776	***	Supported
H6: Attitude → Behavioral intention	0.421	7.465	***	Supported
H8: GME → Subjective norms	0.610	11.826	***	Supported
H9b: GME → GSB	0.175	3.336	***	Supported

Note: *** is at the level of $p < 0.001$; ** is at the level of $p < 0.05$.

Results and Discussion

Results

In the optimized SEM, the paths that GME significantly influences university students to adopt GSB and GLB are “GME → subjective norms → GLB/GSB”, “GME → subjective norms → attitude → GLB/GSB”, “GME → subjective norms → GSB, GME → subjective norms → attitude → GLB”. These paths and relative hypotheses are shown in the Fig. 3.

Discussion

It is proved that GME has obvious influence on university students’ GB. It is necessary to accelerate the legislation on GE, and ensure that GE is included in all levels of education and all links of education and publicity. The Ministry of Education can issue GE policies, list green-management-related courses and social practices as compulsory courses or links, and increase investment in GE, so as to lay a solid policy foundation for GE.

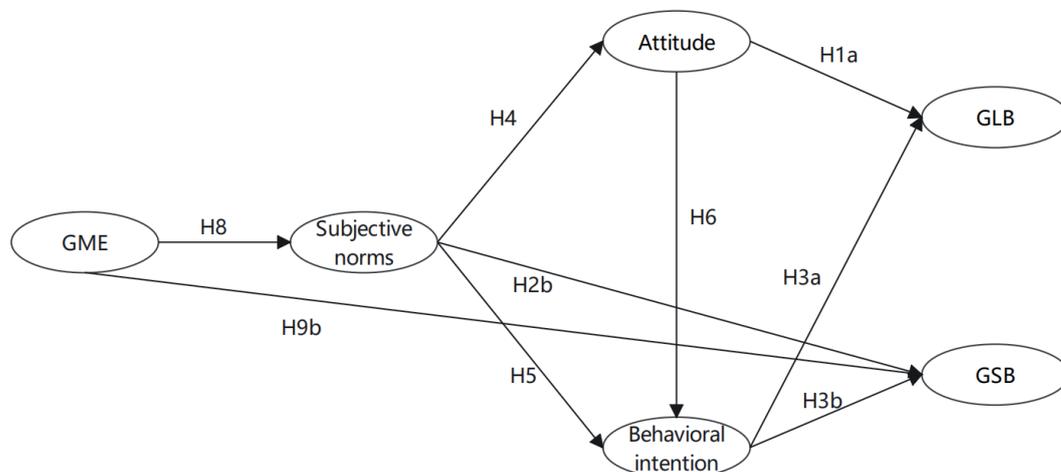


Fig. 3. Paths and coefficients of GME influencing university students’ GB.

In terms of GME, open more courses involved in the GM and sustainable development, and make GME permeate in the courses, social practice, each link of university management, carry out more activities and competitions related to green theme, to strengthen university students' green attitude and subjective norm, and all-sides improve university students to adopt GLB, GSB and the behavioral intention. Meantime, universities should improve teachers' attention to GE, innovate the way of GME, exert a subtle influence on students from the subjective norms, and fundamentally improve the effect of GME. It is also significant to strengthen the publicity and guidance of the value of GME from the social level, encourage university students to start from daily life and social practice, improve their attitude and awareness to strengthen green life and social behavior through the guidance of values, so as to further increase their GLB and GSB.

Conclusions

Through the above analysis, the following conclusions can be drawn:

(1) GLB and GSB are directly influenced by behavior intention. The stronger the GBI is, the more likely it is to produce GLB and GSB, which also confirms the research hypotheses that behavioral intention determines behavior.

(2) Behavioral intention is directly influenced by attitude and subjective norms, among which subjective norms are the main factors influencing behavioral intention. The higher the score of the respondents in the scale of attitude and subjective norms, the stronger their intention to produce relevant GB, which shows that university students are affected by attitude and subjective norms and then produce corresponding GB.

(3) Subjective norms have a direct impact on GSB, GME is the antecedent of subjective norms, and GME also has a direct impact on GSB. The higher the level of GME received by the public, the score of subjective norm scale will increase correspondingly, which promote the generation of GSB. According to the results of the model, we believe that GME is the driving force to promote the development and change of the social and environmental atmosphere in which students live. GME and the changes in social and environmental atmosphere brought by it also promote students to adopt more GSB and improve their own green awareness and environmental literacy.

(4) Attitude has a direct impact on GLB. GME promotes the generation of GLB by affecting subjective norms and then affecting attitudes. The higher the level of GME received by the respondents, the higher the level of subjective norms and attitudes, thus promoting the generation of GLB. Since GLB mainly involves some green environmental protection habits in university students' daily life, the change of students' attitude will

directly promote the generation of their GLB, which is also consistent with our research hypotheses.

Acknowledgments

This paper is supported by General Project of Education and Teaching Research, Beijing Forestry University (# BJFU2017JY019 & BJFU2019JY040).

Conflict of Interest

There is no conflict of interest. All opinions are of authors. Thanks to peer-reviewers.

References

1. FOO K.Y. A vision on the role of environmental higher education contributing to the sustainable development in Malaysia. *Journal of Cleaner Production*, **61**, 2013.
2. CHEN J. Create green university to take the road of healthy and sustainable development. *China Higher Education*, (Z2), 9, 2012.
3. LIU G., YUE W. Exploration on the foundation role of education in the construction of ecological civilization. *Educational Research*, **34** (12), 10, 2013.
4. WANG Q., NIU G., GAN X., CAI Q. Green returns to education: Does education affect pro-environmental attitudes and behaviors in China? *PloS One*, **17** (2), 2022.
5. KUPPER H., LAURENTZEN R., MULDER M. Recent policy developments in green education in The Netherlands. *The Journal of Agricultural Education and Extension*, **18** (2), 2012.
6. SACCO M.M., VITTI E.L., PAROLA A. Developing European key competences with green education. *European Journal of Sustainable Development*, **9** (3), 2020.
7. ZHANG X. Green education in the vision of life. *Journal of the Chinese Society of Education*, **2017** (09), 86, 2017.
8. LUO X., YU B. Green education: approaches to the construction of ecological civilization in Chinese universities. *Journal of Yunnan Minzu University (Social Sciences)*, **34** (02), 151, 2017.
9. HOU X., MA Y., WU Y., WANG W. Implementing green education of urban families: an action research project in Beijing, China. *Action Research*, **18** (1), 2020.
10. YU J., CHEN J. Promoting green education in higher education institutions. *Journal of National Academy of Education Administration*, (11), **26**, 2017.
11. GUERRA A., FIGUEIREDO M. L. Curricular greening in higher education: challenges and perspectives. *Educator em Revista*, **3**, 2014.
12. CHEN M., JERONEN E., WANG A. What lies behind teaching and learning green chemistry to promote sustainability education? a literature review. *International Journal of Environmental Research and Public Health*, **17** (21), 2020.
13. YUAN X., JIAN Z., HUISINGH D. Green universities in china - what matters? *Journal of Cleaner Production*, **61** (dec. 15), 2013.
14. FENG J. From environmental education to human subject education: educational exploration to solve ecological

- problems. *Research in Educational Development*, **39** (12), 19, **2019**.
15. XIA T., WANG Y., XING C. Influence of green management on corporate innovation performance. *Forum on Science and Technology in China*, (03), 64, **2020**.
16. PEI X. The Experience of green management in foreign cities and its enlightenment to China. *Hubei Social Sciences*, (11), **40**, **2012**.
17. SRIVASTAVA A.P., MANI V., YADAV M., JOSHI Y. Authentic leadership towards sustainability in higher education an integrated green model. *International Journal of Manpower*, **41** (7), **2020**.
18. RAMCHUNDER S.J., ZIEGLER A.D. Promoting sustainability education through hands-on approaches: a tree carbon sequestration exercise in a Singapore green space. *Sustainability Science*, **16** (3), **2021**.
19. LIN K., YANG P. Investigation on green behavior and habit formation of university students. *Environmental Education*, (07), 54, **2019**.
20. BAI G., LI G. Green consumption cognition, attitude, behavior and their mutual influence. *Urban Problems*, (09), 64, **2012**.
21. WANG C. Analysis of the attitude-behavior gap of green consumption. *Journal of Xi'an University of Finance and Economics*, **31** (03), 28, **2018**.
22. WANG Y. Study on college students' green behavior and its influencing factors. *Economic Research Guide*, (06), 127, **2020**.
23. SHI H., WANG S., ZHAI K. Influencing mechanisms of dual environmental educations on college students' PM_{2.5} reduction behavior. *Journal of Arid Land Resources and Environment*, **34** (07), 62, **2020**.
24. YU J., CHEN J., XU Y. Construction of green MBA training system: a case study of green mba program of Beijing Forestry University. *Academic Degrees & Graduate Education*, **18** (01), **2018**.
25. AJZEN I. From intentions to actions: a theory of planned behavior. In: J. KUHL and J. BECKMAN (eds), *Action-control: From Cognition to Behavior*. Heidelberg: Springer, **1985**.
26. AJZEN I. Attitudes, traits, and actions: dispositional prediction of behavior in personality and social psychology. *Advances in Experimental Social Psychology*, **20**, **1987**.
27. AJZEN I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, **50**, **1991**.
28. VICENTE-MOLINA M.A., FERNANDEZ-SAINZ A., IZAGIRRE-OLAIZOLA J. Environmental knowledge and other variables affecting pro-environmental behaviour: comparison of university students from emerging and advanced countries. *Journal of Cleaner Production*, **61** (dec. 15), **2013**.
29. HANSLA A., GAMBLE A., JULIUSSON A., GÄRLING T. Psychological determinants of attitude towards and willingness to pay for green electricity. *Energy Policy*, **36** (2), 768, **2008**.
30. DE GROOT J., STEG L. General beliefs and the theory of planned behavior: the role of environmental concerns in the TPB. *Journal of Applied Social Psychology*, **37** (8), 1817, **2007**.
31. ZHANG L., SHUAI C., LIU Y. Psychological attribution and interventional techniques of consumer's green consumption behavior: an empirical research based on the theory of planned behavior and the data from situational experiment. *Journal of China University of Geosciences (Social Sciences Edition)*, **13** (05), 49, **2013**.
32. LU R., LI M., HONG S. The effect mechanism of energy saving behavior of urban residents. *Journal of Arid Land Resources and Environment*, **30** (12), 53, **2016**.
33. LU Z., LI M., MENG X. Understanding the green behavior of students influenced by ecological Civilization education in universities and colleges. *Journal of Arid Land Resources and Environment*, **33** (12), 28, **2019**.
34. ZHANG Y., WANG Z. Determinants of energy saving intention in organizations--a study of knowledge workers based on the theory of planned behavior. *Journal of Beijing Institute of Technology (Social Sciences Edition)*, **14** (06), 7, **2012**.
35. DUAN W., JIANG G. A review of the theory of planned behavior. *Advances in Psychological Science*, (02), 315, **2008**.
36. VARELA-CANDAMIO L., NOVO-CORTI I., TERESA GARCÍA-ÁLVAREZ M. The importance of environmental education in the determinants of green behavior: a meta-analysis approach. *Journal of Cleaner Production*, **170**, 1565, **2018**.
37. MALONEY M.P., WARD M.P., BRAUCHT G.N. A revised scale for the measurement of ecological attitudes and knowledge. *American Psychologist*, **30** (7), 787, **1975**.
38. BECK L., AJZEN I. Predicting dishonest actions using the theory of planned behavior. *Journal of Research in Personality*, **25** (3), 285, **1991**.
39. SHI H. A study on how low-carbon policies influence urban residents' energy conservation behaviors. *Journal of Beijing Institute of Technology (Social Sciences Edition)*, **18** (05), 42, **2016**.
40. JACKSON D.L., GILLASPY J.A., PURC-STEPHENSON R. Reporting practices in confirmatory factor analysis: an overview and some recommendations. *Psychological Methods*, **14**, 6, **2009**.

