

Article

Studying What Influences the Effects of Environmental Education on Visitors of Fuzhou National Park in China—The Mediating Role of Place Attachment

Jiao Yu ¹, Weizhen Xu ¹, Yongchen Zou ¹, Honghui Yang ¹ and Zheng Ding ^{1,2,*}¹ College of Landscape Architecture, Fujian Agriculture and Forestry University, Fuzhou 350100, China² Fujian Environmental Art Association, Fuzhou 350100, China

* Correspondence: 000q151039@fafu.edu.cn

Abstract: With the rapid and vigorous growth of forest tourism, the irresponsible environmental behavior of tourists has caused enormous strain on forests' ecological systems. Carrying out environmental education in forest parks is conducive to promoting the sustainable development of forest tourism. To explore the impact of human–place emotion on environmental education effects, this study took Fuzhou National Forest Park as an example to construct a structural equation model composed of landscape perception, environment interpretation, place attachment, and the effects of environmental education (EEE). The relationship between the four elements and the mechanism of action was clarified. A questionnaire was used with 480 visitors. Statistical analysis showed that: (1) The value of scientific research and education (0.774) influences landscape perception. Reliability (0.770) and tangibility (0.718) contribute to environmental interpretation. Place identification and dependence are represented by environmental identity (0.771) and are activity-dependent (0.792), respectively. Knowledge (0.860) and behavior (0.869) are essential factors in driving the EEE. (2) Place attachment and environment interpretation had a significant positive impact on the environmental education effect ($p < 0.001$), and there was no direct effect between landscape perception and EEE. (3) Landscape perception and environment interpretation indirectly influence EEE with place attachment as full and partial mediators, respectively. This paper aims to provide theoretical support for better synergistic growth of forest park ecology, economy, and environment.

Keywords: the effects of environmental education; environmental interpretation; forest tourism; landscape perception; place attachment



Citation: Yu, J.; Xu, W.; Zou, Y.; Yang, H.; Ding, Z. Studying What Influences the Effects of Environmental Education on Visitors of Fuzhou National Park in China—The Mediating Role of Place Attachment. *Forests* **2022**, *13*, 1735. <https://doi.org/10.3390/f13101735>

Received: 18 August 2022

Accepted: 17 October 2022

Published: 20 October 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Increased urbanization has significantly limited citizens' possibilities to connect with nature, and forest parks play a vital role in beautifying urban landscapes and enhancing the environment for different groups of tourism activity [1]. Environmental problems have become a global concern, and environmental education prepares people to adopt environmentally responsible behavior by shaping environmentally friendly attitudes, values, knowledge, and awareness [2]. With the booming development of the forest tourism industry, a series of environmental problems caused by the irresponsible environmental behavior of some tourists needs to be solved urgently [3]. Forest parks are a natural medium for environmental education for recreationists. The rational use of forest landscape space to achieve environmental education for recreationists is conducive to ensuring sustainable development of forest tourism. The concept of environmental education was originally proposed by Thomas Pritchard in 1948. It already has a richer connotation, with broad and narrow meanings. In general, the initial purpose of environmental education is to help the participants build up a correct awareness of environmental issues, acquire knowledge and skills, and improve and maintain environmental quality [4]. Specifically, it refers to various practical activities that promote the formation of public environmental awareness, quality,

and attitudes through the popularization of environmental knowledge [5]. Environmental education is also known as informal education, which can have a long-term impact on visitors' environmental perceptions [6]. Outdoor environmental education can also strengthen the connection between people and nature [7]. This shows that the effects of environmental education (EEE) can improve the relationship between people and nature in all directions.

Environmental education is often expressed in the form of environmental interpretation, which can effectively enhance EEE in national parks [8]. The recipient is given interpretive content based on landscape perception, and the positive affective experience that comes from high-quality landscape perception can trigger positive environmental behavioral tendencies [9]. Emotions are the source of motivation for the transformation of behavioral outcomes. Studies by Huang et al. (2021) [10] and Gibson (2016) [11] confirm that emotional factors have an impact on tourists' environmental behavior. Recreationists are eager to find deep emotional experiences beyond a physical space to obtain a sense of satisfaction and self-fulfillment and to lay the foundation for regulating visitors' environmental behavior. Most studies in nature tourism destinations focus on environmentally responsible behavior [12,13], which is, in fact, the goal of environmental education. Clarifying the factors of environmental education that attribute to responsible behavior among forest tourists is very important.

The influence of emotions on behavior has been mentioned earlier, but the role of human–place emotion has often been neglected in studies related to environmental education. Our study focuses on the influence of tourists' emotional connection to the destination on EEE. Due to place attachment as one of the important concepts in human–place emotion, the influence mechanism of EEE based on existing theories is introduced to the research. The purpose of this study is to investigate the relationship between place attachment, landscape perception, and environment interpretation on EEE for forest visitors, which will be significant both theoretically and practically for forest parks.

2. Study Design

2.1. Literature Reviews and Hypothesis

2.1.1. Effects of Environmental Education

Undesirable tourist habits, such as littering, destroying historical sites, picking flowers and folding plants, etc., cause great harm to the ecological environment; therefore, evaluating EEE is particularly critical. The Tbilisi Declaration refers to environmental education as an educational activity aimed at achieving public environmental knowledge, awareness, attitudes, skills, and participation. Environmental education in China started late. At present, environmental education in national forest parks focuses more on cultivating young people's awareness to protect the environment and care for the forest. Organizing educational forest experience activities help people perceive the forest environment in all aspects. Forest environmental education methods are mainly divided into the nature experience method and the interactive inspiration method. With the former, visitors can connect with nature through interesting experiences, while the latter deepens visitors' environmental knowledge through measurement, analysis, and experimental activities.

Nicole (2014) [14] empirically determined that participants' attitudes, knowledge, skills, and behaviors related to environmental education were enhanced and improved after receiving it. Zheng (2017) [15] believed that environmental education can have an impact on cognitive, emotional, and motor domains, including knowledge, attitude, ethics, and skills. The purpose of environmental education in forest parks is to guide the public to recognize the value of forest resources, raise awareness of environmental protection, establish good environmental ethics, and acquire relevant environmental skills. Our study chose to evaluate EEE in five areas: skills, ethics, knowledge, awareness, and behavior.

2.1.2. Place Identity and Place Dependence

Place attachment is a human–place emotion that refers to a mental connection formed by an individual's active interaction with a specific environment based on cognition and

practice [16]. Williams (1992) [17] described the actual meaning of place attachment through two dimensions: place dependence and place identity, and developed a place attachment measurement scale accordingly. Gerard (2004) [18] considers place dependence and place identity as important components of place attachment and used this scale to monitor the relationship between place preferences and place meaning. Cundil (2017) [19] validated the generalizability of the two-dimensional scale through field research. The two-dimensional structure of place attachment is now widely used. Therefore, our study used Williams' definition of place attachment [17] and distinguished the different attributes of place attachment and place identity with reference to Gerard's study [18].

Place dependence belongs to functional attachment. It is related to the degree of satisfaction of place function to personal needs. According to Lewis' 4E construction method of landscape gardening, it is known that the four major landscape functions are Environmental, Education, Ecological, and Esthetic [20]. Moreover, Bricker and Kerstetter (2000) showed that place dependence of visitors enhances the conservation of environmental resources [21]. Place identity is the basis of self-identity. It is an emotional attachment, which is influenced by personal upbringing and socio-cultural characteristics. Dlamini et al. (2021) [22] argued that place attachment has a greater impact on environmentally responsible behavior. Referring to the Place Attachment Scale developed by Williams et al. [17], evaluation components were designed to test place attachment in forest parks. Specifically, place dependence consists of experience, activity, recreation, and relaxation. Place identity is divided into four forms: self, enjoying, meaning, and environment. One of the practical values of place attachment is that it fosters a sense of consciousness and behavior to protect the environment while visitors enjoy the national park environment [23]. Hence, the following hypotheses are proposed:

H1 : *Place identity significantly and positively improves EEE.*

H2 : *Place dependence significantly and positively improves EEE.*

2.1.3. Landscape Perception

Landscape perception refers to the process of public interaction with natural or artificial landscapes [24]. The perceptual experience of the multimodal excursion counteracts the individual's cognitive and emotional formation. Emotional characteristics of landscape components influence perceived quality. Moreover, positive perceptual aspects can constitute an environmental landmark landscape that inspires public place identity [25], which is given a special meaning of "humanization" and carries place-dependent representations of different nature and intensity. Chiu et al. (2014) [26] argued that landscape perception contributes to the value of ecotourism activities and is associated with environmentally responsible behavior. The customer perceived value proposed by Zeithaml (1988) is a common product measurement theory applied in marketing. Our study extends it to landscape perceived value, which is a comprehension of evaluation for the individual perception of landscape elements combined with space. The public perception and demand for forest landscape values have changed in recent years. The perceived value of human landscapes, scientific research and education, the natural environment, and recreation are being paid more and more attention [27–29]. Forest landscape perception becomes richer and more practical. The specific hypotheses are as follows:

H3 : *Landscape perception significantly and positively improves place identity.*

H4 : *Landscape perception significantly and positively improves place dependence.*

H5 : *Landscape perception significantly and positively improves EEE.*

2.1.4. Environmental Interpretation

Environmental interpretation is the basic service function of scenic spots. On the one hand, it reveals the intrinsic meaning and interconnection between people and the environment through the local history, culture, and natural resources. On the other hand,

it can regulate the recreationists to maintain environmentally responsible behavior during the visit and help maintain the environmental quality of the tourist place [8]. Susan (2004) [30] believes that environmental interpretation in nature reserves can effectively bring people and nature closer together and reduce environmental damage by tourists. Manu (2013) [31] demonstrated, from a cultural heritage perspective, that visitor emotions have a direct impact on the quality of the interpretation system. Environmental interpretation is to monitor the content and presentation of environmental interpretation. However, the evaluation objects, criteria, and processes are cumbersome, so this study uses the Service Quality (SERVQUAL) model as the theoretical support. The environmental interpretation evaluation model was constructed based on SERVQUAL and forest park interpretation characteristics, and the final decision was made to measure interpretation quality in five dimensions: tangibility, reliability, assurance, responsiveness, and humaneness [32]. Accordingly, the following hypotheses can be derived:

H6 : Environmental interpretation significantly and positively improves place identity.

H7 : Environmental interpretation significantly and positively improves place dependence.

H8 : Environmental interpretation significantly and positively improves EEE.3. Methods.

2.2. Site Selection

Fuzhou National Forest Park is one of the top ten forest parks in China and the first national forest park in Fujian Province (Figure 1). The environmental education content in the park contains both humanities and natural biology. It occupied 859 hectares in the urban area. The park is located in the over-zone from the south subtropics to the middle subtropics with 8000 species of vegetation, including a variety of Grade 1 protected rare plants, such as Metasequoia (*Metasequoia glyptostroboides*), dove trees (*Davidia involucrata*), and the “Queen of Tea” golden camellia (*Camellia chrysantha*). It also contains historical and humanistic attractions such as Zhengxin Temple, ancient post roads, and ancient tombs.

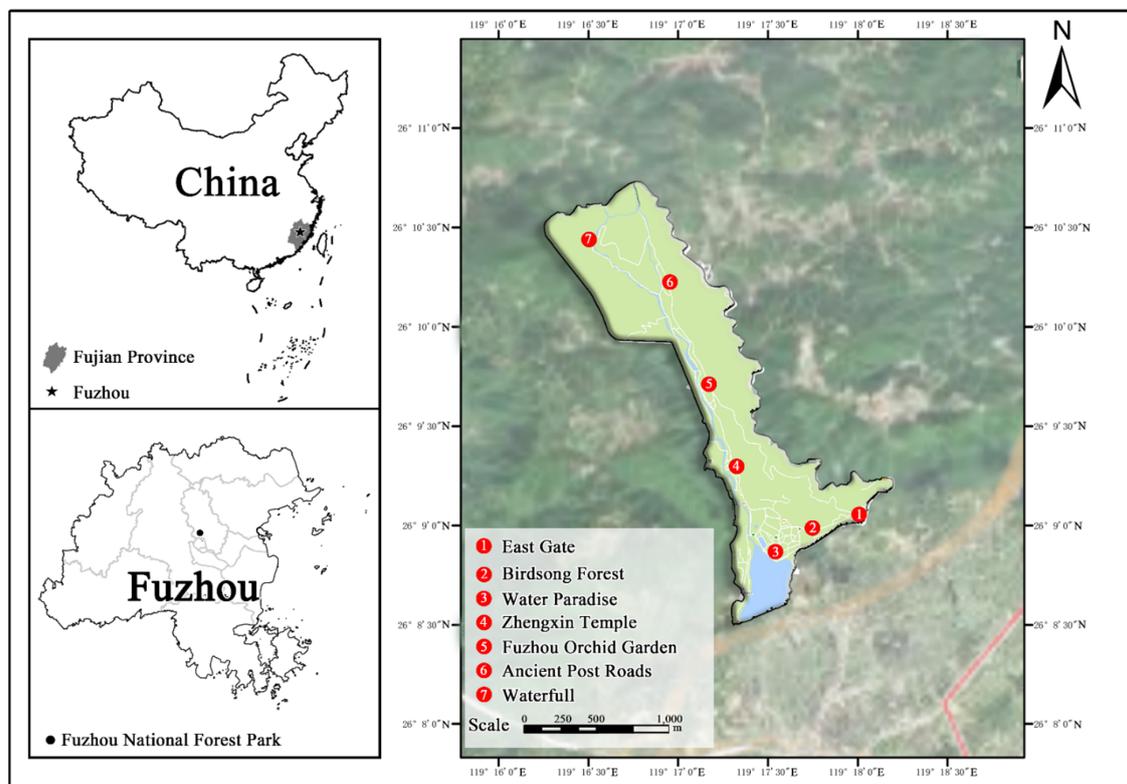


Figure 1. Study Area Overview.

Our study evenly selected seven study sample sites in the park that have the basic characteristics of Fuzhou National Forest Park (Figure 1). The park integrates geographical resource advantages into tourism advantages through the construction of themed gardens. It enriches the tourism and educational resources of the park. In 2021, it was recognized by the Chinese Forestry Society as a national forestry and grass science base and was selected as a “National Youth Nature Education Green Camp”. Taking Labor Day as an example, the number of visitors grew from 31,900 to 67,000 from 2020 to 2021, indicating that environmental education attracted more visitors to the Fuzhou National Forest Park.

2.3. Statistical Analysis Methods

Structural equation modeling uses variable covariance associations to test the validity of theoretical hypotheses as a whole [33]. It is often used to analyze latent variable relationships that are difficult to measure directly and apply to the theoretical hypotheses of this study. To ensure the objectivity of the results, the reliability of scales was first tested by using SPSS 26.0 and AMOS 26.0, and then the relationships between the effects of latent variables were quantified by the structural equation modeling software AMOS 26.0 [34].

2.4. Questionnaire Design and Collection

The content of this questionnaire consists of two parts. The first part is the demographic characteristics of the survey sample, including gender, age, education, occupation, monthly income, and the number of visits. Another part sets questions for the six components of the model, and the topics of the measurement questions are the same as the content of the literature review, which will not be repeated here. The questions were then calibrated through expert consultation and combined with previous literature to finalize 22 questions, which were measured using a 7-point Likert scale method (1~7 represents from dissatisfaction to satisfaction, while 4 represents a neutral attitude) (Table A1). In total, 80 pre-survey questionnaires were first collected and supplementary explanations were given to the items based on the respondents’ feedback. The principles of questionnaire collection are as follows: (1) random sampling; (2) windless and rain-free weather; and (3) selection of the time with many visitors (7:00 am to 11:00 am and 14:00 pm to 17:00 pm). Our study explores the structure and efficacy of visitors’ EEE modeling in forest parks. The extensive visitor semantics of visitors in the Fuzhou National Forest includes general visitors, researchers, and park managers. Therefore, the three groups mentioned above are considered to be representative of the visitors in the park. Concerning questionnaire collection in study sample sites of Fuzhou National Forest Park (Figure 1) between February to March 2022, a total of 498 surveys were completed, out of which 18 were eliminated due to missing information or implausible responses, etc. The final sample for analysis includes 480 individuals, and the effective rate was 96.4%. The questionnaires were collected in paper form, making it easy for visitors who could not conveniently bring their cell phones to fill them out.

2.5. Demographic Characteristics

According to the demographic characteristics of the valid questionnaire sample (Table 1), it can be seen that the proportion of male (48.1%) and female (51.9%) respondents is roughly balanced. Visitors are mostly young and middle-aged between 18–55 years old, with the largest proportion being 18–25 years old (29.6%), followed by 46–55 years old (16.3%), under 18 years old (8.3%), and over 66 years old (7.7%). Education levels mostly ranged below high school (57.1%) and master’s degree (22.5%). The occupational background of students (36.7%), service industry workers (14.8%), and company employees (14.4%) are more common. Most prominently, monthly income groups are less than RMB 3000 (39.8%) and RMB 3000–6000 (23.5%). Nearly half of the visitors visited less than 2 times (46.0%), with 3–5 times (32.1%) accounting for the next highest percentage. The sample distribution of tourists in this survey is reasonable, and there is no obvious subjective preference.

Table 1. Sociological characteristics of the population.

Demographics	Type	%	Demographics	Type	%	
Gender	Male	48.1	Career	government official	4.2	
	Female	51.9		Service workers	14.8	
Age	Under 18	8.3		Casual workers	14.4	
	18–25	29.6		Company Staff	14.4	
	26–35	13.1		Students	36.7	
	36–45	14.8		Freelancer	15.6	
	46–55	16.3		Monthly income	Under RMB 3000	39.8
	56–65	10.2			RMB 3000–6000	23.5
Over 66	7.7	RMB 6000–9000			19.8	
education level	Below high school	57.1		RMB 9000–12,000	12.3	
	Specialty	11.9	Over RMB 12,000	4.6		
	Undergraduate	7.7	Number of visits	Less than 2 times	46.0	
	Master’s Degree	22.5		3–5 times	32.1	
	Doctoral degree or higher	0.8		6 times or more	21.9	

3. Results

3.1. Reliability Test

The results of the questionnaire scale sources and reliability test are as follows (Table 2):

Table 2. Reliability and validity test. Exploratory factor analysis (CFA). The KMO value of 0.924 was first obtained after the factor correlation test, and Bartlett’s sphericity test was significant ($p = 0.000$), which means that standard for factor analysis has been reached. The Cronbach’s α coefficients of landscape perception, environmental interpretation, place identity, place dependence, and EEE were obtained after factor extraction and rotation by using the maximum variance method. The result shows that 0.768, 0.859, 0.811, 0.840, and 0.926 satisfied the scale’s internal consistency test.

Scale	Observed Variables	Estimate >0.5	AVE >0.4	CR >0.6	Cronbach’s α >0.7
Landscape Perception (A)	Value of human landscape (A1)	0.681	0.449	0.765	0.768
	Value of scientific research and education (A2)	0.696			
	Value of the natural environment (A3)	0.643			
	Value of recreation and tourism (A4)	0.659			
Environmental Interpretation (B)	Responsiveness (B1)	0.727	0.551	0.860	0.859
	Assurance (B2)	0.774			
	Reliability (B3)	0.748			
	Tangibility (B4)	0.733			
	humanity (B5)	0.727			
Place Identity (C)	Self-Identity (C1)	0.710	0.516	0.810	0.811
	Enjoying Identity (C2)	0.700			
	Meaning Identity (C3)	0.699			
	Environmental Identity (C4)	0.763			
Place Dependence (D)	Experience Dependent (D1)	0.745	0.570	0.841	0.840
	Activity Dependent (D2)	0.793			
	Recreation Dependent (D3)	0.730			
	Relaxation Dependent (D4)	0.751			
Effects of Environmental Education (F)	Skills (F1)	0.826	0.715	0.926	0.926
	Ethics (F2)	0.850			
	Knowledge (F3)	0.854			
	Awareness (F4)	0.829			
	Behavior (F5)	0.868			

Regarding confirmatory factor analysis (CFA), first, the convergent validity test showed that the standardized factor loadings of each question item were within the range from 0.643 to 0.868, which had reached the standard value of 0.5, and there was no need to eliminate the factors. The average variance extracted (AVE) and combined reliability (CR) of EEE, place attachment, landscape perception, and environmental interpretation ranged from 0.449 to 0.715 and 0.765 to 0.926, Among all, the average variance extracted for landscape perception was 0.449, which is an acceptable result given the good reliability of other indicators of this dimension [31].

3.2. Model Fit

Structural equation model fit indices are composed of absolute fit indices, relative fit indices, and parsimonious fit indices. Parameter fitting analysis of the initial structural equation model by AMOS 26.0 with the maximum likelihood estimation method was performed. The following content provides the results of the goodness-of-fit, and the various statistics indicate that the model fits well. (1) Absolute fit indicators ($\chi^2/df = 2.579$, RMSEA = 0.057, GFI = 0.913; (2) Relative fit indicators (NFI = 0.924, RFI = 0.91, TLI = 0.943, IFI = 0.952, and CFI = 0.952); and (3) Parsimonious fit indicators (PNFI = 0.78, PCFI = 0.804). Our statistics can be used for subsequent hypothesis path testing and analysis.

3.3. Path Analysis

The results of the modified model hypothesis path test (Figure 2, Table 3) are shown below:

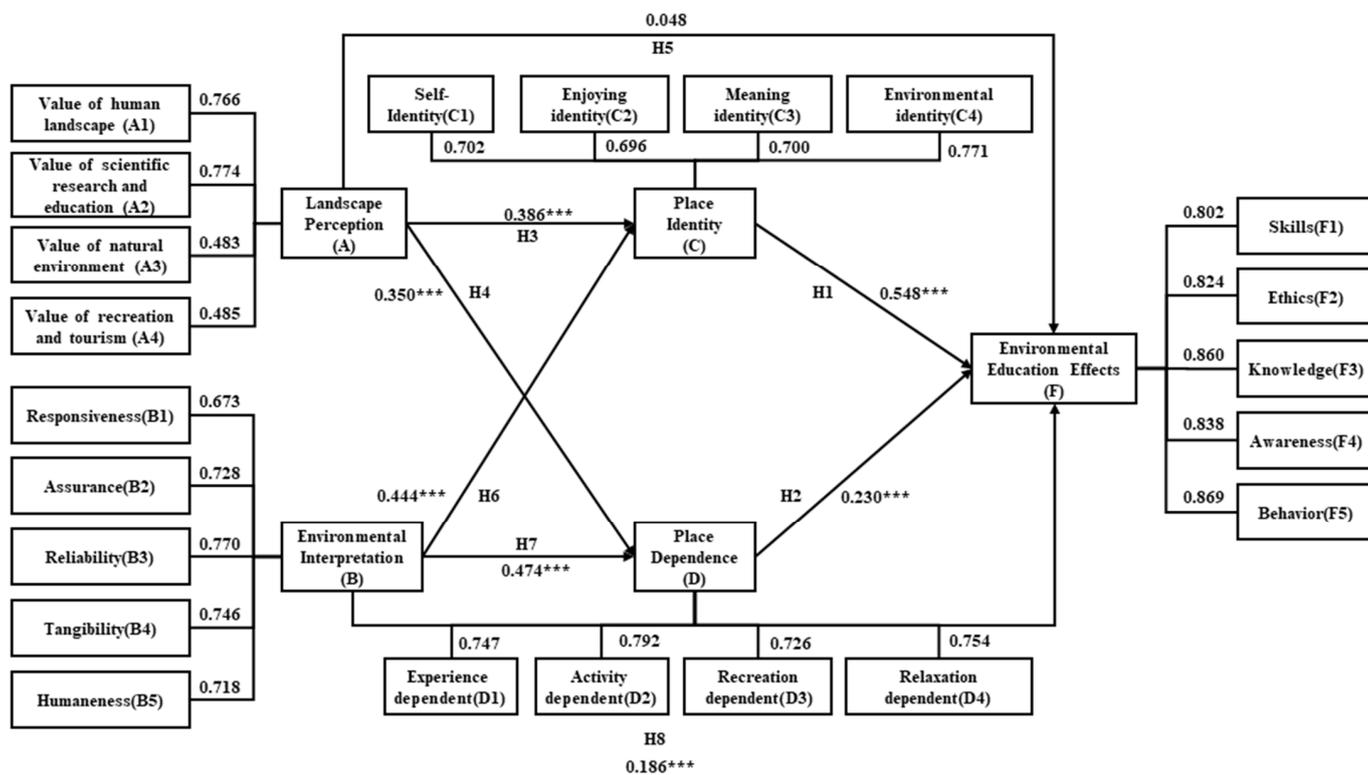


Figure 2. Structural equation model test analysis diagram ($p < 0.001$, ***).

Table 3. Path Testing ($p < 0.001$, ***).

Path	Standardization Factor β	Standard Error	t	p	Results
H1:C→F	0.548	0.060	8.329	***	Significant positive effect Supported
H2:D→F	0.230	0.044	4.246	***	Significant positive effect Supported
H3:A→C	0.386	0.060	5.669	***	Significant positive effect Supported
H4:A→D	0.350	0.063	5.400	***	Significant positive effect Supported
H5:A→F	0.048	0.042	0.917	0.359	Not Supported
H6:B→C	0.444	0.072	6.586	***	Significant positive effect Supported
H7:B→D	0.474	0.079	7.182	***	Significant positive effect Supported
H8:B→F	0.186	0.054	3.357	***	Significant positive effect Supported

3.3.1. Place Attachment and Environmental Education Effect

Place identity and place dependence in place attachment had a significant positive effect on EEE ($\beta_{cf} = 0.548$, $t = 8.329$, $p < 0.001$; $\beta_{df} = 0.230$, $t = 4.246$, $p < 0.001$), so the hypotheses H1 and H2 were valid. The magnitude of the influence of the five observations in EEE is in the order of behavior (0.869) > ethics (0.860) > skills (0.838) > awareness (0.824) > knowledge (0.802). Among all, behavior is the most important influencing factor. Environmental knowledge and awareness can be further enhanced after recreationists participate in forest park tours. New perceptions of environmental ethics can be created to a large extent, so it is helpful to cultivate environmentally friendly behaviors.

Among the place identity dimensions, environmental identity (0.771) showed a higher contribution than self-identity (0.702), meaning identity (0.700), and enjoying identity (0.696). Among the four forms of place dependent, activity dependent (0.792) > relaxation dependent (0.754) > experience dependent (0.747) > recreation-dependent (0.726). Tourists are more inclined to use different spaces to participate in various activities in the park, creating a stronger sense of identification. Tourists form dependence and identification with the functional and emotional aspects of the place based on the process of perception and aesthetics of tourist places, which to a certain extent drives the awareness of environmental protection among recreationists and directly contributes to EEE.

3.3.2. Landscape Perception, Environment Interpretation, and Place Attachment

Landscape perception had a significant positive effect on place dependence and place identity ($\beta_{ac} = 0.386$, $t = 5.669$, $p < 0.001$; $\beta_{ad} = 0.350$, $t = 5.400$, $p < 0.001$). Hypotheses of H3 and H4 were valid. Value of human landscape (0.766) and scientific research and education (0.774) are the main factors of landscape perception. The reason is probably caused by the construction of museums and university education bases, which highlights the value of scientific research and education in the park. The historical and humanistic atmosphere in the park is more intense compared with similar parks. It is more likely to impress tourists to perceive the natural and artificial landscape value of the park, thus stimulating place dependence and place identity.

There was a significant positive association between environment interpretation and place dependence and place identity ($\beta_{bc} = 0.444$, $t = 6.586$, $p < 0.001$; $\beta_{bd} = 0.474$, $t = 7.182$, $p < 0.001$), and the hypotheses H6 and H7 were valid. Tangibility (0.746), reliability (0.770), assurance (0.728), humanity (0.718), and responsiveness (0.673) have a strong correlation to environment interpretation. Environment interpretation helps to realize the alternation of information between tourists and environmental resources. Not only does it encourage tourists to recognize and identify with local connotations, it can make recreationists fully appreciate the function of forest landscape space use and produce functional dependence through information transfer.

3.3.3. Landscape Perception, Environment Interpretation, and Environmental Education Effect

There is no direct relationship between landscape perception and EEE ($\beta_{af} = 0.048$, $t = 0.917$, $p > 0.001$). Environment interpretation has a significant positive effect on EEE

($\beta_{bf} = 0.186$, $t = 3.357$, $p > 0.001$). Therefore, H5 is not valid and H8 is valid. Landscape perception is based on the perceiver's physical perception as an experience. Currently, forest park tour perception in a single form may not be able to fully meet the environmental education needs of tourists. That might be the reason why landscape perception has not shown a significant effect on environmental education. The environment interpretation in forest parks is not yet perfect, and the coefficient value on EEE is low. The impact of environmental interpretation on EEE can be expanded by enhancing its responsiveness and reliability. Compared with place attachment, landscape perception and environmental interpretation mostly use the physical state as a carrier and appear in the objective real form to trigger emotional fluctuation and transfer of tourists. Both of them may indirectly influence EEE with place attachment as the mediator.

3.4. Mediation Effects

The direct effect of landscape perception on EEE did not hold. There was a positive and significant relationship between environment interpretation and EEE. To test the mediating role of place identity and place dependence on the path of landscape perception and environment interpretation affecting on EEE, the Bias-corrected/Percentile Bootstrap method was used, taking 95% as the confidence interval and sampling was repeated 2000 times. The results (Table 4) are shown below:

Table 4. Standardized mediation test.

Project		Indirect Effects		Effect Type Direct Effect	Indirect Effects	
Path		AC→F	A→D→F	B→F	B→C→F	B→D→F
Intermediary Type		Complete intermediary		—	Part of the intermediary	
Effect Value		0.212	0.081	0.186	0.243	0.109
Standard Error		0.066	0.033	0.058	0.060	0.042
Bias-corrected 95% CI	Lower	0.109	0.034	0.060	0.139	0.039
	Upper	0.373	0.170	0.288	0.381	0.209
	P	0.001	0.001	0.003	0.000	0.001
Percentile 95% CI	Lower	0.105	0.028	0.067	0.121	0.034
	Upper	0.370	0.158	0.291	0.359	0.200
	P	0.001	0.002	0.002	0.001	0.001

Place identity and place dependence were fully mediated on the path of “landscape perception → EEE”. The 95% confidence intervals for Bias-corrected and Percentile under the influence of place identity and place dependence were (0.109, 0.373), (0.034, 0.170), and (0.105, 0.370), (0.028, 0.158), respectively. The intervals did not contain “0” ($p \leq 0.002$), which means that place attachment fully mediates the effect significantly. The indirect effect coefficient assumed by place identity was 0.212. The indirect effect of place attachment was 8.1%.

There was a direct effect of 0.186 on the path of “environment interpretation → EEE”. Place identity and place dependence both played a part in mediating the effect. The 95% confidence intervals for Bias-corrected and Percentile were (0.139, 0.381), (0.039, 0.209), and (0.121, 0.359), (0.034, 0.200) for place identity and place dependence dimensions. The intervals did not contain “0” ($p \leq 0.001$). Place attachment is effective as a partial mediator. Among them, place identity is more prominent in partial mediation effects with a mediated path coefficient of 0.243. Place dependence assumed an indirect effect coefficient of 0.109.

4. Discussion and Conclusions

4.1. Relationship between Place Attachment and Environmental Education Effect

There was a positive contribution of place attachment to EEE, which was similar to the results of previous studies. Daryanto and Song (2021) [35] analyzed place attachment

as an important source of force driving pro-environmental behaviour from the perspective of human–place interaction. Lee (2011) [36] took a nostalgic emotional perspective, and it is known that place attachment contributes to the formation of environmentally responsible behavior in visiting wetlands. The physical environment characteristics of places and individual emotional factors can effectively determine place attachment. Most relevant studies have focused on place attachment as a whole, while few scholars have explored the difference between place identity and place dependence on EEE.

Our results show that place identity affects EEE more than place dependence. According to Ajzen (2011) [37], it is hypothesized that environmental attitude formation is more influenced by cognitive outcomes and emotions. Identity has more underlying emotional attributes than dependence. When visitors are highly attached to the attraction, they will learn better from EEE. The relationship between tourism sites and recreationists may appear to be transient and fragile. However, if an emotional bond is formed with tourists, it will enhance the positive influence of a specific environment on the public's cognitive and attitudinal level. It can also counteract the responsible behavior of individuals and enhance the initiative of tourists to achieve environmental goals. The management agencies of tourist places need to find ways to increase public attachment to place and promote the development of environmental education in tourist areas.

4.2. Relationship between Landscape Perception, Environmental Interpretation, and Place Attachment

Tourists transform the landscape environment into individual thoughts and feelings through landscape perception. Sun et al. (2020) [38] argued that landscape perception helps residents to form place attachment on special resources. Our study found that tourists in Fuzhou National Forest Park can influence place dependence and place identity by landscape perception. This may be because most of the tourists in Forest Park visit in groups. Tourists interacting with the landscape in a forest park can form direct and deep emotional connections. Numerous studies show that cognitive imagery has a significant positive impact on affective imagery [39,40]. Future studies may complement the validation of the role of the relationship between place identity and dependence.

Environmental interpretation guides visitors to correctly perceived environmental information and also allows them to understand the function of a specific place. According to Our study, it is known that environment interpretation can effectively enhance the tourists' perception of the place, which forms place dependence and triggers positive emotions of individuals towards the place. Environmental interpretation can bring positive emotions through psychological changes in visitors. Hwang et al. (2003) [41] also argued that environment interpretation helps to reinforce positive and enjoyable landscape experiences for recreationists. Positive emotion generation can connect tourists with environmental resource meaning and stimulate place dependence and identity. In the past, environmental interpretation was only one form of educational experience, but contemporary visitors are eager to make an emotional connection with the place through environmental interpretation [42,43]. However, the emotional function of environmental interpretation is often overlooked. A well-developed environment interpretation in tourist places helps to optimize the visitor experience and the rational realization of tourist activities.

4.3. Landscape Perception, Environment Interpretation, and Environmental Education Effect

Chiu et al. (2014) [26] proposed perceived value in ecotourism activities that can directly promote environmentally responsible behavior. However, this study showed significant differences with the previous studies. The result found that landscape perception could not have a direct effect on EEE. Possible reasons are as follows: (1) Due to the premise of human–place emotions, landscape perception has strong physical attributes and needs to have an indirect influence on EEE by emotions. (2) The value of landscape perception cannot fully contribute to EEE, and subsequent studies need to be further verified in detail.

Previous environment interpretation studies mainly focused on the public's needs and preferences for interpretation services. However, there is limited research focused

on the fundamental purpose of environment interpretation activities. Tilden mentions that environmental interpretation is not a mere interpretation of information, but a way to bring light to people through interpretation. The choice of the form of environmental interpretation needs to take into account the visitor's personality and experience [44]. Based on our results, it can be hypothesized that environmental interpretation influences tourists' attitudes and behaviors by supporting education on environmental protection. Tourists with different purposes of visit will show different environmental behaviors. The promotion of environmental education becomes difficult when environmental interpretation and environmental protection awareness is lacking [45].

4.4. The Mediating Role of Place Attachment

He et al. (2018) [46] found that tourist perceptions need to rely on mediators to have an impact on environmentally responsible behavior. According to research, the visitor's experience of recreation in the landscape space is divided into two parts: perception and emotion. Place attachment is a prerequisite for achieving environmental education [47], and tourists' physical perception and emotional connection to a specific place can promote environmentally responsible behavior [48]. The above studies reflect the importance of human-place emotions on the pathway of landscape perception on EEE. The results showed that landscape perception influences EEE with place identity as a complete mediator. Place dependence takes part in the mediating role of the "landscape perception → EEE" pathway. Place identity can be established by tourism experiences in the short term. Place dependence is built by perceiving and using place functions repeatedly. Emotional identity is more likely to promote environmental protection awareness and enhance EEE.

Environment interpretation will go through the process of "information acquisition and tour experience-attitude-behavior-respect" to influence EEE [49]. Environmental interpretation helps to achieve EEE and alleviate the environmental pressure on the scenic spots caused by the environmental damage of tourists. This study validated the model and determined that environment interpretation can directly affect EEE. It can also have indirect effects partially mediated by place identity and dependence, with the place identity path having the largest indirect effect value. Forest tourism possesses a variety of natural and cultural resources, and environment interpretation can dig deeper into the connotation of the place and stimulate the generation of a unique place spirit. There are differences in the quality of environment interpretation services for individuals from different social backgrounds. The specific impact of socio-demographic characteristics on environment interpretation should be considered in future studies. Tourist destinations can optimize the tourist experience by setting up environment interpretation content in a targeted manner. This helps tourists gain a comprehensive knowledge of environmental ethics and awakens awareness of environmental protection.

4.5. Conclusions

The conclusions obtained are as follows:

(1) Value of scientific research and education have the strongest correlation with landscape perception. Reliability and tangibility have more influence on environment interpretation. Environmental identity and self-identity contribute more to place identity. Being activity-dependent and relaxation-dependent are important factors in place dependence. Knowledge and behavior can effectively be important factors enhancing EEE.

(2) Positive emotions in tourists' tour experience can effectively enhance EEE. Place attachment has a significant positive effect on EEE. Landscape perception emphasizes the public's ability to transform from physical cognition to emotion, which cannot have a direct effect on EEE. Environment interpretation is not a mere information transfer process. However, it relies on the environmental perception ability of tourists to summarize and reflect on environmental information that affects EEE directly.

(3) Landscape perception and environment interpretation reflect the interaction of environmental information and emotions through multiple sensory experiences that endow

the landscape with distinctive meaning. Both of them indirectly influence EEE with place attachment as a full mediator and partial mediator respectively, while place identity is more important than functional dependence. Therefore, in order to promote the sustainable development of forest tourism, it is necessary to strengthen the place identity between tourism destinations and tourists for forest environmental protection. There are limited studies that explore the enhancement of EEE and functional realization from the perspective of tourists' destination emotions. This study explores the relationship between place attachment, landscape perception, environment interpretation, and EEE, and also constructs a model of the EEE mechanism in forest parks. It provides theoretical support to enhance EEE for recreationists and promotes the sustainable development of forest ecotourism. The study has certain limitations, and an experimental site was chosen in a national forest park with relatively complete environmental education functions. In the future, green spaces with different landscape attributes can be selected to verify the stability and universality of the structural model.

Author Contributions: J.Y.: Writing, reviewing, editing, English writing; W.X.: Writing, reviewing, editing, English writing; Y.Z.: Writing and editing; H.Y.: Data collection; Z.D.: Writing, reviewing and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the Special funding project of the China Agriculture and Forestry University Design Art Alliance (111900050).

Data Availability Statement: The data used to support the findings of this study are available from the corresponding author upon request.

Acknowledgments: We are grateful to all organizations that share data.

Conflicts of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

The appendix is model-related item setting content (Table A1):

Table A1. Model-related item setting content.

Latent Variable	Reference	Observed Variable	Item
Landscape Perception (A)	Tampakis et al. [27]; Gong et al. [28]; Deng et al. [29].	Value of human landscape (A1)	Here you can feel the high value of human landscape
		Value of scientific research and education (A2)	Here you can feel the high value of scientific research and education
		Value of the natural environment (A3)	Here you can feel the high value of the natural environment
		Value of recreation and tourism (A4)	Here you can feel the high value of recreation and tourism
Environmental Interpretation (B)	German et al. [33].	Responsiveness(B1)	The park interpretive facilities are contagious and instructive
		Assurance (B2)	Park interpretive facilities are set up to be safe, visible, and easily accessible
		Reliability (B3)	The park interpretive media can fully and clearly convey the relevant content of the scenic spot
		Tangibility (B4)	The type and appearance of the park interpretation facilities are distinctive
		humanity (B5)	Interpretation facilities in the park can meet the needs of different groups of tourists

Table A1. Cont.

Latent Variable	Reference	Observed Variable	Item
Place Identity (C)	Williams et al. [17].	Self-Identity(C1)	The experience of visiting this park can deepen my understanding of myself
		Enjoying Identity (C2)	I enjoyed my visit to this park
		Meaning Identity (C3)	This park has a special meaning to me
		Environmental Identity (C4)	I agree with the environment of this park
Place Dependence (D)	Williams et al. [17].	Experience Dependent(D1)	The experience of visiting this park is unmatched by other parks
		Activity Dependent (D2)	The leisure activities in this park are more satisfying
		Recreation Dependent (D3)	The recreational of this park is unmatched by other parks
		Relaxation Dependent (D4)	This park is the best place to relax
Effects of Environmental Education (F)	Nicole et al. [14]; Zheng et al. [15].	Skills (F1)	I gained conservation skills by visiting parks
		Ethics (F2)	I can gain a deeper understanding of the mutually beneficial relationship between people and nature in this park
		Knowledge (F3)	I grew my knowledge about the environment in the park
		Awareness (F4)	I increased environmental awareness in the park
		Behavior (F5)	I will protect the environment through practical actions in the park

References

- Wan, C.; Shen, G.Q.; Choi, S. Effects of physical and psychological factors on users' attitudes, use patterns, and perceived benefits toward urban parks. *Urban For. Urban Green.* **2020**, *51*, 126691. [CrossRef]
- Stern, M.J.; Powell, R.B.; Hill, D. Environmental education program evaluation in the new millennium: What do we measure and what have we learned? *Environ. Educ. Res.* **2014**, *20*, 581–611. [CrossRef]
- Wu, J.; Lin, H.; Liu, W. Tourists' environmental vandalism and cognitive dissonance in a National Forest Park. *Urban For. Urban Green.* **2020**, *55*, 126845. [CrossRef]
- Clark, C.; Heimlich, J.; Ardoin, N.M.; Braus, J. Using a Delphi study to clarify the landscape and core outcomes in environmental education. *Environ. Educ. Res.* **2020**, *26*, 381–399. [CrossRef]
- Tarsitano, E.; Posca, C.; Rosa, A.G.; Borghi, C.; Colao, M. A "Park to Live" between environmental education and social inclusion through a landsense ecology approach. *Int. J. Sustain. Dev. World Ecol.* **2020**, *28*, 166–178. [CrossRef]
- Toffolo, M.M.; Simoncini, G.A.; Marchini, C.; Meschini, M.; Caroseli, E.; Franzellitti, S.; Prada, F.; Goffredo, S. Long-Term Effects of an Informal Education Program on Tourist Environmental Perception. *Front. Mar. Sci.* **2022**, *9*, 830085. [CrossRef]
- Pirchio, S.; Passiatore, Y.; Panno, A.; Cipparone, M.; Carrus, G. The Effects of Contact with Nature During Outdoor Environmental Education on Students' Wellbeing, Connectedness to Nature and Pro-sociality. *Front. Psychol.* **2021**, *12*, 648458. [CrossRef]
- Tang, T.; Zhao, M.; Wang, D.; Chen, X.; Chen, W.; Xie, C.; Ding, Y. Does Environmental Interpretation Impact Public Ecological Flow Experience and Responsible Behavior? A Case Study of Potatso National Park, China. *Int. J. Environ. Res. Public Health* **2022**, *19*, 9630. [CrossRef]
- Lewis, T.O.C.; Dennis, L.H. Influence of residents' place attachment on heritage forest conservation awareness in a peri-urban area of Guangzhou, China. *Urban For. Urban Green.* **2018**, *33*, 37–45. [CrossRef]
- Huang, Y.; Aguilar, F.; Yang, J.; Qin, Y.; Wen, Y. Predicting citizens' participatory behavior in urban green space governance: Application of the extended theory of planned behavior. *Urban For. Urban Green.* **2021**, *61*, 127110. [CrossRef]
- Gibson, B. The Effect of (Negative) Emotion on Pro-Environmental Behavior: An Application of the Theory of Planned Behavior. Master's Thesis, Jyväskylä University School, Jyväskylä, Finland, 2016. Available online: <http://urn.fi/URN:NBN:fi:jyu-201605172597> (accessed on 10 August 2022).
- He, X.H.; Cheng, J.; Swanson, S.R.; Su, L.; Hu, D. The effect of destination employee service quality on tourist environmentally responsible behavior: A moderated mediation model incorporating environmental commitment, destination social responsibility and motive attributions. *Tour. Manag.* **2022**, *90*, 104470. [CrossRef]
- Chen, G.Z.; Huang, X. From good feelings to good behavior: Exploring the impacts of positive emotions on tourist environmentally responsible behavior. *J. Hosp. Tour. Manag.* **2022**, *50*, 1–9. [CrossRef]
- Nicole, M.A.; Maria, D.; Jennifer, B.; Chang, S.; Nicole, H.; Kathleen, O. Using digital photography and journaling in evaluation of field-based environmental education programs. *Stud. Educ. Eval.* **2014**, *41*, 68–76. [CrossRef]

15. Zheng, Q.J.; Xu, A.X.; Kong, D.Y. Environmental Education, Knowledge Management and Professional Performance in ecotourism: The Impact relatedness. *Eurasia J. Math. Sci. Technol. Educ.* **2017**, *13*, 4679–4687. [[CrossRef](#)]
16. Scannell, L.; Gifford, R. Defining place attachment: A tripartite organizing framework. *J. Environ. Psychol.* **2009**, *30*, 1–10. [[CrossRef](#)]
17. Willams, D.R.; Patterson, M.E.; Roggenbuck, J.W.; Watson, A.E. Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leis. Sci.* **1992**, *14*, 29–46. [[CrossRef](#)]
18. Gerard, T.K.; Andrew, J.M.; Michael, T. Linking place preferences with place meaning: An examination of the relationship between place motivation and place attachment. *J. Environ. Psychol.* **2004**, *24*, 439–454. [[CrossRef](#)]
19. Cundill, G.; Bezerra, J.C.; Vos, A.D.; Ntingana, N. Beyond benefit sharing: Place attachment and the importance of access to protected areas for surrounding communities. *Ecosyst. Serv.* **2017**, *28*, 140–148. [[CrossRef](#)]
20. Bourassa, S.C. Toward a theory of landscape aesthetics. *Landsc. Urban Plan.* **1988**, *15*, 241–252. [[CrossRef](#)]
21. Bricker, K.S.; Kerstetter, D.L. Level of Specialization and Place Attachment: An Exploratory Study of Whitewater Recreationists. *Leis. Sci.* **2000**, *22*, 233–257. [[CrossRef](#)]
22. Dlamini, S.; Tesfamichael, S.G.; Mokhele, T. Socio-demographic determinants of environmental attitudes, perceptions, place attachment, and environmentally responsible behaviour in Gauteng province, South Africa. *Sci. Afr.* **2021**, *12*, e00772. [[CrossRef](#)]
23. Ramkissoon, H.; Weiler, B.; Smith, L.D. Place attachment and pro-environmental behaviour in national parks: The development of a conceptual framework. *J. Sustain. Tour.* **2012**, *20*, 257–276. [[CrossRef](#)]
24. Gullino, P.; Devecchi, M.; Larcher, F. How can different stakeholders contribute to rural landscape planning policy? The case study of Pralormo municipality (Italy). *J. Rural. Stud.* **2018**, *57*, 99–109. [[CrossRef](#)]
25. Belanche, D.; Casalo, L.V.; Rubio, M.Á. Local place identity: A comparison between residents of rural and urban communities. *J. Rural. Stud.* **2021**, *82*, 242–252. [[CrossRef](#)]
26. Chiu, Y.H.; Lee, W.I.; Chen, T.H. Environmentally responsible behavior in ecotourism: Antecedents and implications. *Tour. Manag.* **2014**, *40*, 321–329. [[CrossRef](#)]
27. Tampakis, S.; Andrea, V.; Karanikola, P.; Pailas, I. The Growth of Mountain Tourism in a Traditional Forest Area of Greece. *Forests* **2019**, *10*, 1022. [[CrossRef](#)]
28. Gong, L.; Zhang, Z.; Xu, C. Developing a Quality Assessment Index System for Scenic Forest Management: A Case Study from Xishan Mountain, Suburban Beijing. *Forests* **2015**, *6*, 225–243. [[CrossRef](#)]
29. Deng, S.; Yan, J.; Guan, Q.; Kato, M. Short-term effects of thinning intensity on scenic beauty values of different stands. *J. Northeast. For. Univ.* **2012**, *18*, 209–219. [[CrossRef](#)]
30. Boyle, S.C. Opening Minds: Interpretation and conservation. *Mus. Int.* **2004**, *56*, 85–93. [[CrossRef](#)]
31. Io, M. Testing a model of effective interpretation to boost the heritage tourism experience: A case study in Macao. *J. Sustain. Tour.* **2013**, *21*, 900–916. [[CrossRef](#)]
32. German, J.D.; Redi, A.; Prasetyo, Y.T.; Persada, S.F.; Ong, A.K.; Young, M.N.; Nadlifatin, R. Choosing a package carrier during COVID-19 pandemic: An integration of pro-environmental planned behavior (PEPB) theory and service quality (SERVQUAL). *J. Clean. Prod.* **2022**, *346*, 131123. [[CrossRef](#)]
33. Jam, K. Review of A Beginner’s Guide to Structural Equation Modeling. *Struct. Equ. Model. A Multidiscip. J.* **2022**, *29*, 817–819. [[CrossRef](#)]
34. Chen, J.; Bosch, C.C.; Lin, C.; Liu, F.; Huang, Y.; Huang, Q.; Wang, M.; Zhou, Q.; Dong, J. Effects of personality, health and mood on satisfaction and quality perception of urban mountain parks. *Urban For. Urban Green.* **2021**, *63*, 127210. [[CrossRef](#)]
35. Daryanto, A.; Song, Z. A meta-analysis of the relationship between place attachment and pro-environmental behaviour. *J. Bus. Res.* **2021**, *123*, 208–219. [[CrossRef](#)]
36. Lee, T.H. How recreation involvement, place attachment and conservation commitment affect environmentally responsible behavior. *J. Sustain. Tour.* **2021**, *19*, 895–915. [[CrossRef](#)]
37. Ajzen, I. The theory of planned behaviour: Reactions and reflections. *Psychol. Health* **2011**, *26*, 1113–1127. [[CrossRef](#)]
38. Sun, Y.; Fang, Y.; Yung, E.H.K.; Chao, T.S.; Chan, E.H.W. Investigating the links between environment and older people’s place attachment in densely populated urban areas. *Landsc. Urban Plan.* **2020**, *203*, 103897. [[CrossRef](#)]
39. Asunciòn, B.; Josefa, D.M. Factors influencing destination image. *Ann. Tour. Res.* **2004**, *31*, 657–681. [[CrossRef](#)]
40. Baloglu, S.; McCleary, K.W. A model of destination image formation. *Ann. Tour. Res.* **1999**, *26*, 868–897. [[CrossRef](#)]
41. Hwang, S.; Lee, C.; Chen, H. The relationship among tourists’ involvement, place attachment and interpretation satisfaction in Taiwan’s national parks. *Tour. Manag.* **2005**, *26*, 143–156. [[CrossRef](#)]
42. Huotari, K.; Hamari, J. A definition for gamification: Anchoring gamification in the service marketing literature. *Electron. Mark.* **2017**, *27*, 21–31. [[CrossRef](#)]
43. Cheng, T.E.; Wang, J.; Cao, M.M.; Zhang, D.J.; Bai, H.X. The Relationships among Interpretive Service Quality, Satisfaction, Place Attachment and Environmentally Responsible Behavior at the Cultural Heritage Sites in Xi’an, China. *Appl. Ecol. Environ. Res.* **2018**, *16*, 6317–6339. [[CrossRef](#)]
44. Tilden, F. *Interpreting Our Heritage*; University of North Carolina Press: Raleigh, NC, USA, 1957; ISBN 0-8078-4016-5.
45. Hamar, J.; Koivisto, J. Why do people use gamification services? *Int. J. Inf. Manag.* **2015**, *35*, 419–431. [[CrossRef](#)]
46. He, X.; Hu, D.; Swanaon, S.R.; Su, L.; Chen, X. Destination perceptions, relationship quality, and tourist environmentally responsible behavior. *Tour. Manag. Perspect.* **2018**, *28*, 93–104. [[CrossRef](#)]

47. Ramkissoon, H.; Smith, L.D.G.; Weiler, B. Testing the dimensionality of place attachment and its relationships with place satisfaction and pro-environmental behaviours: A structural equation modelling approach. *Tour. Manag.* **2013**, *36*, 552–566. [[CrossRef](#)]
48. Elizabeth, A.H. Pro-environmental behaviours and park visitors: The effect of place attachment. *J. Environ. Psychol.* **2010**, *30*, 409–421. [[CrossRef](#)]
49. Wang, C.; Zhang, J.; Yu, P.; Hu, H. The theory of planned behavior as a model for understanding tourists' responsible environmental behaviors: The moderating role of environmental interpretations. *J. Clean. Prod.* **2018**, *194*, 425–434. [[CrossRef](#)]