



A study on the influence of social media on college students' pro-environmental behavior

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ABSTRACT

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Keywords

Social media usage, pro-environmental behavior, pro-environmental attitudes, environmental awareness, university students.

The ubiquitous nature of social media in the daily routines of college students poses a dual prospect and obstacle in the advancement of eco-friendly conduct. The utilization of social media has the potential to augment the dissemination of environmentally conscious messages while simultaneously perpetuating the culture of consumption that is a driving force behind environmental degradation. This study investigates the impact of social media on the pro-environmental conduct of university students within the educational

framework of ChengDu, China. A cross-sectional approach was employed to collect data from 287 university students through self-reported measures. The assessment of pro-environmental conduct was conducted across three distinct sub-categories, namely household, information, and transportation. The findings indicate that social media usage positively impacts pro-environmental behavior among college students, with pro-environmental attitudes serving as a partial mediator of this relationship. The research findings indicate a correlation between the utilization of social media and pro-environmental conduct. Additionally, it was observed that this correlation is influenced by the level of environmental consciousness, as a more pronounced positive association was observed among students who exhibit heightened environmental awareness. The findings contribute to the existing literature on the relationship between social media and pro-environmental behavior by elucidating the intermediary and regulatory impacts of pro-environmental attitudes and environmental consciousness. The current study's results have both theoretical and practical implications, as well as the potential to leverage social media to promote environmentally conscious actions among college students. The study suggests potential avenues for future research, such as using longitudinal or experimental methodologies and replicating findings in diverse educational contexts.

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Introduction

The growing recognition of the imperative to tackle pressing environmental issues, including but not limited to climate change, biodiversity decline, and resource depletion, has elevated environmental sustainability to a prominent global preoccupation (Azam, Khan, & Ali, 2023). The emergence of social media has gained significant traction and has brought about a paradigm shift in how individuals interact, disseminate information, and address ecological concerns (Aichner et al., 2021). The recognition of the role of university students in influencing forthcoming societal and environmental attitudes and behaviors is extensively acknowledged (Zeng, Zhong, & Naz, 2023). It is posited that this demographic is paramount in the propagation of pro-environmental conduct. Gaining a comprehensive understanding of the impact of social media on environmentally responsible behavior among university students is imperative for addressing contemporary environmental challenges within this context (Zhang, Hu, & Gu, 2022).

The present study is situated within the context of the extensive proliferation of social media platforms as crucial channels for communication and dissemination of information in the current digital era (Ahmad et al., 2021). The employment of social media platforms such as Facebook, Instagram, Twitter, and WeChat has gained significant traction among college students as a means of engaging in social activities, obtaining information, expressing opinions, and engaging in diverse online activities (Yunus, Zakaria, & Suliman, 2019). The platforms in question offer distinct opportunities for disseminating pro-environmental messages, campaigns, and behaviors. As a result, they can influence university students' environmental attitudes and behaviors within the educational setting of ChengDu, China (Tyers, 2021).

The extant body of literature about the association between social media and environmental behavior has yielded ambiguous findings (Chen & Lin, 2019). A recent study suggests that social media can potentially contribute to pro-environmental behavior by enhancing environmental consciousness, fostering pro-environmental attitudes, and promoting sustainable behaviors (Hossain, Nekmahmud, & Fekete-Farkas, 2022). According to Alsaad, Alam, and Lutfi (2023), social media platforms can serve as effective tools for disseminating environmental information, promoting environmental initiatives, and cultivating social and cultural norms that encourage pro-environmental behavior. In addition, university students have the potential to utilize social media platforms as a means of articulating their environmental apprehensions, participating in environmental dialogues, and rallying for joint initiatives, which could conceivably result in the adoption of pro-environmental conduct (Li & Wu, 2020).

In contrast, extant literature indicates that social media may harm environmental conduct, as evidenced by the findings of Liu et al. (2021). According to Pellegrino, Abe, and Shannon (2022), social media can foster consumerism, materialism, and a culture of overconsumption, which may contribute to environmental degradation and resource depletion. In addition, social media platforms possess the capacity to enable superficial engagement with environmental issues, as evidenced by the phenomenon of "slacktivism" or "clicktivism," wherein individuals participate in virtual environmental activities but undertake minimal action in the tangible realm (Bapitie & Carter, 2022). Further inquiry is required to comprehensively comprehend the intricate association between social media and environmentally-friendly behavior, particularly among university students in the educational context of ChengDu, China, as indicated by Li and Wu (2020) research.

The present investigation explores several factors, encompassing the utilization of social media as the autonomous variable, pro-environmental attitudes as the mediator, and environmental awareness as the moderator. The investigation assesses pro-environmental conduct across three distinct sub-categories, household, information, and transportation, as reported by [Omarova and Jo \(2022\)](#). Social media usage is defined as the operationalization of the frequency and duration of engagement with environmental content through activities such as publishing, sharing, liking, and commenting. The pro-environmental attitude measures individuals' cognitive and affective evaluation of the environment, encompassing their beliefs, values, and emotions toward environmental issues. [Dubovi and Tabak \(2021\)](#) have posited that assessing individuals' comprehension, awareness, and perception of environmental problems, encompassing their recognition of ecological hazards, outcomes, and solutions, is conducted. The measurement of pro-environmental behavior is based on individuals' self-reported engagement in various actions about household behaviors (such as recycling and energy conservation), information behaviors (such as environmental information-seeking and environmental education), and transportation behaviors (such as public transportation use and carpooling) ([Lange, 2023](#)).

[Li and Wu \(2020\)](#) conducted a study that yielded significant implications for understanding the influence of social media on the pro-environmental behavior of university students in the educational context of ChengDu, China. Furthermore [Mansoor and Wijaksana \(2021\)](#), have investigated the underlying mechanisms that explain the association between the utilization of social media among college students, their pro-environmental attitudes, environmental awareness, and pro-environmental actions. The findings of this study have the potential to offer significant perspectives on this association. The study's results may provide important insights into social media's positive or negative effects on environmentally friendly behavior. Moreover, the results could provide direction for developing strategies and metrics to promote sustainable conduct among college students in the digital transformation era.

Furthermore, the results of this study are of great importance for the progress of the theoretical framework in the field of environmental psychology, particularly regarding the relationship between social media and environmentally-friendly behavior. The current study can augment the theoretical understanding of the complex mechanisms regulating social media interaction and environmentally-friendly behavior. The objective will be attained by examining the mediating role played by pro-environmental attitudes and the moderating impact of environmental consciousness. The proposed theoretical framework can function as a fundamental groundwork for forthcoming research endeavors that aim to explore the intricacies of these interactions and furnish authentication.

The outcomes of this research have practical implications for environmental advocacy, educational programs, and policy interventions aimed at promoting environmentally responsible conduct among college students ([Khan & Terason, 2022](#)). Gaining comprehension regarding the influence of social media on the attitudes and behaviors of students towards the environment is a pivotal means of information for educators, policymakers, and environmental practitioners in formulating effective interventions. The favorable attributes of social media can be utilized as interventions to promote the adoption of environmentally-friendly behaviors. Social media platforms have the potential to function as a means of effectively communicating accurate and engaging information about

the environment, fostering online communities that promote eco-friendly practices, and inspiring students to participate in environmental endeavors actively. Understanding the impact of social media on students' environmental attitudes and behaviors can aid in developing targeted interventions that effectively leverage the potential of social media to promote sustainable behaviors among students (Farrington et al., 2019).

Nevertheless, it is imperative to acknowledge the noteworthy constraints of this investigation. The investigation primarily centers on self-reported metrics, which are vulnerable to social desirability bias and may not fully capture the genuine pro-environmental behaviors of college students (He, Blye, & Halpenny, 2022). Verbitsky, Dopfel, and Zhang (2020) suggest that in forthcoming research, it would be possible to substantiate the results by utilizing objective measurements, such as observational or behavioral assessments. The study's cross-sectional design poses challenges in establishing causality between various factors. According to Spector (2019), longitudinal or experimental designs have the potential to provide more definitive evidence for establishing causal relationships. The research has certain limitations as it solely focuses on university students within the education sector of ChengDu, China. This may impede the applicability of the results to other cultural contexts or demographic groups (Lyu, Shepherd, & Lee, 2021). Alsaad et al. (2023) suggest that replicating the study in various contexts and with diverse participants could yield a more comprehensive comprehension of the correlation between social media and pro-environmental conduct.

The study conducted by Fu et al. (2020) contributes to the existing literature on the association between social media and pro-environmental behavior. The research explores the mediating impact of pro-environmental attitudes and the moderating role of environmental awareness among university students in the academic context of ChengDu, China. According to Han and Cheng (2020) research, social media can positively impact pro-environmental behavior among university students. This influence is mediated by pro-environmental views and moderated by environmental awareness. The present study conducted by Kouhizadeh, Saberi, and Sarkis (2021) has been analyzed regarding its implications for theory, practice, and policy.

Additionally, the limitations of the study have also been considered. Future research endeavors would be advantageous to explore the correlations in diverse contexts and utilize multiple investigative methodologies while recognizing and alleviating any possible limitations. The endeavors mentioned above would enhance our understanding of the intricate relationship between social media and environmentally responsible behavior, as stated by Aljawarneh (2020).

Literature Review and Hypotheses Development

The swift proliferation of social media has transformed communication and information dissemination patterns among college students globally, including those in China (Yang & Ha, 2021). According to Mavrodieva et al. (2019), social media platforms provide novel avenues for disseminating environmental knowledge, forming opinions, and exerting influence on behaviors. In contemporary times, environmental predicaments such as climate change, pollution, and resource depletion have garnered increased attention. Consequently, the role of social media in fostering pro-environmental conduct among university students has emerged as a subject of scholarly inquiry (Barchielli et al., 2022).

Students' Social Media Usage (Independent Variable)

The utilization of social media platforms such as WeChat, Weibo, and QQ has become a ubiquitous aspect of the daily routines of university students in ChengDu, China, as reported by [Zhou and Xie \(2023\)](#). According to [Mese and Aydin \(2019\)](#), students employ social media for diverse purposes, such as gathering information, communicating, seeking entertainment, and engaging in social networking. Students' pro-environmental attitudes and activities can potentially be impacted by their access to environmental knowledge through social media, online forums, and social networks, as noted by [Shah, Wei, and Ghani \(2021\)](#). Prior studies have indicated that using social media by college students can enhance their environmental knowledge, attitudes, and behavior in various settings ([Liu, Teng, & Han, 2020](#)). Improved utilization of social media has been associated with enhanced environmental awareness, more positive environmental perspectives, and increased participation in eco-friendly activities such as energy conservation and recycling ([Hossain et al., 2022](#)).

Pro-environmental Attitude (Mediator)

Pro-environmental attitude pertains to individuals' cognitive, affective, and evaluative responses toward the natural world ([Chen, 2020](#)). The development of pro-environmental behavior is a crucial aspect as it reflects an individual's inclination, apprehension, and preparedness to undertake environmental action ([Suárez-Perales et al., 2021](#)). According to [Rodriguez \(2020\)](#), the exposure of university students to environmental content, perspectives, and storylines through social media can impact their pro-environmental attitudes. According to [Sultan et al. \(2020\)](#), social media platforms have the potential to facilitate environmental education, awareness campaigns, and online dialogues that can effectively transform students' perceptions of environmental issues and shape their attitudes toward the environment. According to a study conducted by [Liu et al. \(2020\)](#), it has been established that a positive inclination towards the environment has a significant impact on the correlation between the utilization of social media by college students and their pro-environmental conduct. The research indicates that social media has the potential to influence pro-environmental behavior by indirectly modifying students' environmental attitudes.

Environmental awareness (Moderator)

Environmental awareness encompasses comprehension and recognition of environmental issues, such as climate change, pollution, and biodiversity depletion ([Yoqutxon & Go'zalbonu, 2022](#)). The dissemination of knowledge and increased consciousness concerning safeguarding the environment can impact pro-environmental conduct ([Faraz et al., 2021](#)). According to [Severo et al. \(2019\)](#), social media has the potential to effectively distribute environmental information, news, and educational content, which can contribute to enhancing students' environmental awareness. The association between social media usage and environmental awareness can be intricate because not all environmental information disseminated on social media is reliable or authentic ([Zhong, Huang, & Liu, 2021](#)). The potential impact of environmental knowledge as a moderator in the correlation between social media usage and pro-environmental behavior among university students in ChengDu, China, has not been extensively explored. Therefore, further research is necessary to comprehensively understand its potential influence, as [Shah et al. \(2021\)](#) noted.

Pro-environmental behavior (Dependent Variable)

The term "pro-environmental behavior" pertains to actions that positively impact the environment, such as engaging in recycling, energy conservation, waste reduction, and involvement in environmental activism (Afsar & Umrani, 2020). According to Liobikiene and Poškus (2019), the employment of social media platforms can influence the pro-environmental conduct of college students by modifying their attitudes, norms, and environmental knowledge. According to Xiao, Liu, and Ren (2022), social media has the potential to support environmental campaigns, promote social norms related to pro-environmental behavior, and exert peer pressure that can influence students' participation in pro-environmental activities. Research has shown that social media usage can positively impact pro-environmental behavior among university students. However, the nature and extent of this impact may vary depending on cultural, social, and educational factors (Zhang et al., 2022). The investigation of the effects of social media on pro-environmental conduct among university students can yield valuable insights for developing efficacious environmental education and intervention initiatives in the ChengDu region of China. This is especially relevant given the pressing environmental concerns, such as air and water pollution, in the area (Shen et al., 2020).

Sub-dimensions of Pro-environmental Behaviour at Home, Information, and Transportation

Pro-environmental behavior encompasses a range of actions individuals undertake to promote environmental sustainability. These actions can be broadly classified into three categories, namely household behaviors, information behaviors, and transportation behaviors. Household behaviors refer to actions such as recycling and energy conservation, while information behaviors involve seeking and sharing environmental information. Transportation behaviors, on the other hand, include actions like taking public transportation and carpooling. As Matara, Suleman, and Wibawa (2022) noted, these behaviors are all examples of pro-environmental behavior. Various factors, including social media usage, pro-environmental sentiments, environmental awareness, and cultural context, have the potential to impact the subdimensions of pro-environmental behavior, as posited by Andreou et al. (2022).

The transit behaviors, encompassing the utilization of public transportation or carpooling, may hold significant importance for the pro-environmental conduct of university students in ChengDu, China, owing to the region's well-established and overall public transportation system (Shen et al., 2020). The utilization of social media can potentially influence transportation behaviors by disseminating information regarding public transit options, promoting carpooling or ride-sharing programs, and establishing social norms surrounding eco-friendly transportation alternatives (Safdar et al., 2022). The transportation behaviors of individuals can be influenced by their pro-environmental attitudes and level of environmental awareness. It has been observed that individuals who hold positive attitudes toward the environment and exhibit higher levels of environmental awareness are more inclined toward adopting sustainable transportation practices (Valko, 2021).

According to Dharmesti, Merrilees, and Winata (2020), social media usage, pro-environmental views, and environmental awareness can influence household habits such as recycling and energy conservation. According to Duong (2023), social media has the potential to distribute information regarding recycling programs, endorse energy-saving

concepts, and communicate accomplishments in environmental conservation. Household activities can be influenced by individuals' environmental attitudes, which can shape their environmental values, beliefs, and motives (Tian, Zhang, & Li, 2020). Singha and Eljamal (2020) argue that environmental awareness plays a crucial role in shaping household habits by educating on the environmental impact of different actions and the importance of conservation efforts.

According to Alam, Lutfi, and Alsaad (2023), using social media, endorsement of pro-environmental perspectives, and having a level of environmental consciousness can impact information-seeking behaviors and the dissemination of environmental content. According to Okuah, Scholtz, and Snow (2019), social media can be a platform for acquiring environmental knowledge, providing university students access to environmental news, articles, and educational content. According to Choi and Johnson (2019), individuals' inclination toward environmental perspectives can impact their drive to acquire and disseminate environmental information, affecting their information-seeking behavior. The level of environmental consciousness can potentially impact information-seeking and sharing behaviors, as evidenced by a positive correlation between environmental awareness and the inclination to engage with environmental content on social media platforms (Salem & Alanadoly, 2021).

In brief, the available evidence indicates that the pro-environmental conduct of college students, encompassing household, information, and transportation behaviors, can be impacted by their utilization of social media, pro-environmental attitudes, environmental knowledge, and cultural milieu. Further investigation is required to ascertain potential interventions to encourage pro-environmental conduct among university students in the ChengDu region of China. Additionally, it is imperative to comprehend the precise mechanisms by which social media impacts pro-environmental behavior among this demographic.

Hypothesis 1: *There is a positive relationship between social media usage and pro-environmental behavior among university students.*

Hypothesis 2: *Pro-environmental attitudes mediate the relationship between social media usage and pro-environmental behavior among university students.*

Hypothesis 3: *Environmental awareness moderates the relationship between social media usage and pro-environmental behavior among university students.*

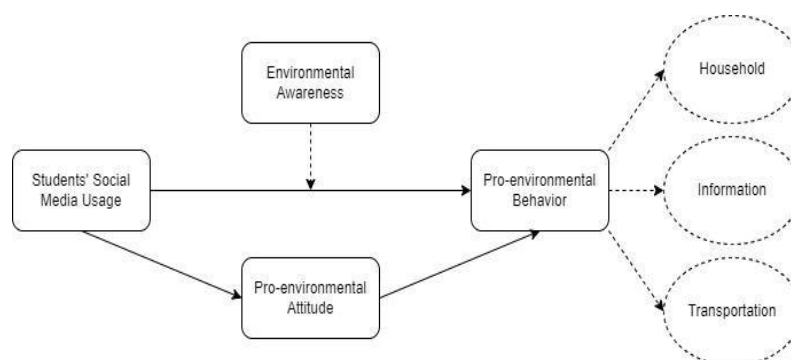


Figure 1. Conceptual Model

Methodology

Sampling and Procedures

The research methodology utilized in the study was Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine data collected from a cohort of 287 university students situated in ChengDu, China. The study utilized a cross-sectional approach, which involved collecting data at a particular point in time. The study's cohort consisted of university students actively engaged in social media platforms and enrolled in various universities in ChengDu, China. The investigators used a non-probability convenience sampling technique to collect study subjects' data. The research involved administering in-person surveys on campus premises, allowing participants to participate voluntarily. The survey instrument comprised several sections encompassing various dimensions of interest. The researchers employed an eight-item scale developed by [Mieczkowski, Lee, and Hancock \(2020\)](#) to gauge social media usage.

Meanwhile, to assess pro-environmental attitudes, the researchers utilized a six-item scale developed by [Lavelle, Rau, and Fahy \(2015\)](#). In addition, the study employed a three-item scale developed by [Stevenson and Peterson \(2015\)](#) to assess environmental awareness. Furthermore, pro-environmental behavior was measured using a ten-item scale, which included five items related to household behavior, three to information-seeking behavior, and two to transportation behavior, also developed by [Stevenson and Peterson \(2015\)](#). The variables of interest were measured using a 5-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree) in the questionnaire.

Before initiating data collection, a preliminary assessment of the survey questionnaire was conducted on a restricted sample of students to establish its validity and reliability. Following the pretesting phase, crucial modifications were made to improve the clarity and comprehensibility of the survey tool. The data collection process lasted for four weeks, during which the participants were assured of the confidentiality and anonymity of their responses.

Following the conclusion of the data collection process, the gathered information was entered into a statistical software application to conduct analysis. The research employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the interconnections among the variables of concern as delineated in the conceptual framework. The study used Partial Least Squares Structural Equation Modeling (PLS-SEM), a robust statistical technique for analyzing complex relationships with restricted sample sizes. The rationale behind choosing this methodology was its ability to effectively handle reflective and formative measures and its flexibility in accommodating non-parametric data.

The data analysis process involved several stages. The data's completeness and accuracy were initially verified, and any missing data were remedied through appropriate methods, such as mean imputation. The assessment of the reliability and validity of the measurement model entailed utilizing Cronbach's alpha to evaluate the internal consistency reliability of the scales. Furthermore, convergent and discriminant validity was assessed using the average variance extracted (AVE) and Fornell-Larcker criterion, correspondingly.

After ensuring the reliability and validity of the measurement model, the structural model was evaluated to explore the relationships among the variables being studied. The statistical bootstrapping technique was implemented to assess the statistical significance of the direct and indirect effects within the model. To achieve this objective, a total of 5000 samples were bootstrapped. The t-values obtained from the bootstrapping results were utilized to evaluate the statistical significance of the path coefficients.

The current investigation utilized a cross-sectional design, non-probability convenience sampling, and PLS-SEM analysis to explore the interconnections among social media usage, pro-environmental attitudes, environmental awareness, and pro-environmental behavior within the population of university students located in ChengDu, China. The research utilized a survey questionnaire as a means of data collection. Subsequently, the reliability and validity of the measurement model were evaluated, followed by structural model testing and moderation analysis. The latter was conducted to explore the potential moderating impact of environmental awareness.

Statistical Analysis and Results

The current investigation employed Cronbach's alpha coefficient to evaluate the internal consistency and reliability of the measurement scales utilized for each variable, as depicted in Table 1. Cronbach's alpha is a frequently employed metric for evaluating the coherence and reliability of a measuring instrument. The coefficient under consideration is a numerical quantity between 0 and 1, where larger values suggest increased levels of internal consistency. The research ascertained a Cronbach's alpha value of 0.711 to evaluate Environmental Awareness. The value mentioned above denotes that the measurement items employed for this particular construct exhibit acceptable levels of internal consistency. The assertion mentioned above implies that the instruments used to assess the degree of ecological consciousness among college students in the research were dependable and uniform in grasping this concept.

Table 1

Cronbach Alpha

	Cronbach's Alpha
Environmental Awareness	0.711
Household Behavior	0.918
Information Seeking	0.853
Pro-Environmental Attitude	0.745
Transportation	0.711
Students' Social Media Usage	0.848

The Household Behavior variable was assessed using measurement items, and the resulting Cronbach's alpha coefficient was determined to be 0.918, indicating a high degree of internal consistency among the items used. The results suggest that the tools utilized to evaluate pro-environmental behavior concerning household activities, such as waste reduction and energy conservation, demonstrated significant reliability and consistency in measuring this construct. The internal surface of the measurement items used to assess the Information Seeking variable was deemed satisfactory, as evidenced by Cronbach's alpha coefficient of 0.853. The statement above suggests that the tools utilized to measure the extent to which college students learn about ecological topics, including updates on

environmental issues and suggestions for environmentally conscious behaviors, demonstrated reliability and consistency in evaluating this specific construct.

The internal consistency of the measurement items used to assess the Pro-Environmental Attitude variable was deemed satisfactory, as evidenced by Cronbach's alpha coefficient of 0.745. The findings suggest that the tools utilized to evaluate the positive perceptions of college students towards environmentally conscious behaviors, such as conservation and waste reduction, demonstrated a significant level of reliability and consistency in measuring this specific construct. The internal consistency of the measurement items used to assess the Transportation construct was deemed satisfactory, as evidenced by Cronbach's alpha coefficient of 0.711. The results suggest that the tools utilized to evaluate pro-environmental behavior related to transportation, such as public transportation and ride-sharing, demonstrated significant reliability and consistency in measuring this specific concept.

The measurement items utilized to assess the variable of Students' Social Media Usage exhibit robust internal consistency, as indicated by Cronbach's alpha coefficient of 0.848. The statement above suggests that the instruments employed to measure the frequency and extent of social media utilization among college students were reliable and consistent in evaluating this phenomenon. The Cronbach's alpha values of the study's variables exceeded the commonly recommended threshold of 0.7, indicating that the measurement scales demonstrated robust internal consistency and reliability. The statement above suggests that the measurement tools used to assess this study's variables demonstrated reliability and consistency in accurately capturing the intended constructs (refer to Figure 2).

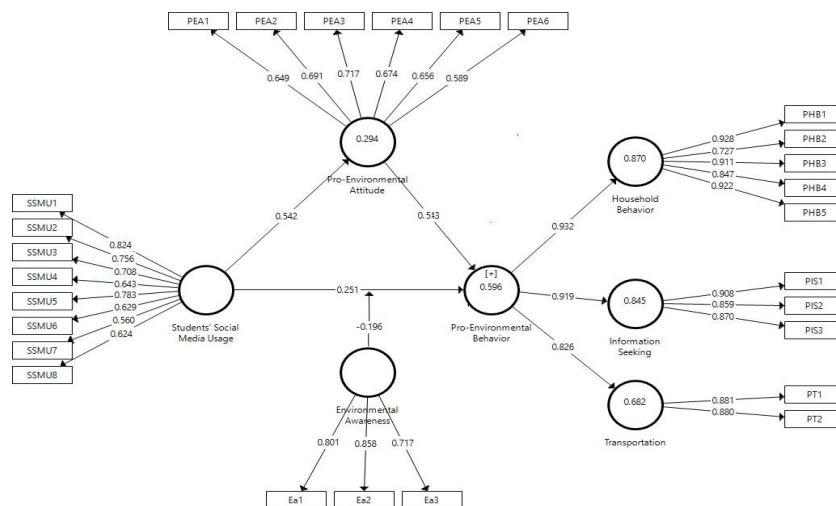


Figure 2. Structural Model

The study's findings were derived through an analysis of the primary sample (O), wherein the composite reliability and average variance extracted were evaluated for each variable. Composite reliability and average variance extracted are frequently employed metrics for assessing the dependability and soundness of measurement scales in studies utilizing structural equation modeling (SEM).

The research utilized a measurement scale that consisted of three discrete items, EA1, EA2, and EA3, specifically designed to assess the level of Environmental Awareness (EA) among the study participants. The research findings indicate that the composite reliability score of the Environmental Awareness construct was 0.836, which suggests a satisfactory level of reliability for the measuring instrument. The average variance extracted (AVE) for Environmental Awareness was 0.630. The aforementioned suggests that the latent construct of Environmental Awareness could explain roughly 63% of the variance detected in the measurement items. The Pro-Environmental Attitude (PEA) was assessed using a measurement scale comprising six items, denoted as PEA1, PEA2, PEA3, PEA4, PEA5, and PEA6. The composite reliability of the Pro-Environmental Attitude was calculated to be 0.825, indicating that the measurement scale exhibits favorable reliability. The Pro-Environmental Attitude construct showed an average variance extracted of 0.500, signifying that 50% of the variance in the measurement items was attributable to this construct.

Table 2*Loadings and Data Validity*

			Original Sample (O)	Composite reliability	Average variance extracted
Environmental Awareness	Ea1		0.801	0.836	0.630
	Ea2		0.858		
	Ea3		0.717		
Pro-Environmental Attitude	PEA1		0.649	0.825	0.500
	PEA2		0.691		
	PEA3		0.717		
	PEA4		0.674		
	PEA5		0.656		
	PEA6		0.589		
Pro-Environmental Behavior	Household Behavior	PHB1	0.928	0.939	0.758
		PHB2	0.727		
		PHB3	0.911		
		PHB4	0.847		
		PHB5	0.922		
	Information Seeking	PIS1	0.908	0.911	0.773
		PIS2	0.859		
		PIS3	0.870		
	Transportation	PT1	0.881	0.874	0.776
		PT2	0.880		
	Students' Social Media Usage	SSMU1	0.824	0.881	0.515
		SSMU2	0.756		
		SSMU3	0.708		
		SSMU4	0.643		
		SSMU5	0.783		
SSMU6		0.629			
SSMU7		0.560			
SSMU8		0.624			

The pro-environmental behavior (PHB) measurement scale for household behavior comprises five elements, namely PHB1, PHB2, PHB3, PHB4, and PHB5. The scale assessing household behavior exhibited a composite reliability of 0.939, indicating a significantly

elevated level of reliability. The construct of Household Behavior showed an average variance of 0.758, demonstrating its ability to explain approximately 75.8% of the variance observed in the measurement items. The Information Seeking (PIS) assessment scale comprised three distinct items, namely PIS1, PIS2, and PIS3. The Information Seeking composite reliability was found to be 0.911, indicating favorable reliability of the measuring scale. The Information Seeking construct exhibited an average variance recovery of 0.773, indicating that the construct explained 77.3% of the variance observed in the measurement items.

The study employs a measurement scale comprising two distinct items pertaining to transportation, namely PT1, and PT2. The composite reliability coefficient of the Transportation construct was determined to be 0.874, indicating favorable dependability of the measurement scale. The findings suggest that the mean-variance obtained for the transportation construct was 0.776, signifying that the fundamental transportation construct could account for approximately 77.6% of the variance in the measurement items. The SSMU (Students' Social Media Usage) assessment scale comprises eight distinct components, namely SSMU1, SSMU2, SSMU3, SSMU4, SSMU5, SSMU6, and SSMU8. The composite reliability score of 0.881 for the measurement scale of students' social media usage indicates a significant level of dependability. As per the study results, the average variance extracted for students' social media usage was 0.515. The findings suggest that the fundamental construct of Students' Social Media Usage was responsible for approximately 51.5% of the variability observed in the survey measures.

The findings suggest that the measuring scales employed to evaluate the variables in the study demonstrated a high level of dependability, as evidenced by the high composite reliability ratings. The study's results indicate that the measuring scales exhibited acceptable convergent validity, as evidenced by the average variance extracted values (refer to [Table 2](#)). The underlying constructs significantly influenced the measurement items, accounting for a considerable proportion of the variance. The study's results substantiate the soundness of the deductions and inferences made from the analysis by furnishing proof of the reliability and precision of the measurement scales.

The study's findings indicate that the constructs under investigation exhibited satisfactory levels of internal consistency reliability, as demonstrated by the results obtained from the Fornell and Larcker model. According to the study, the composite reliability (CR) of the Environmental Awareness (EA) construct was determined to be 0.794, indicating an acceptable level of reliability. Regarding the internal consistency reliability, it was found that the Household Behavior (HB) construct exhibited a coefficient of reliability (CR) of 0.870. In contrast, the Information Seeking (IS) construct demonstrated a CR of 0.879. A coefficient alpha (CR) of 1.000 denotes a perfect score, indicating that the construct of Moderating Effect 1 (ME1) exhibited a high degree of reliability in terms of internal consistency. This suggests that the measurement possesses a high degree of reliability. The Pro-Environmental Attitude (PEA) construct demonstrated satisfactory internal consistency dependability, as evidenced by a reliability coefficient (CR) 0.664.

The internal consistency reliability of the construct of Students' Social Media Usage (SSMU) was found to be moderate, with a coefficient alpha value of 0.696. The internal consistency reliability of the T construct was deemed satisfactory, as evidenced by a Cronbach's alpha coefficient of 0.881. As per the findings, the measures employed in the

research were considered reliable and consistent in gauging the relevant concepts. The substantial construct reliability levels observed for most constructs suggest that the measurement items effectively and precisely captured the underlying constructs.

The study's findings indicate that the CR values surpass the acknowledged threshold of 0.70 for ensuring reliable outcomes. This discovery is of utmost importance to acknowledge. The study's outcomes suggest that the evaluation instruments employed to assess each construct exhibit reliability and can be utilized to facilitate additional analysis and comprehension of the findings (refer to [Table 3](#)).

Table 3

Farnell and Lekker Model

	1	2	3	4	5	6	7
Environmental Awareness	0.794						
Household Behavior	0.488	0.870					
Information Seeking	0.707	0.750	0.879				
Moderating Effect 1	-0.578	-0.556	-0.616	1.000			
Pro-Environmental Attitude	0.534	0.459	0.507	-0.531	0.664		
Students' Social Media Usage	0.362	0.481	0.502	-0.376	0.542	0.696	
Transportation	0.664	0.631	0.769	-0.606	0.534	0.418	0.881

The study results indicate that the constructs demonstrate an acceptable degree of discriminant validity, as demonstrated by the Heterotrait-Monotrait (HTMT) ratio analysis outcomes. The HTMT ratios, which show the strength of relationships between different constructs, suggest that these constructs are distinguishable. The HTMT ratio for the association between Environmental Awareness and Pro-Environmental Attitude is 0.710, and the ratio for the association between Environmental Awareness and Pro-Environmental Behavior is 0.778. The data indicates a moderate degree of discriminant validity among the constructs mentioned. The HTMT ratio for the correlation between Environmental Awareness and Students' Social Media Usage is 0.397, indicating an acceptable level of discriminant validity between these constructs as it falls below the predetermined threshold of 0.90.

Table 4

HTMT Ratios

	1	2	3	4
Environmental Awareness				
Pro-Environmental Attitude	0.710			
Pro-Environmental Behavior	0.778	0.643		
Students' Social Media Usage	0.397	0.618	0.557	

The research presents HTMT ratios about the interconnections between Pro-Environmental Attitude, Pro-Environmental Behavior, and Students' Social Media Usage. The findings suggest moderate discriminant validity among the constructs under investigation. The HTMT ratios for the associations between Pro-Environmental Attitude and Pro-Environmental Behavior, Pro-Environmental Attitude and Students' Social Media Usage, and Pro-Environmental Behavior and Students' Social Media Usage were 0.643, 0.618 and 0.557, respectively. The results suggest that the constructs of Environmental

Awareness, Pro-Environmental Attitude, Pro-Environmental Behavior, and Students' Social Media Usage are distinct and do not demonstrate significant levels of association. The discovery mentioned above proves the validity of the measurement framework utilized in the research, as evidenced by the data showcased in Table 4 and Figure 3.

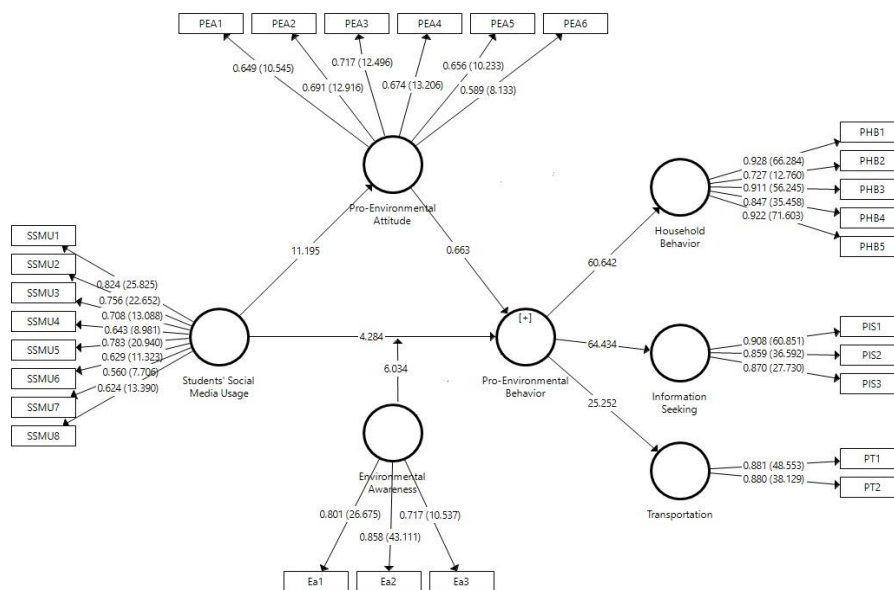


Figure 3. Path Model

The results of the data analysis presented in the table indicate that the model accurately predicts household behavior. A Q2predict score of 0.520 suggests that the model can explain 52% of the variance in household behavior. The model's low RMSE value of 0.079 and MAE value of 0.105 indicate low average prediction error and average absolute prediction error. The R Square value of 0.87 demonstrates that the model adequately explains 87% of the variance in household behavior, indicating a high degree of explanation. This could suggest that the model functions well with the available data.

Overall, the study's analysis results demonstrate the model's ability to predict household behavior. However, additional research is required to completely comprehend the study's findings regarding the other components examined. The results mentioned above provide insightful perspectives on the model's efficacy and prospective directions for future academic research (see Table 5).

Table 5

Model Fit

	Q ² predict	RMSE	MAE	R Square
Household Behavior	0.520	0.079	0.105	0.870
Information Seeking				0.845
Pro-Environmental Attitude				0.294
Pro-Environmental Behavior				0.596
Transportation				0.682

As shown in Table 6, the study's findings reveal significant associations between students' use of social media, pro-environmental attitudes, and pro-environmental behaviors, as well as the moderating effect. The data in the table's top row indicate that the path coefficient between Students' Social Media Usage and Pro-Environmental Behavior in the initial sample (O) is 0.251, with a standard deviation (STDEV) of 0.059. Calculating the absolute value of the observed value divided by the standard deviation, as expressed by the formula $|O/STDEV|$, yields a T statistic of 4.284. The p-value of 0.000 indicates a statistically significant relationship between students' social media usage and their pro-environmental behavior.

In the original sample (O), the path coefficient between students' social media usage and pro-environmental attitudes, followed by pro-environmental behavior, is 0.123, with a standard deviation (STDEV) of 0.037, as shown in the second row of the table. The obtained T statistic of 2.63 and the associated p-value of 0.003 provide evidence of significant associations between the extent to which students use social media, their pro-environmental attitudes, and their pro-environmental behavior.

Table 6

Path analysis

	Original Sample (O)	Standard Deviation	T Statistics	P Values
Students' Social Media Usage -> Pro-Environmental Behavior	0.251	0.059	4.284	0.000
Students' Social Media Usage -> Pro-Environmental Attitude -> Pro-Environmental Behavior	0.123	0.037	2.636	0.003
Moderating Effect 1 -> Pro-Environmental Behavior	-0.196	0.032	6.034	0.000

The third row of the table indicates that the correlation between Students' Social Media Usage and Pro-Environmental Behavior in the original sample (O) is subject to moderation by Moderating Impact 1, as evidenced by a value of -0.196. The standard deviation (STDEV) value of 0.032 is utilized to denote the statistical variability of the moderating effect. The calculated T statistic is 6.034, and the corresponding p-value is 0.000. The findings indicate that the moderating impact of variable 1 significantly influences the correlation between the extent of social media usage by students and their pro-environmental conduct.

The results suggest a significant positive association between the usage of social media among students and their environmentally responsible behavior. The moderating effect of pro-environmental attitudes indirectly impacts the association between the two variables. Furthermore, the statistical significance of the moderating impact concerning the correlation between the utilization of social media by students and their pro-environmental behavior has been confirmed. The findings of this research provide important insights into the topic being examined by elucidating the connections among the variables investigated.

Discussion

The study's findings support the three hypotheses, confirming significant associations between social media use, pro-environmental beliefs, environmental awareness, and pro-

environmental behavior among university students in ChengDu, China. Initial speculation hypothesized a correlation between social media usage and the manifestation of pro-environmental behavior. The study demonstrates a positive correlation between university students' use of social media and their adoption of environmentally conscious behaviors. This is consistent with prior research highlighting the capacity of social media as a mechanism for promoting pro-environmental behavior among youth (Ashraf, Zhang, & Özpolat, 2022; Pittman, 2020). According to the findings, social media may be an effective tool for raising awareness, disseminating information, and promoting environmentally responsible behavior among university students in ChengDu.

The second hypothesis asserts that pro-environmental attitudes mediate the relationship between social media usage and pro-environmental behavior. The findings corroborate the proposed hypothesis, indicating that university students' pro-environmental attitudes influence the relationship between social media usage and pro-environmental behavior. This finding supports the theory of planned behavior, which posits that attitudes toward a particular behavior are a significant predictor of the behavior's manifestation (Hagger et al., 2022). The findings indicate that social media may influence pro-environmental behavior by altering individuals' perspectives on the environment and sustainability.

The findings regarding Hypothesis 3 indicate that environmental knowledge influences the relationship between social media use and pro-environmental behavior, as hypothesized. The results of this study suggest that environmental knowledge significantly moderated the relationship between social media use and pro-environmental behavior among undergraduate students. The study revealed that individuals with greater environmental awareness demonstrated a stronger correlation between their social media usage and pro-environmental behavior. According to the hypothesis above, individuals with a higher level of environmental awareness may be more receptive to pro-environmental messages communicated via social media, leading to increased participation in pro-environmental behavior.

In conclusion, the research findings provide significant insights into the influence of social media on nurturing environmentally conscious behavior among university students within the educational framework of Chengdu, China. The results demonstrate that social media can promote pro-environmental behavior among university students, with pro-environmental beliefs and ecological consciousness playing crucial roles as mediators and moderators. The findings of this study have significant implications for environmental education and communication strategies in Chengdu and similar settings. The study indicates that using social media platforms to promote environmentally conscious behavior among college students could be an effective strategy.

Nonetheless, it is essential to recognize the research's limitations. The research was conducted in Chengdu, China, so it is conceivable that the findings do not apply to other cultures or countries. In addition, the study relied on self-reported assessments, which are susceptible to bias and may not accurately reflect genuine pro-environmental behavior. Future research may consider utilizing objective metrics to evaluate pro-environmental behavior or conducting experimental interventions to establish causal relationships. In addition, the study concentrated solely on social media usage as an independent variable, ignoring other potential determinants that could influence pro-environmental behavior, such as customary practices, peer pressure, and personal convictions. Future research

could examine the influence of these variables on the correlation between social media usage and pro-environmental behavior among university students in greater detail.

This study contributes significantly to the existing literature on the influence of social media on environmentally conscious behavior among university students in Chengdu, China. The findings highlight the importance of social media, pro-environmental attitudes, and environmental awareness in fostering pro-environmental behavior among college students. The empirical evidence indicates a positive correlation between the use of social media and the adoption of environmentally friendly behavior. This association is moderated by pro-environmental beliefs and mediated by environmental consciousness. The findings of this study suggest that social media could be a useful tool for promoting environmentally responsible behavior among university students in ChengDu, China, and similar contexts.

Theoretical and Practical Implications

This study contributes to the theoretical understanding of the relationship between university students' social media use and environmentally conscious behavior. The study's results support the theory of planned behavior, suggesting that attitudes play a crucial role as a mediator between social media usage and pro-environmental behavior. This supports the notion that pro-environmental beliefs can influence environmental behavior through social media. In addition, the study makes a scholarly contribution by emphasizing the moderating role of environmental consciousness, indicating that individuals with higher levels of environmental consciousness may be more receptive to pro-environmental messages spread via social media. The preceding demonstrates the importance of incorporating personal characteristics, such as environmental familiarity, when analyzing the complex relationship between social media usage and pro-environmental behavior.

This research has implications for environmental education, communication, and policy initiatives that seek to promote environmentally responsible behavior among university students. The findings suggest that social media can serve as a viable mechanism for disseminating pro-environmental information, increasing environmental awareness, and altering environmental perspectives. Academic institutions, environmental organizations, and policymakers have the potential to use social media platforms to encourage university students to engage in pro-environmental behavior. This can be accomplished through the creation and execution of campaigns that utilize social media as an effective communication medium.

The study emphasizes the significance of pro-environmental attitudes as a mediator in the correlation between social media use and pro-environmental behavior. Formulating messages that provide information, establishing positive environmental narratives, and promoting environmental principles on social media platforms can influence university students' pro-environmental attitudes and behavior. It is essential to tailor pro-environmental communications to university students' characteristics, considering their environmental beliefs, attitudes, and values.

The study concludes by emphasizing the significance of environmental literacy as a mediator in the relationship between social media use and environmentally responsible behavior. This indicates that individuals with environmental knowledge may be more receptive to pro-environmental messages distributed via social media platforms.

Consequently, it can be inferred that environmental awareness and knowledge campaigns and interventions can increase the efficacy of social media-based interventions designed to promote pro-environmental behavior. These interventions include the provision of environmental information, the implementation of environmental education programs, and the promotion of environmental literacy.

The findings of this study highlight the significance of policymakers and practitioners recognizing the potential of social media as a communication instrument to promote environmentally responsible behavior among university students. Environmental education and communication programs that utilize social media platforms have the potential to be cost-effective, simple to implement, and reach a diverse audience. Prudent planning and vigilance are required to ensure the precision, scientific validity, and congruence of social media communications to promote sustainable behavior.

Future Research, Recommendations, and Limitations

Notwithstanding the advantageous outcomes of this study, it is imperative to acknowledge and tackle certain constraints. Initially, the outcomes may be limited to a specific cohort of tertiary-level scholars within the academic landscape of ChengDu, China. Diverse student populations across various educational tiers, geographic regions, and cultural contexts may demonstrate varying dispositions and conduct toward pro-environmental engagement and utilization of social media platforms. Therefore, it is advisable to exercise caution when generalizing the findings beyond the parameters of this study. Furthermore, the data utilized in this study were obtained through self-report instruments, which are susceptible to social desirability and memory distortions. It is possible that the participants' responses may have been inconsistent with social norms or that their recollection of their social media usage, attitudes, knowledge, and behavior may have been inaccurate. Subsequent investigations ought to explore diverse methodologies and objective criteria, such as the monitoring of authentic social media usage data or the utilization of digital trail data, to obtain a more precise and comprehensive evaluation of social media usage.

The cross-sectional design utilized in the study poses challenges in establishing causality or temporal relationships between variables. The study revealed an association among social media usage, pro-environmental attitudes, environmental consciousness, and pro-environmental behavior. However, it did not establish a definitive causal connection. Prospective studies could employ longitudinal or experimental approaches to develop causality and examine alterations in these variables over an extended period. Moreover, the present study utilized self-report instruments to evaluate social media utilization, which may not comprehensively encompass the complexities of social media engagement, including frequency, duration, and interactive content. Subsequent studies may employ objective metrics to provide a more accurate and comprehensive assessment of social media utilization.

Ultimately, although this study examined the intermediary role of pro-environmental attitudes and the moderating influence of environmental awareness, the magnitudes of the effects observed were negligible. Subsequent research endeavors should examine additional potential mediators and moderators that could elucidate the association between social media utilization and pro-environmental conduct among college students.

Possible mediators or moderators that could shed light on the underlying processes of this association include variables such as self-identity, social norms, and environmental values. Additionally, while the present study centered on the favorable influence of social media on pro-environmental conduct, it is crucial to acknowledge that social media can also yield adverse environmental outcomes, such as promoting consumerism, generating digital waste, and contributing to electronic refuse. Subsequent research endeavors could delve into the potential adverse effects of social media on environmental conduct and offer remedial approaches.

One limitation of this study is its dependence on self-reported measures, which could introduce bias and fail to capture the nuances of individuals' attitudes and behaviors. Subsequent investigations could employ mixed-methods methodologies, which involve integrating self-reported evaluations with behavioral observations or qualitative interviews, to comprehensively comprehend the association between social media usage and pro-environmental conduct. Moreover, the present study centered on college students, who are recognized for their extensive utilization of social media. It is imperative to conduct an investigation on different age cohorts, including minors, grown-ups, and senior citizens, to gain a comprehensive comprehension of how the utilization of social media platforms fosters eco-friendly conduct across diverse life phases. In addition, it may be beneficial to investigate potential cultural variations in the correlation between social media usage and pro-environmental behaviors, given that environmental attitudes and behaviors can vary across different cultural contexts. The present study exclusively investigated the impact of social media usage on pro-environmental conduct, neglecting to incorporate other potential factors that could influence pro-environmental behavior, such as individual traits, situational circumstances, and extraneous influences. Subsequent research endeavors ought to investigate the interplay between social media utilization and other factors to comprehensively comprehend the intricacies involved in pro-environmental conduct among college students.

This study adds to the existing literature on the relationship between social media usage and pro-environmental behavior among college students. However, it is important to acknowledge the significant constraints of this research. Subsequent investigations could overcome these limitations by examining alternative theoretical models, employing unbiased measures, employing a combination of quantitative and qualitative methodologies, assessing diverse populations and cultural settings, and considering additional pertinent factors. Identifying prospective research domains will facilitate comprehension of the correlation between social media utilization and pro-environmental conduct. Additionally, it will enable the formulation of efficacious interventions and methodologies to foster sustainable behavior among university students and other populations.

Conclusion

The present study aims to enhance our understanding of the interplay between social media usage, pro-environmental attitudes, environmental knowledge, and pro-environmental behavior among college students in ChengDu, China. The study's findings confirm the three hypotheses, demonstrating a favorable association between the utilization of social media and pro-environmental behavior. The research findings indicate that pro-environmental attitudes function as mediators, whereas environmental awareness operates as moderator.

This study contributes to the existing literature by highlighting the importance of social media in promoting environmentally responsible behavior among undergraduate students. The results suggest that social media can be a feasible platform for disseminating pro-environmental information, promoting awareness, and influencing environmental attitudes, ultimately leading to pro-environmental actions. The study's findings support the planned behavior theory, suggesting that attitudes are crucial in linking social media usage with pro-environmental behavior. The results underscore the significance of environmental literacy as a moderating element, indicating that individuals with higher environmental knowledge may demonstrate more openness to pro-environmental messages communicated via social media channels.

The study holds significant practical implications. The results indicate that educational institutions, environmental organizations, and governmental bodies can leverage social media platforms to encourage pro-environmental behavior among college students. Using social media strategies that prioritize promoting pro-environmental attitudes, providing information, and raising awareness can effectively encourage environmentally friendly behaviors. This study provides valuable insights into developing and implementing environmental education campaigns and outreach efforts utilizing social media as a communication tool.

However, it is imperative to acknowledge the limitations of this research. The study was conducted in the specific geographical location of ChengDu, China. Therefore, the results may not universally apply to other regional or cultural contexts. The presence of potential bias is a concern that arises from the reliance on self-reported data. Future studies should consider incorporating objective measures of pro-environmental behavior to address this issue. Furthermore, the present investigation did not examine additional factors such as cultural norms, social influence, and personal convictions that may potentially influence environmentally-friendly behavior. Subsequent research endeavors may explore how these variables contribute to the association between social media usage and environmentally conscious conduct.

The current research provides significant contributions to understanding the relationship between social media utilization, pro-environmental beliefs, environmental awareness, and pro-environmental behavior among college students in ChengDu, China. The findings highlight the potential of social media as a tool for promoting environmentally-friendly behavior and emphasize the importance of environmental attitudes and knowledge in shaping the ecological actions of college students. The results hold significance in theory and practice for environmental education and communication efforts to foster environmentally conscious behavior among university students and other groups.

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