IPRPD
International Journal of Arts, Humanities and Social Sciences
ISSN 2693-2547 (Print), 2693-2555 (Online)
Volume 03; Issue no 09: September, 2022
DOI: 10.56734/ijahss.v3n9a5

DO SOCIAL MEDIA PROMOTE PRO-ENVIRONMENTAL BEHAVIORAL INTENTIONS? MODERATION OF EMPATHY AND MEDIATION OF ENVIRONMENTAL INTERESTS

Suji Park[1], Hae Rin Kang[2]

[1]*Ph.D, Research professor, Institute of Body & Culture, Konkuk University, South Korea*
[2]*M.S.W., Ph.D candidate, Seoul National University, South Korea*

Abstract

The aim of the current study is to examine how Facebook use influences pro-environmental behavioral intentions via individuals' interests in pre-environmental behaviors and if the link is moderated by empathy. 229 individuals participated in an online survey via Amazon Mechanical Turk. The finding showed that the moderating effect of empathy on the relationship between Facebook use and pro-environmental behavioral intentions was found to be positively significant. Along with this moderation effect, an indirect effect of Facebook use on pro-environmental behavioral intentions via environmental interests was also positively significant. These findings contribute to the discussion on the importance of considering the effects of both a personological trait and a situational variable on promoting pro-environmental behavioral intentions.

Keywords

Social Media, Empathy, Environmental Interests, Pro-Environmental Behaviors

1. Introduction

Previous research has actively focused on the anthropogenic nature of global warming and other environmental challenges (Intergovernmental Panel on Climate Change, 2007; Hirsh, 2010). A great number of studies have also investigated the effects of media content, including public services announcements and documentary shows/films, that have portrayed environmental crises such as the consumption of fossil fuels and deforestation (e.g., Myrick & Evans, 2014). These media messages have been created with the purpose of raising awareness of the gravity of pro-environmental behavior, which refers to "behavior that consciously seeks to minimize the negative impact of one's actions on the natural and built world" (Kollmuss & Agyeman, 2002, p. 240). Among diverse media messages, discourse about pro-environment or sustainability on social media may have a greater impact on pro-environmental behaviors and behavioral intentions considering the active participation of users in producing, consuming, and transmitting messages (Han & Cheng, 2020). Due to widespread discussion on environmental protection at an individual and a societal level, general concerns about environmental destruction have increased. For instance, 75% of Americans think that the U.S. should put effort into reducing climate change by participating in international climate change efforts (Spencer & Funk, 2022). Despite this high awareness of how important environmental protection is, irresponsible and harmful behaviors to the environment still prevail (Berenguer, 2007).

Governments, corporations, and individuals actively use social media to support environmental campaigns and encourage pro-environmental behaviors (Warner et al., 2014). Given a good deal of pro-environmental campaigns on social media, users who enjoy social media frequently may be more exposed to environmental campaigns or relevant posts than those not using social media much. Thus, active users may be more interested in environmental responsibilities and pro-environmental behaviors due to high exposure to such content. Interestingly, little research has investigated how social media use influences users' interests in pro-environmental behaviors. In fact, a meta-analysis reviewing 57 articles indicated problem awareness, internal attribution, social norm, feelings of guilt, perceived behavioral control, attitude, moral norm, and intention as psycho-social predictors of pro-environmental behaviors (Bamberg & Möser, 2007). This outcome demonstrates the research gap regarding environmental interests with reference to social media use and pro-environmental behavioral intentions.

One of the individual trait factors that predict pro-environmental behavioral intentions is empathy (Berenguer, 2007). Schultz (2002) suggested that individuals can empathize with nature and, in turn, become willing to be engaged in pro-environmental behaviors on the basis of benefits for their communities and societies. Though a few studies investigated the role of empathy in promoting pro-environmental behaviors, its moderating effect on the link between social media use and pro-environmental behavioral intentions has not been explored. To fill this gap, thus, the current study is to explore how individuals' environmental interests mediate the effect of Facebook use on pro-environmental behavioral intentions. In addition, a moderating effect of empathy on a link between Facebook use and pro-environmental behavioral intentions will be examined based on the empathy-altruism hypothesis as a theoretical framework.

2. Literature Review

2.1. Social Media Effects on Pro-environmental Behavioral Intentions

Social media provide a virtual space where individuals learn about eco-responsibility and get involved in the relevant discussion (Mallick & Bajpai, 2019). Due to the features of social media that allow people to create, selectively choose, and retransmit content, social media are one of the most effective communication tools for sharing environmental issues with numerous people (Robelia et al., 2011). This social media activity may motivate users to have concerns for environmental issues and foster pro-environmental behaviors (Warren et al., 2014). To explore how social media use is related to pro-environmental behaviors, Büssing and colleagues (2019) studied the association between desires for liking on social media and desires for engaging in pro-environmental behaviors. The outcome revealed that desires to like for the protection of animals at risk to become extinct are significant predictors of desires to donate money and volunteer. Similar to this, other researchers also found a positive link between exposure to environment-related social media content and pro-environmental behavioral intentions (Han & Cheng, 2020; Han & Xu, 2020). However, these studies were only focused on the effects of specific social media content. Considering numerous social media posts about pro-environmental behaviors, it is possible that exposure to general Facebook posts including pro-environmental behaviors has a positive impact on behavioral intentions.

However, the ease with being engaged in and supporting pro-environmental messages online by simply reading or liking the posts may not directly lead to participating in pro-environmental behaviors in reality. Individuals who actively use social media and consider social media important to their life may be more exposed than those not using social media much to messages demonstrating environmental sustainability (Teoh, & Gaur, 2018). Given ubiquitous environmental campaigns on social media, users may be, in turn, more interested in environmental issues and pro-environmental behaviors. Personal interest refers to a characteristic of a person, and in the pro-environmental context, one's personal interest is a "relative stable orientation towards environmental issues" (Uitto et al., 2011, p. 168). An individual's cognitive involvement in the environmental issues and responsibilities, which can be an indicator of corresponding behaviors, is led by environmental interests as personal interests (Uitto et al., 2006). Therefore, an increase in environmental interests due to exposure to social media may be related to a greater intention to behave pro-environmentally. According to a recent article, adolescents and young adults who are concerned about the environment were likely to boycott a product resulting in an environmental crisis and to sign petitions about an environmental issue (Boulianne & Ohme, 2021). Hence, the current study proposed that (see Figure 1):

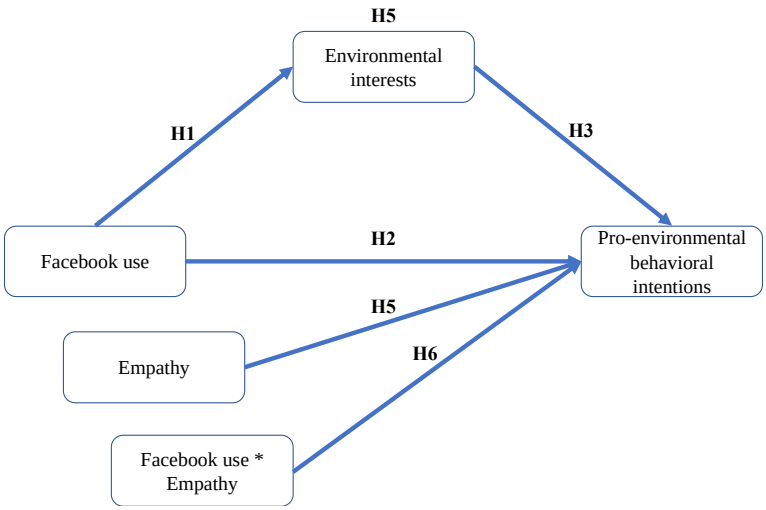

Figure 1: Theoretical model

H1: Facebook use will positively predict environmental interests.
H2: Facebook use will positively predict pro-environmental behavioral intentions.
H3: Environmental interests will positively predict pro-environmental behavioral intentions.
H4: Environmental interests will mediate the relationship between Facebook use and pro-environmental behavioral intentions.

2.2. The Empathy-Altruism Hypothesis

The empathy-altruism hypothesis provides an explanation of the role of empathy in encouraging pro-environmental behaviors (Batson et al., 2015). According to this theoretical framework, empathetic concern promotes altruistic motivation (Batson, 1987). Empathy refers to affective and cognitive responses deriving from understanding or concerning others' emotional states and contains emotional components (Eisenberg et al., 2010). That is, empathy

is other-oriented emotional reactions, such as compassion and sympathy, that a person experiences due to the perceived welfare of others in need (Batson et al., 2015). Altruism is a motivational state and "is concerned with the ultimate goal of this motivational state with the purpose of enhancing someone's welfare" (Batson et al., 2015, p. 3). Altruism explains other-interest and, thus, has been often used to examine one's helpful and/or moral acts.

Perception of need is a prerequisite for altruistic behaviors. In order to perceive others in need, there are two conditions that must be met simultaneously (Batson et al., 2015). First, an individual must realize the difference between what is and what is desirable. Second, he or she must not focus on him/herself or other situational factors, but on the ones in need. However, satisfying these conditions does not necessarily mean that the individual can successfully perceive others in need. Other factors including cognitive and environmental factors may be also required to stimulate the perception of need (Batson et al., 2015). For example, the ability to put oneself in the other's shoes is likely to induce the perception of need. This empathetic feeling can be elicited by an individual's capacity to place value on another's welfare (Rokeach, 1973). Therefore, based on the empathy-altruism hypothesis, it is likely that an empathetic individual who values the other's welfare and/or perceives another in need has altruistic motivations, which lead to prosocial behaviors. In line with this hypothesis, previous research showed that empathy is a significant indicator of altruistic and prosocial behaviors such as allocating funds to help drug addicts (Batson et al., 2002).

Empathy can induce not only prosocial but also pro-environmental behaviors because altruistic motivation can lead to pro-environmental behaviors. In fact, previous empirical evidence supports the significant impact of empathy on promoting pro-environmental behaviors and behavioral intentions (e.g., Berenguer, 2007; Larsson & Herrera, 2021). Importantly, however, these studies did not consider the moderating effect of empathy on the link between social media use and pro-environmental behavioral intentions. The effects of the degree to which an individual uses and enjoys Facebook on pro-environmental behavioral intentions may depend on the levels of empathy. It is possible that empathetic people are more motivated and willing to be engaged in pro-environmental behaviors than less empathetic people when using Facebook frequently. On the other hand, for those less empathetic the extent to which Facebook use impacts pro-environmental behavioral intentions could be smaller. Therefore, the current study proposes two main effects of Facebook use and empathy on pro-environmental behavioral intentions as well as a moderating effect of empathy on a relationship between Facebook use and pro-environmental behavioral intentions. Based on the theoretical framework of the empathy-altruism hypothesis and the findings of previous research, the following hypotheses are suggested (see Figure 1):

H5: Empathy will positively predict pro-environmental behavioral intentions.
H6: Empathy will moderate the relationship between Facebook use and pro-environmental behavioral intentions.

3. Research Methodology

3.1. Sample

The current study conducted an online survey, using Amazon Mechanical Turk (MTurk) because previous research successfully completed surveys on MTurk (e.g., DiRusso & Myrick, 2021; Hussain & Alhabash, 2020) and levels of MTurk participants' attentiveness and diversity were proven to be high (Buhrmester et al., 2011, Hauser & Schwarz, 2016). Participants voluntarily participated in and received $0.65 for the 20-minute long survey. 214 were retained for the final analysis after removing two incomplete responses and 15 participants who have not been exposed to Facebook posts regarding pro-environment before. The average age was 33.91 (SD = 8.43, ranging from 21 to 63) with 65.4% of males. The sample consisted of Caucasians (36.9%), followed by Asians (28.%), Hispanics (18.2%), others (10.3%), and African Americans (6.5%).

3.2. Measures

3.2.1. Facebook activity regarding pro-environmental behaviors. Participants were asked to answer whether they have read (Yes $N = 214$) Facebook posts regarding pro-environmental behaviors or sustainability in the past.

3.2.2. Facebook use. A social media use integration scale was adopted to measure the extent to which individuals use and enjoy Facebook on a 7-point Likert scale with 10 questions (Jenkins-Guarnieri et al., 2013). Example items are "Using Facebook is part of my everyday routine" and "I enjoy checking my Facebook account" ($M = 5.30$, $SD = .92$, $\alpha = .85$).

3.2.3. Environmental interests. Participants were asked if they were interested in the environment on a 7-point Likert scale ($M = 5.84$, $SD = .99$).

3.2.4. Empathy. Empathy was measured with 18 items adapted from Carré et al. (2013) on a 7-point Likert scale, and example items include "I get caught up in other people's feelings easily" and "I can usually work out when my friends are scared" ($M = 5.26$, $SD = 0.83$, $\alpha = .89$).

3.2.5. Pro-environmental behavioral intentions. The pro-environmental behavioral intention scale by Brody et al. (2012) was employed to measure one's intention to engage in pro-environmental behaviors on a 7-point Likert scale (i.e., planting trees, using recycled products; M = 5.63, SD = .69, α = .84).

3.2.6. Control variables. Participants' sex, age, and ethnicity were measured to be controlled for.

4. Results

4.1. Bivariate Correlations

Zero-order correlations among variables are significantly positive.

	1	2	3	4	VIF
EI	1				1.07
Empathy	.29*	1			1.13
Facebook use	.33*	.75*	1		1.08
PEBI	.52*	.57*	.60*	1	

Note. EI = Environmental interests; PEBI = Pro-environmental behavioral Intentions
* p < .01

Table 1: Zero-order correlations among variables

The correlation between empathy and environmental interests was positively significant (r = .29, p < .01). The correlations between Facebook use and a) environmental interests (r = .33, p < .01) and b) empathy (r = .75, p < .01) were also found to be significant. Pro-environmental behavioral intentions were significantly correlated with a) environmental interests (r = .52, p < .01), b) empathy (r = .57, p < .01), and c) Facebook use (r = .60, p < .01). To check if the independent variables are highly correlated, a multicollinearity diagnostic was conducted. The values of the VIF were below 2, which indicates no possibility of multicollinearity.

4.2. Hypotheses Testing

		β	*SE*	*p*	LLCI	ULCI
Direct effects	FU → EI (H1)	.34	.07	< .001	.206	.482
	FU → PEBI (H2)	.30	.06	< .001	.178	.411
	EI → PEBI (H3)	.26	.04	< .001	.180	.330
	Empathy→ PEBI (H5)	.17	.06	.003	.060	.289
Indirect effect	FU → EI → PEBI (H4)	.09	.03		.037	.147
Interaction effect	FU × Empathy → PEBI (H6)	.14	.04	.0001	.069	.211

Note. FU = Facebook use; EI = Environmental interests; PEBI = Pro- environmental behavioral intentions; LLCI & ULCI = lower level and upper level confidence intervals. CIs are based on the bootstrapping of 5,000 samples.

Table 2: Main effects and moderating effects on pro-environmental behavioral intentions

Moderation and mediation effects were tested based on Model 5 of the Process macro in SPSS (Hayes, 2013; 5,000 bootstrapping, 95 CI). This model allows testing the direct and indirect effects of variables of interest along with a conditional effect of a moderator. H1 and H2 proposed the direct effects of Facebook use. The analyses revealed both positively significant its main effects on environmental interests (β = .34, p < .001) and pro-environmental behavioral intentions (β = .30, p < .001). Thus, these results supported H1 and H2. H3 stated that individuals' environmental interests would positively predict pro-environmental behavioral intentions and the result supported this prediction (β = .26, p < .001). A mediation model was constructed to examine the indirect effect of Facebook use on pro-environmental behavioral intentions via environmental interests (H4). The result suggested that the link between Facebook use and pro-environmental behavioral intentions was significantly mediated by environmental interests (CI = .037 to .147). This finding is consistent with H4. H5 proposed the positive effect of empathy on pro-environmental behavioral intentions. The outcome revealed a significant and positive link between empathy and pro-environmental behavioral intentions (β = .17, p = .003), which is consistent with H5. Lastly, the interaction effect of Facebook use and empathy on pro-environmental

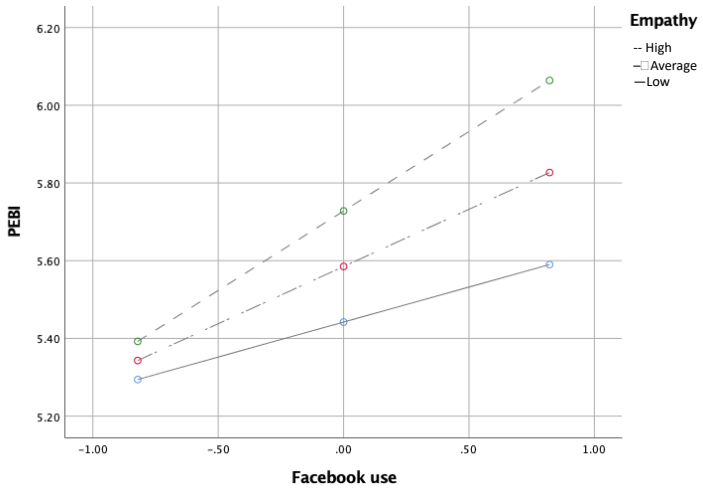

Figure 2: Moderating effect of empathy on a link between Facebook use and pro-environmental behavioral intentions

behavioral intentions is also found to be positively significant (β = .14, p = .0001; see Figure 2).

For people with the lowest level of empathy, Facebook use has a minimal effect on pro-environmental behavioral intentions. For those high in empathy, the effect is much noticeable in such a way that Facebook use has the greatest impact on pro-environmental behavioral intentions. As for individuals with the average level of empathy, the effect of Facebook use on the behavioral intentions is greater than but lower than those low in empathy and those high in empathy respectively. Thus, this finding supported H6.

5. Discussion

5.1. Implications

The current study reveals that individuals who use Facebook frequently and value it are more likely to be willing to act pro-environmentally. In addition, their interests in the environment predicted by the high level of Facebook use lead to a great level of pro-environmental behavioral intentions. Facilitating a better understanding of the role of a trait factor in promoting pro-environmental behaviors, this research also empirically shows that individuals' intentions to be engaged in pro-environmental behaviors predicted by Facebook use vary depending on the levels of empathy.

Previous studies have produced empirical evidence of the positive relationship between exposure to social media in regard to environmental information and intention to act pro-environmentally (e.g., Han & Cheng, 2020; Han & Xu, 2020). In line with these findings, the current study indicates that the general use of Facebook is also a significant predictor of pro-environmental behavioral intentions. Social media users are likely to be subjected to normative pressure due to the social comparison function (Hynes & Wilson, 2016) and motivated to act pro-environmentally by the display function (Oakley et al., 2008). Because the current study did not examine how different types and characteristics of Facebook posts (e.g., positive and negative opinions) impact pro-environmental behaviors, however, exploring the effects of such characteristics on environmental issues and responsible acts can offer venues for future studies.

With regard to a link between Facebook use and pro-environmental behavioral intentions, this research supports the bridging role of personal interests in the environment. Individuals having greater environmental interests are likely to intend to behave pro-environmentally because interest is significantly associated with positive attitudes towards the environment (Uitto et al., 2011), which have been found to be a robust predictor of pro-environmental behavioral intentions (Effendi et al., 2020). Furthermore, as mentioned above, those using and enjoying Facebook frequently may have a greater chance to be exposed to environment-related content compared to those not using it much regardless of the types and characteristics of the posts. This high possibility of exposure to Facebook posts dealing with environmental issues is likely to enhance interest in the environment. According to agenda setting theory, people tend to place importance on a topic that is frequently reported by the media (McCombs et al., 2014). Although the theory is originally focused on news media, its proposition can be applied to the effect of social media on a public agenda considering that people employ social media to acquire information and knowledge. Therefore, those frequently reading environment-related posts are likely to think that environmental issues are important topics and to become more interested in the issues and environmental responsibility. And in turn, their greater environmental interests serve as motivation for behaving pro-environmentally.

The result also points to the role of social media as an educational tool to increase environmental interests and promote pro-environmental behaviors. In the U.S., online media consumption surpassed traditional media consumption since 2020 (Statista, 2022) and Facebook is the second most popular social media among American adults (Auxier & Anderson, 2021). Given the high rate of social media consumption and interactive communication they offer, much research suggested that social media, including Facebook, can be a new space for learning certain subject matters (Tiryakioglu & Erzurum, 2011). Hence, a practical recommendation for governments as well as educational institutions and professionals would be to provide social media users with accurate information about environmental issues to improve public awareness and promote pro-environmental behaviors.

The current study extends the empathy-altruism hypothesis by applying it to a pro-environment context and confirming a moderating effect of empathy on Facebook use and pro-environmental behavioral intentions. Empathy is found to be a crucial indicator of altruistic behavioral intentions including pro-environmental behavioral intentions. Importantly, how Facebook use influences behavioral intentions is conditional on the degree of trait empathy. Since Facebook use is promotive of pro-environmental behaviors when an individual's empathy is high compared to when one is low, it is vital to take consideration into both personal and environmental factors.

5.2. Limitations

The current study is subject to limitations that can be improved in future studies. First, this study did not observe and measure pro-environmental behaviors but measured pro-environmental behavioral intentions. According to theory of planned behavior, behavioral intentions are the most direct predictors of behaviors (Fishbein & Ajzen, 1975). However, Armitage and Conner (2010) conducted a meta-analysis on the efficacy of theory of planned

behavior and suggested that observed behaviors that participants were engaged in might not correspond with behavioral intentions and behaviors that people reported on surveys. Thus, future studies should attempt to investigate how various factors influence behaviors by observing participants. Second, the current study might not exhaustively measure pro-environmental behavioral intentions. In the study, participants were asked if they had been engaged in specific pro-environmental behavioral intentions such as donating to an organization protecting the environment and choosing a fuel-efficient vehicle with ten items. Though an item asks about general intention to improve the environment (i.e., intention to increase their contribution to the improvement of the environment), this might be not enough to comprehend individuals' pro-environmental behavioral intentions. Hence, future research may construct a more exhaustive measure to have a better understanding of pro-environmental behavioral intentions.

Works Citation

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British journal of social psychology*, *40*(4), 471-499. https://doi.org/10.1348/014466601164939

Auxier, B., & Anderson, M. (2021, April 7). *Social Media Use in 2021: A majority of Americans say they use YouTube and Facebook, while use of Instagram, Snapchat and TikTok is especially common among adults under 30*. Pew Research Center. https://www.pewresearch.org/internet/2021/04/07/social-media-use-in-2021

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of environmental psychology*, *27*(1), 14-25.

Batson, C. D. (1987). Prosocial motivation: Is it ever truly altruistic? *Advances in experimental social psychology*, *20*, 65-122.

Batson, C. D., Chang, J., Orr, R., & Rowland, J. (2002). Empathy, attitudes, and action: Can feeling for a member of a stigmatized group motivate one to help the group?. *Personality and Social Psychology Bulletin*, *28*(12), 1656-1666.

Batson, C. D., Lishner, D. A., & Stocks, E. L. (2015). The empathy—Altruism hypothesis. *Oxford Handbooks Online*. 1-27. doi: 10.1093/oxfordhb/9780195399813.013.023

Berenguer, J. (2007). The effect of empathy in proenvironmental attitudes and behaviors. *Environment and behavior*, *39*(2), 269-283.

Boulianne, S., & Ohme, J. (2021). Pathways to environmental activism in four countries: social media, environmental concern, and political efficacy. *Journal of Youth Studies*, 1-22.

Brody, S., Grover, H., & Vedlitz, A. (2012). Examining the willingness of Americans to alter behaviour to mitigate climate change. *Climate Policy*, *12*(1), 1–22. https://doi.org/10.1080/14693062.2011.579261

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science, 6*(1), 3–5. https://doi.org/10.1037/14805-009

Carré, A., Stefaniak, N., D'ambrosio, F., Bensalah, L., & Besche-Richard, C. (2013). The Basic Empathy Scale in Adults (BES-A): Factor structure of a revised form. *Psychological assessment*, *25*(3), 679. https://doi.org/10.1037/a0032297

DiRusso, C., & Myrick, J. G. (2021). Sustainability in CSR Messages on Social Media: How Emotional Framing and Efficacy Affect Emotional Response, Memory and Persuasion. *Environmental Communication*, *15*(8), 1045–1060. https://doi.org/10.1080/17524032.2021.1933120.

Effendi, M. I., Sugandini, D., Sukarno, A., Kundarto, M., & Arundati, R. (2020). The theory of planned behavior and pro-environmental behavior among students. *Journal of Environmental Management & Tourism*, *11*(1), 35-43.

Eisenberg, N., Eggum, N. D., & Edwards, A. (2010). Empathy-related responding and moral development. In W. F. Arsenio & E. A. Lemerise (Eds.), Emotions, aggression, and morality in children: Bridging development and psychopathology (pp. 115–135). American Psychological Association. https://doi.org/10.1037/12129-006

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Addison-Wesley.

Han, R., & Cheng, Y. (2020). The influence of norm perception on pro-environmental behavior: A comparison between the moderating roles of traditional media and social media. *International Journal of Environmental Research and Public Health*, *17*(19), 7164. doi: 10.3390/ijerph17197164

Han, R., & Xu, J. (2020). A comparative study of the role of interpersonal communication, traditional media and social media in pro-environmental behavior: A China-based study. *International Journal of Environmental Research and Public Health*, *17*(6). https://doi.org/10.3390/ijerph17061883

Hauser, D. J., & Schwarz, N. (2016). Attentive Turkers: MTurk par- ticipants perform better on online attention

checks than do subject pool participants. *Behavior Research Methods*, *48*(1), 400–407.

Hayes, A. F. (2013). *Introduction to mediation, moderation and conditional process analysis: A regression-based approach.* New York, NY: The Guilford Press.

Hirsh, J. B. (2010). Personality and environmental concern. *Journal of environmental psychology*, *30*(2), 245-248.

Hussain, S. A., & Alhabash, S. (2020). Effect of nostalgia as a motivational force for depressed students to seek professional psychological help. *Journal of American College Health*, 1-9. https://doi.org/10.1080/07448481.2020.1754838

Hynes, N., & Wilson, J. (2016). I do it, but don't tell anyone! Personal values, personal and social norms: Can social media play a role in changing pro-environmental behaviours?. *Technological Forecasting and Social Change*, *111*, 349-359.

Intergovernmental Panel on Climate Change. (2007). *Climate change 2007: The physical science basis: Contribution of working group 1 to the fourth assessment report of the IPCC* (Vol. 4). Cambridge, England: Cambridge University Press.

Jenkins-Guarnieri, M. A., Wright, S. L., & Johnson, B. (2013). Development and validation of a social media use integration scale. *Psychology of popular media culture, 2*(1), 38-50. DOI: 10.1037/a0030277

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239–260. https://doi.org/10.1080/13504620220145401

Larsson, S., & Angelica, H. (2022). The relationship between empathy as a trait and pro-environmental behavior in Sweden. *Stockholms Universitet*. 1-12.

McCombs, M. E., Shaw, D. L., & Weaver, D. H. (2014). New directions in agenda-setting theory and research. *Mass communication and society*, *17*(6), 781-802.

Mallick, R., & Bajpai, S. P. (2019). Impact of social media on environmental awareness. In *Environmental awareness and the role of social media* (pp. 140-149). IGI Global.

Mou, Y., & Lin, C. A. (2014). Communicating food safety via the social media: The role of knowledge and emotions on risk perception and prevention. *Science Communication, 36*(5), 593–616. https://doi.org/10.1177/1075547014549480

Myrick, J. G., & Evans, S. D. (2014). Do PSAs take a bite out of shark week? The effects of juxtaposing environmental messages with violent images of shark attacks. *Science Communication, 36*(5), 544-569.

Oakley, I., Chen, M., & Nisi, V. (2008). Motivating sustainable behavior. *Ubiquitous Comput*, 174-178.

Robelia, B. A., Greenhow, C., & Burton, L. (2011). Environmental learning in online social networks: Adopting environmentally responsible behaviors. *Environmental Education Research, 17*(4), 553-575.

Rokeach, M. (1973). *The nature of human values*. New York: Free Press.

Schultz, W. (2002). Empathizing with nature: The effects of perspective taking on concern for environmental issues-statis. *Journal of Social Issues, 56*(3), 391-406.

Statista (May 3. 2020). *Time spent with digital vs. traditional media in the U.S. 2011-2023*. https://www.statista.com/statistics/565628/time-spent-digital-traditional-media-usa/

Spencer, A. & Funk, C. (2022). Americans largely support U.S. joining international efforts to address climate change. *Pew Research Center*. https://www.pewresearch.org/fact-tank/2022/03/09/americans-largely-support-u-s-joining-international-efforts-to-address-climate-change/

Teoh, C. W., & Gaur, S. S. (2018). Environmental concern: an issue for poor or rich. *Management of Environmental Quality: An International Journal.*

Tiryakioglu, F., & Erzurum, F. (2011). Use of social networks as an educational tool. *Contemporary educational technology, 2*(2), 135-150.

Uitto, A., Juuti, K., Lavonen, J., Byman, R., & Meisalo, V. (2011). Secondary school students' interests, attitudes and values concerning school science related to environmental issues in Finland. *Environmental education research, 17*(2), 167-186.

Uitto, A., Juuti, K., Lavonen, J., & Meisalo, V. (2006). Students' interest in biology and their out-of-school experiences. *Journal of Biological Education, 40*(3), 124-129.

Warner, A., Eames, C., & Irving, R. (2014). Using social media to reinforce environmental learning and action taking for school students. *International Electronic Journal of Environmental Education, 4*(2), 83-96.

Warren, A. M., Sulaiman, A., & Jaafar, N. I. (2014). Facebook: The enabler of online civic engagement for activists. *Computers in Human Behavior, 32*, 284-289. doi: 10.1016/j.chb.2013.12.017

Acknowledgement

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2020S1A5B8097404).