FBMS Journal of Family Business and Management Studies
Journal of Family Business and Management Studies
ISSN 2821-9643 (online) Volume 17 Number 2, July-December 2025

Factors Affecting Thai Adolescents' Pro-Environment Behaviors: Empirical Evidence from Samut Sakhon Province

Received: 04.03.2024
Revised: 07.06.2024
Accepted: 17.06.2024

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Abstract

Children and young consumers are crucial market segments for sustainable marketing efforts. To encourage sustainable behaviors in children and young consumers, researchers, marketing managers, and policymakers need to understand the current state of their behaviors and the factors affecting them. With more than fourteen million children and adolescents in Thailand, this study aims to explore the pro-environmental behaviors of Thai adolescents and examine how demographic, psychological, and social factors affect their behaviors. The pro-environmental behaviors examined in this study comprise two dimensions, including resource conservation and recycling behaviors. This study hypothesizes that adolescents with higher levels of environmental concern, beliefs, and knowledge will display more pro-environmental behaviors. The adolescents' pro-environmental behaviors are also expected to be influenced by their age, gender, and parents' behaviors. Quantitative data analysis was conducted on a sample of ninth graders in Samut Sakhon province, and structural equation modeling was performed to test the proposed hypotheses. Results show that the adolescents' pro-environmental behaviors are directly and positively affected by their environmental concerns, beliefs, and parents' pro-environmental behaviors. Girls and older adolescents were found to display more pro-environmental behaviors than boys and younger adolescents. This study contributes to the literature by exploring Thai adolescents' pro-environmental behaviors and testing the relationships between these behaviors and several antecedents. The findings provide implications for researchers, marketing practitioners, and policymakers.

Keywords: Pro-environmental behavior, Environmental attitudes, Environmental concerns, Environmental knowledge, Thai Adolescents, Parents

Introduction

From a sustainability perspective, children and young consumers are perceived as change agents of the future. They are consumers of tomorrow who will not only make important decisions that can shape the future of our planet but will also carry their behaviors, preferences, decision-making skills, and purchasing strategies into adulthood. As a result, it is essential to instill a sustainability mindset and encourage pro-environmental behaviors in children and young consumers if we want to accomplish sustainable development goals.

Researchers have investigated children's and young consumers' pro-environmental behaviors in many countries. Findings from prior research provide promising evidence supporting the proposition that children and young consumers are change agents of the future. Findings showed that children and young consumers behave responsibly towards the environment (Evans et al.,2007), responded positively to sustainability food labels (De Brabandere et al., 2022), and were willing to change their way of life to minimize the negative impacts on the environment (Trott, 2020).

Nonetheless, studies probing the pro-environmental behaviors of adolescents in Thailand are limited to our knowledge. Prior research examining pro-environmental behaviors in Thailand had focused on adults or college students (Arttachariya, 2012; Chankrajang & Muttarak, 2017; Maichum et al., 2016). With more than 14.6 million children and adolescents in Thailand, accounting for 22 percent of the total population (National Statistical Office of Thailand, 2023), this study recognizes a need to explore the sustainable behaviors of this significant market segment. To persuade adolescents to behave responsibly, we must know the extent to which the adolescents are engaging in pro-environmental activities. As a result, this study aims to explore levels of pro-environmental behaviors, environmental attitudes, and environmental knowledge among Thai adolescents. In addition, this study plans to investigate the impact of demographic factors (age and gender), psychological factors (environmental concern, environmental belief, environmental knowledge), and social factors (parents' behaviors) on Thai adolescents' pro-environmental behaviors. The pro-environmental behaviors examined in this study comprise two dimensions, including resource conservation (energy and water) and recycling behaviors.

Since there are limited studies regarding young children and adolescents' pro-environmental behaviors in Thailand, this study contributes as an exploratory investigation of the adolescents' pro-environmental behaviors. Results should provide a baseline for future research on how adolescents in Thailand behave towards the environment and whether similar behaviors can be expected in other samples. Moreover, this study uses self-reported behavior, not behavioral intentions, as a proxy for pro-environmental behaviors. The results should present a better picture of the relationships between the pro-environmental behaviors and their antecedents. Furthermore, results regarding the impacts of demographic, psychological, and social factors on children's behaviors should help

researchers, marketing managers, and public policymakers develop effective strategies to encourage pro-environmental behaviors in adolescents in the future.

This paper proceeds as follows. The next section provides a conceptual background regarding adolescents' pro-environmental behaviors and their antecedents. Then, hypotheses regarding the factors affecting pro-environmental behaviors are proposed. The second section explains the research methodology and measurements of all constructs in the model. Results and findings are reported in the section that follows. Section four discusses the conclusions and implications of the findings. In the last section, this study discusses limitations and suggests future research.

Literature review and hypotheses development

Adolescents' pro-environment behaviors

Children's pro-environmental behavior is defined as a set of actions taken by children, within or outside their family contexts, that reduce harmful environmental consequences and use of natural resources (Hosany et al., 2022). This study categorizes the behaviors into two clusters based on analyzing pro-environmental behaviors investigated in prior research. The first cluster includes behaviors children perform as responsible global citizens, reflecting their intention to do good to nature per se and not related to product purchase. These are such behaviors as recycling, waste reduction, and energy-saving behaviors, as reported by Evans et al. (2007), Eagles and Demare (1999), and Wan Hussain et al. (2021). The second cluster includes adolescents' behaviors as responsible consumers, reflecting their sustainable purchases. These are behaviors such as green product purchases, as reported by Uddin and Khan (2018) and Grønhøj and Thøgersen (2017). Note that some of the literature in this cluster measured purchase intention instead of actual purchasing behavior. This study aims to examine the pro-environmental behaviors indicated in the first cluster, including resource conservation (energy and water) and recycling behaviors.

Impact of environmental attitude on adolescents' pro-environment behaviors

Based on the theory of reasoned action by Fishbein and Ajzen (1975), attitude is a construct that can predict actual behavior through subjective norms and behavioral intentions. As a result, environmental attitude is a psychological factor widely investigated as a predictor of pro-environmental behavior. Cruz and Manata (2020) acknowledged that prior research has treated environmental attitudes with two different approaches. On the one hand, research scholars treat attitudes as a single system comprising beliefs, intentions, and behaviors. On the other hand, research scholars distinguish environmental attitudes from other constructs and measure each concept separately. This study adopts a latter approach and treats environmental attitude as a distinctive construct from environmental behaviors. This study investigates two dimensions of

environmental attitudes: environmental concern and environmental belief.

Environmental concern

Dunlap and Jones (2002) defined *environmental concern* as "the degree to which people are aware of problems regarding the environment and support efforts to solve them and or indicate the willingness to contribute personally to their solution (p. 485)." In a study by Schultz (2000), environmental concerns were measured by three dimensions, including biospheric, altruistic, and egoistic. In an empirical study by Evans et al. (2007), the researchers assessed the children's environmental concerns by measuring their worries in five dimensions. Note that Evans et al.'s measurements of worries are comparable to measurements for biospheric concerns, as mentioned in other studies.

Prior research acknowledged the positive impact of environmental concerns. Schultz (2000) suggested that people with biospheric concerns would engage in various environmental issues, ranging from specific to global and abstract environmental issues. Steg et al. (2014) proposed that individuals with biospheric concerns were more likely to engage in pro-environmental behavior. In the context of pro-environmental behaviors in young children, Evans et al. (2007) reported that the children had moderately high environmental concerns and were likely to behave sustainably. Similarly, Wan Hussain et al. (2021) found that children's altruistic concern significantly influenced their energy-saving behavior. Lee (2008) also reported a positive impact of environmental concern on pro-environmental behavior. Based on findings from the literature mentioned above, we set up the first hypothesis as follows:

Hypothesis 1: Environmental concern positively affects adolescents' pro-environmental behaviors.

Environmental belief

Prior research widely used the New Environmental Paradigm (NEP) measurement to assess individuals' environmental worldviews. Dunlap and Van Liere developed the original NEP scales in 1978. While many studies used the NEP scales to represent various constructs, Dulap (2008) stated that using the NEP to measure environmental beliefs is the most accurate scale interpretation. According to the researcher, NEP items measured "primitive beliefs about the relationship between human beings and their environments (Dulap, 2008, p.9)." Manoli et al. (2007) revised and validated the scales for use with children. The validated NEP scales comprise three dimensions: rights of nature, eco-crisis, and human exemptionalism.

Prior research acknowledged a positive relationship between environmental beliefs and pro-environmental behaviors. Olli *et al*. (2001) found that environmental beliefs positively correlated to pro-environmental behaviors, such as waste handling, resource conservation, and responsible consumption. Mayer and Frantz (2004) found positive correlations between environmental beliefs and pro-environmental behaviors. Prior research has also reported a positive effect on children's pro-environmental behaviors. Kaiser et al. (1999) found that

environmental values, measured by the right-to-nature dimension of the NEP scales, could predict children's pro-environmental behaviors in Germany. In addition, Collado et al. (2013) found that environmental beliefs mediated a relationship between exposure to nature and children's pro-environmental behaviors. Based on the literature mentioned above, this study sets up the next hypothesis as follows:

Hypothesis 2: Environmental beliefs positively affect pro-environmental behaviors.

Impact of environmental knowledge on children's pro-environmental behaviors

Policymakers and researchers encourage environmental education programs for children, believing that the programs can enhance environmental knowledge and, ultimately, lead to pro-environmental behaviors. Hosany et al. (2022) defined environmental knowledge as the information individuals possess on environmental or ecological aspects. According to Carmi et al. (2015), environmental knowledge has two dimensions: subjective and objective.

Prior research reported that environmental knowledge had a significant impact on pro-environmental behaviors. Coyle (2005) reported that people with a higher level of knowledge were more likely to engage in pro-environmental actions. Levine and Strube (2012) found that environmental knowledge significantly predicted pro-environmental behaviors. In a study of pro-environmental behaviors of primary students, Otto and Pensini (2017) reported that environmental knowledge mediated an impact of environmental education on pro-environmental behaviors. A study by Casalo et al. (2019) also reported an association between objective knowledge and energy-efficient behaviors, such as using low-energy light bulbs.

Nonetheless, researchers also argue that the indirect effect of environmental knowledge on pro-environmental behaviors should be investigated. Kaiser and Fuhrer (2003) acknowledged that knowledge was not a sufficient predictor of pro-environment behavior. Frick et al. (2004) also suggested that researchers could explain the impact of knowledge on pro-environmental behaviors better if they also investigated its indirect effect. Carmi et al. (2015) empirically examined the impact of environmental knowledge on pro-environmental behaviors and found that environmental emotions mediated the effect. Similarly, Liu et al. (2020) also reported that environmental attitudes and environmental intention mediated environmental knowledge's impact on pro-environmental behaviors. Based on the literature mentioned above, we develop the subsequent two hypotheses as follows:

Hypothesis 3a: Environmental knowledge has a direct effect on pro-environmental behaviors.

Hypothesis 3b: Environmental knowledge has an indirect effect on pro-environmental behaviors.

Impact of family on children's pro-environmental behaviors

Prior literature acknowledged that children learn about pro-environmental behaviors from their parents, both directly through their parents' teaching and indirectly through observing their behaviors. Results from Chawla (1999) showed that pro-environmental values learned from family members through explicit teaching or implicit role modeling were a significant source of children's commitment to environmental protection. Empirical evidence from Molinario et al. (2020) also showed that exposure to pro-environmental social norms during childhood could help shape adulthood's environmental self-identification and ultimately affect the individual's sustainable food consumption. Investigating parents' and children's motivation to perform activities such as separating waste, buying environmentally friendly products, and saving electricity, Grønhøj and Thøgersen (2017) found a strong association between the children's motivation to perform certain types of activities and the parents' motivation of the perform the same types of activities. Francis and Davis (2014) found that authoritative figures, such as parents and teachers, drove the children's socialization process for environmental sustainability. The next hypothesis is set up based on the literature mentioned above.

Hypothesis 4: Parent's pro-environmental behaviors positively affect children's pro-environmental behaviors.

Impact of demographic factors on adolescents' pro-environment behaviors

This study investigates two elements of the demographic factors, namely gender and age. As for the impact of gender, prior literature reported gender differences in environmental attitudes and behaviors. Researchers suggested that women tend to have higher environmental attitudes, concerns, and behaviors than men (Gifford & Nilsson, 2014). Casalo et al. (2019) reported that men had lower levels of pro-environmental behavior than women for all pro-environmental activities they investigated. Olli et al. (2001) found that women exhibited more environmentally friendly behavior than men. Examining children's understanding of and relationship with nature, Pointon (2014) reported that, compared to boys, girls expressed significant concern about nature, realized the need to care for nature, and were more likely to see the interconnection between themselves and nature. The results are consistent with a study by Loughland et al. (2003), which reported that girls were more likely than boys to see a relationship between people and the environment. Eagles and Demare (1999), who investigated the environmental attitudes of six-graders in Canada, found that girls had a higher score in concern for the right and wrong treatment of the environment than boys. Based on the literature mentioned above, this study set up the next hypothesis as follows:

Hypothesis 5: Children's gender has an impact on their pro-environmental behaviors. Girls are more likely to engage in pro-environmental behavior than boys.

As for the impact of age, prior studies acknowledged that age positively impacts children's pro-environmental orientation. Levine and Strube (2012) reported that older students had more favorable environmental attitudes than younger students. An analysis of environmental concern in fourth-grade students by Torkar et al. (2021) showed that the students' altruistic concern for the environment increased with age. According to Easterling et al. (1995), as children age, they are increasingly capable of processing multiple facets of information. By middle childhood, children can develop accurate and detailed representations of the natural world (Easterling et al., 1995, p.535). Gifford and Nilsson (2014) also suggested that their ability to manage a resource sustainably increases as children age, perhaps due to their growing cognitive ability. Based on the literature mentioned above, this study sets up the next hypothesis as follows:

Hypothesis 6: Children's age has an impact on their pro-environmental behaviors. Older children are more likely to engage in pro-environmental behavior than younger children.

Research methodology

Data and sample

This paper utilizes secondary data collected from ninth-grade students by the Research Institute of Policy Evaluation and Development (RIPED) University of the Thai Chamber of Commerce (UTCC).

The survey was conducted in February of 2023 in Samut Sakhon, a province fifty kilometers west of Bangkok. UTCC granted RIPED ethical approval for data collection. The parents of the participating students were informed about the survey and gave consent for their children to participate.

The primary objective of the data collection was to investigate the impact of the COVID-19 pandemic on Thai children's learning outcomes. Samut Sakhon province was chosen as a representative sample for the project because it was at the center of the pandemic at that time. Sixty schools throughout the province were approached, and fifty-eight agreed to participate in the survey. Subsequently, the survey team randomly chose one classroom from each school to complete the questionnaires.

The survey team administered questionnaires to the children in the classrooms, and the students completed the questionnaires independently. For the parents, the survey team asked the children to bring the questionnaires back home to their parents to complete. The student and parent questionnaires were assigned the same household identification number so the research team could match up the children and their parents across the datasets.

The student questionnaire comprises items measuring the children's learning outcomes (for example, their math and science scores), demographics, and other pro-environment-related variables. The parent questionnaire comprises items inquiring about the parents' characteristics, such as age, gender, education level, and pro-environmental behaviors. Note that parents' pro-environmental behaviors are the only

variables from the parent dataset incorporated into the data analysis as an antecedent of children's pro-environmental behaviors.

The survey team received 915 completed questionnaires from the children and 800 completed questionnaires from their parents. Therefore, the sample used to analyze the impact of parents on the children's behaviors was 800 dyadic observations. Among the student respondents, 47.9 % were female, and the average age was 14.7 years old (SD= 0.5 years, ranging from 13 to 16 years). Among the parent respondents, 68.6 % were female, and the average age was 44.5 years old (SD= 9.2 years, ranging from 21 to 81 years).

Measures

Environmental concern (CEC)

In this study, children's environmental concern is measured by items adapted from the measurement of children's worries used by Evans *et al.* (2007). The children were asked how much they were worried about i) air pollution, ii) water pollution, iii) inadequate resources for the world population, iv) the amount of waste humans generate, and v) shrinking forests or community green space. Their answers were recorded on a five-point Likert scale, ranging from '*not worried*' to '*very worried.'*

Environmental belief (CEB)

Children's environmental beliefs are measured by items adapted from measurements of the rights of nature dimension by Manoli *et al*. (2007) and items measuring environmental values used by Kaiser *et al*. (1999). The children were asked if they agree that i) all organisms' lives are precious and worth preserving, ii) the earth's value does not depend on people but is valuable in itself, iii) all things, whether human, animals, plants, have the right to exist, and iv) nature is fragile and can be easily destroyed. Their answers were recorded on a five-point Likert scale, ranging from *'strongly disagree'* to '*strongly agree.'*

Environmental behaviors (CB)

Five items adapted from measurements by Heyl et al. (2013) and Evans et al. (2007) measure children's pro-environmental behaviors in two dimensions, including resource conservation (energy and water) and recycling behaviors. The children were asked how frequently they perform the following activities, including i) turning off the lights when leaving a room or when there is enough natural light, ii) turning off the TV when nobody is watching it, or they are doing other things, iii) turning off the water while brushing their teeth, and iv) throwing away empty glass bottles into a recycling bin. Their answers were recorded on a three-point Likert scale, ranging from '*never'* to '*always'*.

Environmental knowledge (CEK)

This study examines children's environmental knowledge levels in terms of general scientific knowledge. The measurements were selected from a list of environmental objective knowledge questions developed by Carmi *et al.*

(2015). The children answered eight true/false questions regarding environmental knowledge, such as '*carbon dioxide contributes to the creation of the greenhouse effect,*' '*plastic bottles can be recycled,*' and *'a drop of groundwater can become part of a cloud in the future.'* The children received one point for each question they answered correctly and zero points for the question they answered incorrectly. The total score each child received was then used as a continuous variable to represent his/her level of environmental knowledge in our analysis.

Parents environmental behaviors (PB)

The parents' pro-environmental behaviors are measured by four items, adapted from measurements used by Kaiser *et al.* (2003), representing waste avoidance and energy-saving behaviors. The parents were asked how often they perform four activities, including i) using energy-saving light bulbs, ii) separating waste, iii) buying electronic appliances with energy-saving labels, and iv) using cloth bags when going shopping. The answers were recorded on a three-point Likert scale ranging from '*never*' to '*always.*'

Data analysis

Descriptive statistics

The statistical analyses in this study were conducted using Stata software. Table 1 provides summary statistics of the main measures and their correlation coefficients. The results indicate that children's pro-environmental behaviors have positive and significant correlations with all other variables in the model. The children and the parents often perform pro-environmental behaviors (a mean score of 2.51 and 2.29 out of 3, respectively).

Table 1 Summary statistics of the main measures and their correlations

		1	2	3	4	5	Mean	SD	Min	Max
1	CEC (Ave.)	1					3.14	0.81	1	5
2	CEB (Ave.)	0.33***	1				4.04	0.68	1	5
3	CEK	0.13***	0.13***	1			5.76	1.21	1	8
4	PB (Ave.)	0.12***	0.12**	0.12***	1		2.29	0.43	1	3
5	CB (Ave.)	0.21***	0.23***	0.13***	0.29***	1	2.51	0.36	1.25	3

*Note: **=p < 0.01, ***=p<.001*
CEC (Ave.) = Average value of children's pro-environmental concerns
CEB (Ave.) = Average value of children's pro-environmental beliefs
CEK =Total score of children's pro-environmental knowledge
PB (Ave.) = Average value of parent's pro-environmental behaviors
CB (Ave.) = Average value of children's pro-environmental behaviors

Results indicate a mean score of 4.04 for children's environmental beliefs, which implies that children strongly believe in the importance of nature. As for children's environmental concerns, the results indicate a mean score of 3.14, a magnitude slightly above the scale's midpoint. The result implies that, on average, the children are worried about the environment. In addition, the results also show that the children have a certain level of environmental knowledge. On average, they could answer around 5 (out of 8) questions correctly.

Exploratory factor analysis

All measurements for each construct, except the environmental knowledge, were then factor analyzed using principal component analysis with orthogonal varimax rotation. Table 2 shows the factor loadings of all constructs, together with their Eigenvalues. Most item loadings were above the threshold of 0.70, except for a few. These four factors explained 57.8 % of the variance of the sample data. Note that this study treats environmental knowledge as an observed variable, not a latent variable.

Table 2 Measurement items

Factors and items	Factor Loadings	Eigenvalue	Variance explained	Cronbach's alpha
Children's environmental concerns (CEC)		4.34	25.53%	0.88
I am concerned about the following issue.				
Air pollution (Air)	0.83			
Water pollution (Water)	0.85			
Inadequate resources for world population (Resource)	0.81			
Amount of waste humans generate (Waste)	0.79			
Shrinking forests or community greenspace (Forest)	0.74			
Children's environmental beliefs (CEB)		2.21	13.04%	0.78
I agree with the following sentence.				
All organisms' lives are precious and worth preserving. (Precious)	0.80			
The earth's value does not depend on people, but it is valuable in itself. (Value)	0.72			
All things, whether human, animal, or plant, have the right to exist. (Rights)	0.80			
Nature is fragile and can be easily destroyed. (Fragile)	0.73			
Children's environmental behaviors (CB)		1.88	11.11%	0.61
I do the following activities.				
I turn off the lights when leaving a room, or there is enough natural light. (CEnergy1)	0.71			
I turn off the TV when nobody is watching it, or I am doing other things. (CEnergy2)	0.76			
I turn off the water while brushing my teeth. (CWater)	0.62			
I throw away empty glass bottles into a recycling bin. (CRecycle)	0.52			
Parents' environmental behaviors (PB)		1.39	8.15%	0.67
I do the following activities.				
I use energy-saving bulbs. (PEnergy1)	0.72			
I separate waste. (PWaste1)	0.66			
I buy electronics with an energy-efficient label. (PEnergy2)	0.73			
I use cloth bags when going shopping. (PWaste2)	0.68			
Total variance explained			57.83 %	

Hypothesis testing and results

This study performed structural equation modeling to test the proposed hypotheses. Maximum likelihood estimates were used to measure parameters in the proposed models. This study uses the root mean square error of approximation (RMSEA) and the comparative fit index (CFI) to evaluate the model's goodness of fit. According to statistical conventions, a model will reflect a good fit with the structure of the empirical data if CFI ≥ 0.95 and RMSEA < 0.06 and will reflect a reasonable fit if CFI ≥ 0.90 and RMSEA < 0.08 (Hu & Bentler, 1999).

This study tests three structural equation models: the main model estimates all constructs' direct effects on children's pro-environmental behaviors, the first alternative model estimates the indirect impact of environmental knowledge via environmental concerns and beliefs, and the second alternative model estimates the indirect impacts of environmental knowledge and gender simultaneously. All models are considered to have a reasonable fit with the data, with the RMSEA indices lower than 0.08 and the CFIs equal to 0.91 and 0.89, respectively. Results from each model are shown in the second, third, and fourth columns of Table 3. (Please also see the appendix for the table and figures illustrating estimated parameters from each model.)

Table 3 Coefficients from the tested models

Dependent: CB	**Main Model**	**First Alternative Model**	**Second Alternative Model**
CEC	0.047*	0.057**	0.057**
CEB	0.084***	0.091***	0.092***
CEK	0.013	0.011	0.011
PB	0.271***	0.272***	0.272***
CGender	0.033	0.034	0.029
CAge	0.094***	0.093***	0.093***
Dependent: CEC			
CEK		0.082***	0.093**
CGender			0.187***
Dependent: CEB			
CEK		0.058**	0.069**
CGender			0.188***
Number of observations	754	754	754
CFI	0.91	0.89	0.89
RMSEA	0.06	0.06	0.06
Chi-square	497.51	625.75	601.62
degree of freedom	152	159	157
p > chi2	0	0	0

*Note: * = p<0.05, **= p<0.01, ***= p<0.001*
CGender = Children's gender
CAge = Children's age

The test results from the main model confirm Hypothesis 1, showing that children's environmental concerns directly and positively impact their pro-environmental behaviors (coefficient = 0.047, $p<0.05$). That means adolescents who are more concerned about the environment will engage more in pro-environmental activities. In addition, the test results also confirm Hypothesis 2, showing that children's environmental beliefs directly and positively impact pro-environmental behavior (coefficient = 0.084, $p<0.001$). That means adolescents with a stronger belief in the importance of nature will engage more in pro-environmental activities.

Nonetheless, results from our main model showed that children's environmental knowledge does not directly affect children's pro-environmental behavior (coefficient = 0.013, $p>0.05$). As a result, Hypothesis 3a is not supported. Thus, this study investigates the environmental knowledge construct further. We expect that children's environmental knowledge might indirectly affect their pro-environmental behaviors, as suggested by Hypothesis 3b.

Test results from the first alternative model confirm Hypothesis 3b, showing that children's environmental knowledge indirectly influences their pro-environmental behaviors (see the third column of Table 3). The impact is mediated by environmental concerns (coefficient = 0.082, $p<0.001$) and beliefs (coefficient = 0.058, $p<0.01$). In other words, adolescents with more knowledge about the environment display more pro-environmental behaviors because they are more concerned about the environment and have a stronger belief in the importance of nature.

As for the impact of parents' behaviors, the test results from all models confirm Hypothesis 4, showing that parent's pro-environmental behaviors directly and positively impact children's pro-environmental behavior (coefficient = 0.27, $p<0.001$). The results underscore the critical role of parents in shaping their children's behaviors, as suggested in prior research.

Results from the main model did not confirm Hypothesis 5 (coefficient = 0.033, $p>0.05$), reflecting that gender does not directly affect the children's pro-environmental behaviors. Since prior studies had reported no gender differences in adults' (Levine & Strube, 2012) and children's environmental attitudes (Evans *et al*., 2007), this study investigates the gender construct further. This study speculates that gender affects pro-environmental behaviors indirectly, and environmental beliefs and concerns mediate the impact. Accordingly, we run the second alternative model to estimate the indirect impacts of environmental knowledge and gender simultaneously.

Findings from the second alternative model confirmed this speculation (see the fourth column of Table 3). Gender has an indirect influence on children's pro-environmental behaviors, and the influence is mediated by environmental concerns (coefficient = 0.187, $p<0.001$) and beliefs (coefficient = 0.188, $p<0.001$). In other words, girls display more pro-environmental behaviors because they are more concerned about the environment and have a stronger belief in the importance of nature than boys.

Lastly, the test results confirmed Hypothesis 6, showing that age positively impacts children's pro-environmental

behavior across all models (coefficient = 0.09, $p<0.001$). That is, older children engage more in pro-environmental behaviors than younger children.

Discussion and conclusions

With more than fourteen million children and adolescents in Thailand, this study aims to explore pro-environmental behaviors displayed by Thai adolescents. The pro-environmental behaviors focused on in this study comprise two dimensions: resource conservation (energy and water-saving) and recycling behaviors. This study also examines how the adolescents' demographic, psychological, and social factors affect their pro-environmental behaviors. This study hypothesizes that adolescents with higher environmental concerns, beliefs, and knowledge will display more pro-environmental behaviors. The adolescents' pro-environmental behaviors are also expected to be affected by their age, gender, and parents' behaviors.

This study analyzed a secondary dataset from Samut Sakhon province in rural Thailand. Results show that children often performed pro-environmental behaviors, firmly believed in the importance of nature, and were moderately worried about the environment. The children are found to have a certain level of objective knowledge about the environment.

Results from the structural equation modeling showed that children's pro-environmental behaviors are directly influenced by their age, environmental beliefs, environmental concerns, and parents' pro-environmental behaviors. In contrast, children's environmental knowledge and gender indirectly affect children's pro-environmental behaviors. The impacts of environmental knowledge and gender are mediated by the children's environmental beliefs and concerns.

The above findings provide several theoretical implications. Firstly, the findings emphasize the importance of environmental attitudes toward adolescents' sustainable behaviors. The results show that attitudes, represented in the model by environmental concerns and beliefs, have direct and mediating effects on adolescents' pro-environmental behaviors. Moreover, this study measures pro-environmental behaviors via self-reported behaviors, not behavioral intentions. The results should present a clearer picture of the relationships between the pro-environmental behaviors and their antecedents. Lastly, this study contributes to the discussion of environmental knowledge's impact on pro-environmental behaviors by testing for the indirect effect of environmental knowledge, as suggested by prior studies (Molinario *et al*.,2020; Kaiser & Fuhrer, 2003).

This study also provides managerial implications for marketing practitioners. Firstly, the findings showing direct and positive impacts of environmental belief and environmental concern on pro-environmental behaviors imply that to encourage pro-environmental behaviors in children, marketers must communicate to raise levels of their environmental concerns or to influence their beliefs in the importance of nature. Prior research reported that children who talked about the environment at home, read environmental books and watched environmental television or movies had a

higher score in concern for the right and wrong treatment of the environment (Eagles & Demare, 1999). As such, if marketers can provide appropriate environmental content for adolescents, this might help heighten their environmental concerns. In doing so, marketers may choose marketing communication channels appropriate for reaching adolescents effectively, such as social media platforms. This recommendation is consistent with reports from prior literature suggesting social media is an essential platform for reaching young consumers compared to traditional media (Boerman & Van Reijmersdal, 2020).

The second practical implication is based on the finding that there was a gender difference in children's pro-environmental behaviors, and the impact is due to differences in the levels of environmental concerns and beliefs. As a result, when communicating with adolescents, marketers must remember that boys perform pro-environmental activities less than girls because they have lower levels of environmental concerns and beliefs than girls. Marketers should create communication campaigns targeting boys to increase their environmental beliefs and concerns. Marketers may utilize marketing channels suitable to boys' nature and use creative media to help improve their engagement and learning. Prior research suggested that much of boy culture involved playing video games (Engerman et al., 2018). Educators could use video games to help players learn about specific social issues (Sanford & Madill, 2007). Accordingly, marketers may use video games to enhance boys' learning about the environment.

The third practical implication is related to the finding that parents' pro-environmental behavior directly and positively affects children's pro-environmental behavior. Since children could learn directly from their parents' teaching and indirectly from observing their parents' actions, this study suggests that marketers can offer various campaigns and aim for different outcomes. On the one hand, marketers may offer sustainability campaigns targeting parents as role models for their children to encourage them to carry out more pro-environmental behaviors. On the other hand, marketers may offer campaigns to promote pro-environmental behaviors among family members. These campaigns can encourage activities that parents and children can perform together daily, such as recycling, waste sorting, and energy-saving behaviors.

The finding regarding the indirect impact of environmental knowledge on children's pro-environmental behavior also provides a policy implication. Policymakers have long been encouraging environmental education programs for children, hoping to enhance their environmental knowledge and, ultimately, to improve their pro-environmental behaviors. Nonetheless, this study showed that environmental knowledge alone is insufficient to bring about pro-environmental behaviors. Knowledge only matters when it can affect the children's environmental concerns and beliefs. As a result, a puzzle for policymakers to solve is to think of how to design an environmental education program that not only educates the children but simultaneously heightens their concerns for the environment and belief in the importance of nature.

Limitations and further research

This study has some limitations that need to be addressed in future research. Firstly, this study examined a convenience sample from one province in a rural area of Thailand and explored only the behaviors of ninth-grade students. Therefore, the findings are not generalizable to the Thai adolescent population. The environmental contexts of adolescents who live in rural and urban areas and those who belong to different age groups are diverse. As a result, researchers should use additional representative samples from other places and age cohorts in the future. Secondly, this study investigated Thai adolescents' pro-environmental behaviors using cross-sectional data. To understand the dynamics of adolescents' pro-environmental behaviors over time, researchers may want to use longitudinal data to observe adolescents' pro-environmental behaviors in the future. It will be interesting to see how the children's pro-environmental behaviors and the relationships with their antecedents change with time. Thirdly, this study investigated only one dimension of environmental knowledge, i.e., objective knowledge. Since environmental knowledge is known to comprise another dimension, i.e., subjective knowledge, future studies may expand the scope of the research and examine the impact of subjective knowledge on children's pro-environmental behavior.

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Appendix

Table 4 Average Variance Extracted (AVE) for all latent constructs across the three models.

Constructs	Main Model	First Alternative Model	Second Alternative Model
CB	0.2898	0.2821	0.2831
CEC	0.5942	0.5942	0.5942
CEB	0.4829	0.4837	0.4838
PB	0.3367	0.3366	0.3366

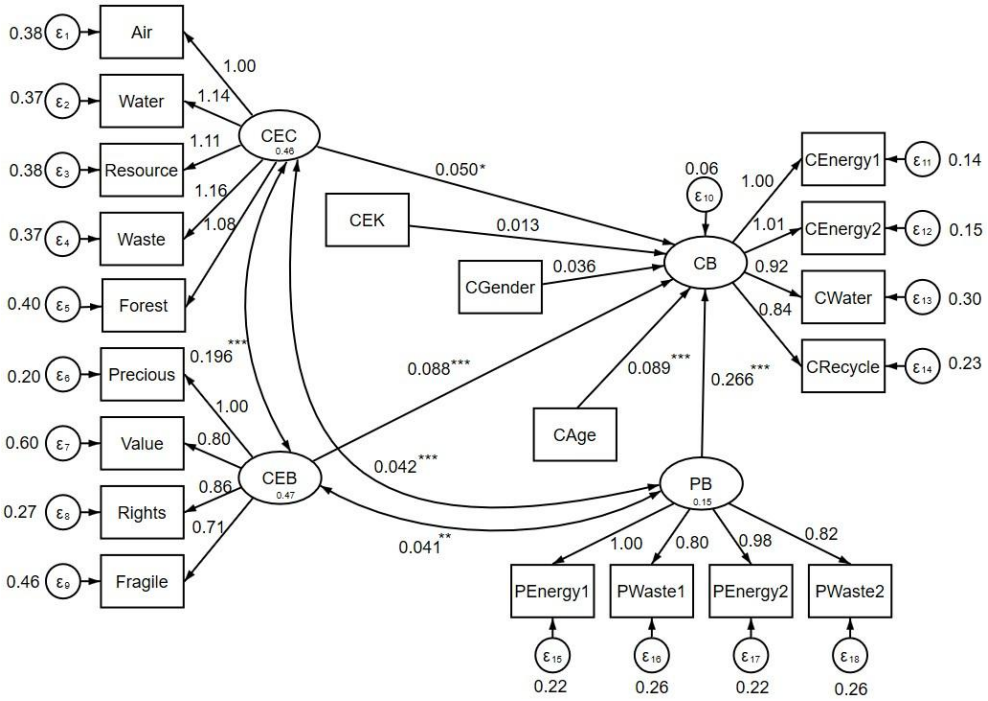

Figure 1 Estimated parameters from the main model

*Note: * = p<0.05, **= p<0.01, ***= p<0.001*

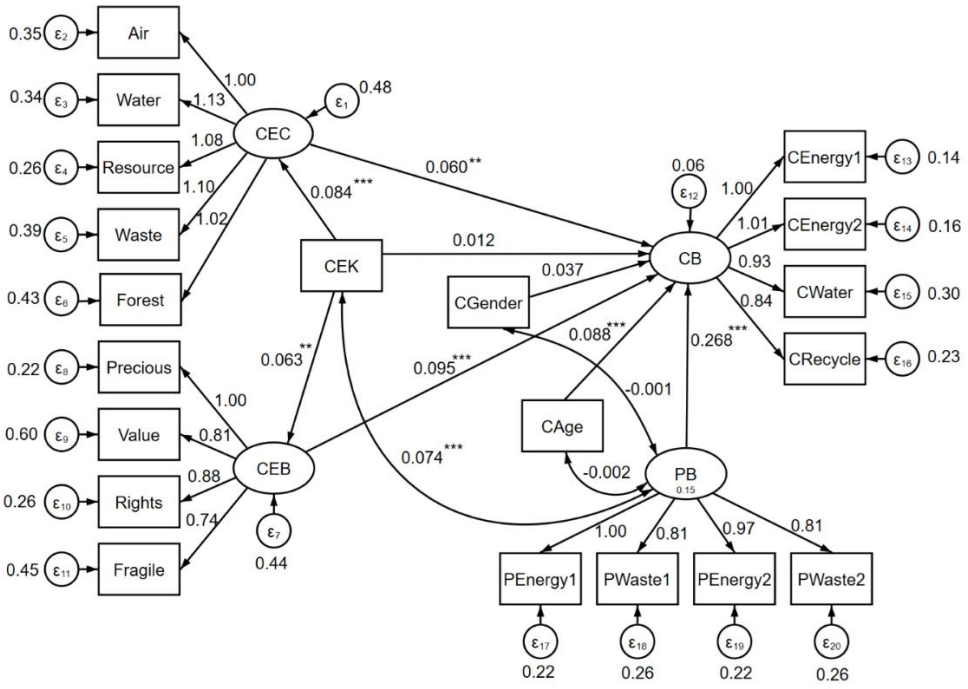

Figure 2 Estimated parameters from the first alternative model

*Note: * = p<0.05, **= p<0.01, ***= p<0.001*

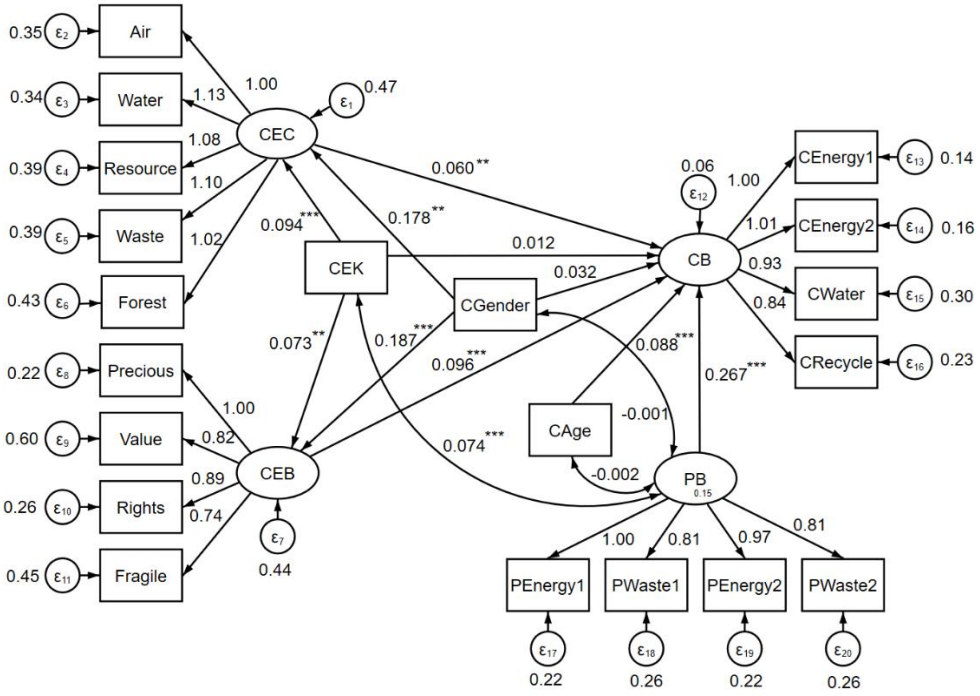

Figure 3 Estimated parameters from the second alternative model

*Note: * = p<0.05, **= p<0.01, ***= p<0.001*