



## Research article

## Antecedents of Thai student teacher sustainable consumption behavior



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## ARTICLE INFO

## Keywords:

Psychology  
 Education sustainability  
 Environmental education  
 Psychological state  
 Psychological traits  
 Science education  
 Situational  
 Student teachers  
 Thailand

## ABSTRACT

A new area of research and intervention has arisen, namely the psychology of sustainability. Therefore, this study investigates how an undergraduate student teacher's psychological traits, their psychological state, their situation, and environmental education affect their sustainable consumption behavior. Two sample groups were selected from ten Thai university education programs' science ( $n = 400$ ) and social science ( $n = 400$ ) colleges nationwide. The research instrument used randomized multistage questionnaires for each group, which used a five-level scale to evaluate each student teacher's item agreement. The analysis of the causal relationship models used LISREL 9.10 which determined that both models and their four causal variables positively affected a Thai student teacher's sustainable consumption behavior (SCB). For the science education student teachers, these were the situation (SIT = 0.87), environmental education (EDU = 0.34), their psychological state (STATE = 0.22), and their psychological traits (TRAITS = 0.22). For the social science education student teachers, these were SIT = 0.85, STATE = 0.25, EDU = 0.08, and TRAITS = 0.04. Combined, they can explain 92% (science program) and 82% (social science program) of variance in a student teacher's SCB. The study also determined that EDU's attitude and conservation factors were critical, which most probably increased in prominence due to media awareness efforts. There also appears to be greater individual responsibility in SCB as well as the perceived need to conserve resources. Finally, this study further confirmed numerous other studies in which humans have a strong desire to fit in and will conform to the behavior of those around them, with this study concluding that each student teacher's situation was determined to have a moderate to strong influence on either their psychological state or environmental education. This study contributed to the literature as it investigated 18 aspects related to four casual variables affecting a Thai student teacher's sustainable consumption behavior. The study was unique in that it classified and compared opinions from two diverse university teaching programs nationwide (Science and Social Science), whose results can help educational leaders identify and develop in-depth, SCB future programs.

## 1. Introduction

In 2015 the United Nations released a 15-year vision of Sustainable Development Goals (SDGs), including 17 primary goals, of which 169 targets were outlined (Di Fabio, 2017; United Nations, 2015). The SDGs were a continuation of the previously uncompleted Millennium Development Goals, both of which have been stated as critically important for humanity and the planet.

In 2019, Thailand welcomed nearly 40 million international visitors (Wongkhajompaibul and Sornsaruht, 2019). As such, stakeholders and public officials have become acutely aware of the essential and fragile nature of Thailand's environment and economic sustainability (Committee for Sustainable Development, 2017). From a deepening concern about plastic waste disposal/recycling to destination over-tourism (Achakulwisut, 2019; Chalcharoenwattana and Pharino, 2015; Mongkolnchaiarunya,

2005; Na Thalang et al., 2020; "Overtourism," 2019) Thailand has made great strides in tackling the U.N.'s SDGs and their related targets (Committee for Sustainable Development, 2017). Specifically, related issues such as sustainable consumption production (SCP) (de Zoysa, 2009; Tseng et al., 2016), environmentally friendly consumption, and green consumption (Haraty and Bitar, 2019; Nam et al., 2017), and environmental sustainability have become areas of concern for many global citizens and educators.

Furthermore, the United Nations Environmental Programme (UNEP) has categorized sustainable consumer behaviors (SCB) according to a human's main life 'functions,' one of which is 'education' (United Nations Environment Programme, 2002). Furthermore, this includes teaching sustainable living and the promotion of sustainability (Kostadinova, 2016). The UNEP is also engaged in environmental education at the university level, including a postgraduate course on Environmental

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Management for Developing Countries, and a new initiative with the United Nations University to establish a Global Virtual University to promote environmental and development education via the Internet.

Moreover, Heiskanen and Pantzar (1997) in the Netherlands have stated that there is no clear definition of sustainable consumption but environmental problems are one of the most significant issues of our times. However, it has been suggested that sustainable consumption is when the needs of the present generations are met without compromising the needs of future ones (Brundtland Report, 1987). This is consistent with reporting from the United Nations in which sustainable consumption and production is stated to be concerned with doing more and better with less. It is also about decoupling economic growth from environmental degradation while increasing resource efficiency and promoting sustainable lifestyles. Sustainable consumption and production can also contribute significantly to the alleviation of poverty and the transition towards low-carbon and green economies (Chalcharoenwattana and Pharino, 2015; United Nations, 2020).

However, sustainable consumption is also something quite different, as it is an issue of consumption patterns as a totality, not buying greener shampoo or recycling soda bottles (Heiskanen and Pantzar, 1997). Some have suggested the requirement for Western economies to decrease materials use sharply while shifting to less resource-intensive types of consumption (United Nations Environment Programme, 2015). Such a program could potentially allow for the pursuit of social sustainability, as a decrease in materials intensity may correspond with an increase in the labor intensity of goods and services (Heiskanen and Pantzar, 1997).

In Thailand, many of these concepts have been addressed in Thailand's National Economic and Social Development Plan (NESDP) agendas over the past 20 years, including both the 11th NESDP (2012–2016) and the 12th NESDP (2017–2021) (Office of the National Economic and Social Development Board, n/d). Additionally, in Thailand, the 'sufficiency economy philosophy (SEP)', which was conceptualized by Thailand's King Bhumibol Adulyadej The Great in response to the 1997 financial crisis, has become a guiding light in environmental and sustainability policy-making decisions. In simple terms, SEP teaches the Thai people how to live a sustainable life and how to become more self-reliant (The Chaipattana Foundation, 2017; Wibulwasdi et al., 2012).

A fundamental precept under these guiding principles is *sufficiency is moderation*. *Risk management* is also vital in turbulent times, with the *pursuit of knowledge* critical for the ideas of a sufficiency economy to work. There must also be an emphasis on *morals and ethics* as well as consideration for a *spiritual dimension*. Moreover, the philosophy emphasizes *foundation-building* and *bottom-up approaches*, which allows individuals to stand on their own. This differs sharply from other economic development concepts such as 'trickle-down.' Therefore, the SEP developmental path emphasizes a broader and more balanced idea of sustainability (Wibulwasdi et al., 2012).

Moreover, an outgrowth of SEP and other sustainability objectives has been the desire to adjust consumption behavior to a low carbon society that is environmentally friendly (Schanes et al., 2016). This is consistent with a new area of research and intervention, in which organizational well-being is linked to the rising psychology of sustainability (Di Fabio, 2017). This new area of thought also goes beyond seeing sustainability in terms of the ecological and socio-economic environment (Brundtland Report, 1987), but expands the horizon into terms of improving the quality of life for every human being (Di Fabio, 2017).

Thailand's SEP is also consistent with the Intergovernmental Panel on Climate Change (IPCC) mitigation report, which elaborates on how lifestyle, culture, and an individual's behavior significantly affect a society's energy use and associated emissions (Pachauri and Meyer, 2014). Other research has suggested that a sharing economy, stabilization, and lower consumption, along with the adoption of behavioral changes can have a significant impact on mitigation potential (Pachauri and Meyer, 2014; United Nations Environment Programme, 2015). Another way of accomplishing this is by encouraging individuals in all sectors to be environmentally responsible by raising their public

awareness (Hungerford and Volk, 1990; Pachauri and Meyer, 2014; United Nations Environment Programme, 2015; Vantamay, 2018). The additional focus must be on waste reduction and disposal (Wangwong-watana, 2009), non-hazardous chemical use, and sustainable governmental management processes. These goals can thereby be realized by using formal and informal educational processes (Diego et al., 2019), which change attitudes and creates sustainable consumption values. By so doing, students and citizens can understand sustainable consumption, which should focus on influencing consumer choices and avoiding locked-in techno-economic structures (Shah et al., 2012). Therefore, this allows each individual to play a role in a transformative, sustainable consumption society from the bottom-up.

Moreover, given the critical nature of these concerns in creating a sustainable, sufficient, and environmentally healthy world for both today and tomorrow, the author set out to investigate the causal relationships of sustainable consumption behavior (SCB) of Thai student teachers, who are the influencers and leaders of tomorrow.

Firstly, the researcher adopted research from Inayatullah (2009), who has provided insight into how the European Union (E.U.) views the world's economy and environmental problems. Key elements include the social and physical environment as well as their interaction between these two realms. However, these E.U. concepts can most likely find their foundations in previous research in which an individual's *interaction* is discussed as four personality models. These include *interactionism*, *situationism*, *trait psychology*, and *psychodynamics* (Endler, 1993; Tett and Burnett, 2003; Walsh et al., 1992).

Furthermore, research suggests that human behavior can be explained by psycho-behavioral science's use of the *interactionism model* to select, interpret, and change their situations (Terborg, 1981). In Thailand, a framework for determining the causes of human behavior, which has been elaborated on in Thai research in what translates as the *Ethical Tree Theory* (ETT) (Bhanthumnavin, 1995, 2000, 2017).

In the ETT, it is stated that in determining the causes of behavior, there are four main investigation lines, with the first being the *situational* cause. The situational cause includes the various things that surround people, such as social norms and family support. The next ETT cause is the original *psychological* cause, which consists of the mental trait or personality that exists due to the social transfer of such items as mental health, social experiences, intelligence, values, etc. The third cause is the interaction between the cause of the situation and the original mental state. This is also referred to as *mechanical interaction*. The fourth and final cause within the ETT model is the cause of the mental nature according to the situation. This is also known as an *organismic interaction*, which is also the attitude towards something or stress about a particular subject or knowledge about a thing (Boonrourgrut and Huang, 2018).

Further research into the environmentally friendly consumption behavior of students and the public identified three exogenous latent variables influencing SCB (Figuerola-García et al., 2018). These were environmental, consisting of family, friends, traditions, education, and positive consumer perceptions of products. Also, within the 21st century, positive psychological approaches have been introduced to well-being based on improving individual and organizational resources (Di Fabio, 2017). Therefore, it must be remembered that sustainable development is a lifelong endeavor, involving individuals, institutions, and societies (Glasser, 2009).

As such, I felt a great need to investigate how Thai student teachers were influenced by these aspects of sustainable consumption behavior. As these are the influencers of tomorrow's leaders, their specific awareness of these factors has the potential to make significant changes by their transfer of knowledge, skills, attitudes, and good behavior in sustainable consumption. These individuals also have the potential to act as role models and a vital force in preserving the environment for the youth of the country. Also, readers of this study will have a greater awareness of these influential factors.

Therefore, I see an appropriate need to study and develop causal relationship models of SCB for Thai student teachers as a whole.

Moreover, the study's modeling is built on a comparison of student teachers enrolled in either a science faculty program (SG) and a social science faculty (SSG) program. Further strength to the results is the large 400 individual sample size from each program dispersed across ten Thai regional universities. From the identified latent variables, eight hypotheses were developed which were used in the modeling for each program. Questionnaire items investigated each group's appropriate SCB behavior, as well as a result of each aspect. Examples of these aspects include the practice of product selection and purchase, resource-saving behavior, learning behavior, and participation.

Finally, the essential nature of disseminating environmental knowledge behavior is reported. This includes the development and promotion of knowledge, raising awareness of sustainable consumption by youth, and the general population. Hopefully, the outcome of the study will help in modifying consumption patterns and behaviors, leading to a more sustainable and environmentally friendly national economy and social development path.

## 2. Literature review

### 2.1. Psychological traits (TRAITS)

Some have hypothesized that psychological traits are how institutions shape childhood and adolescence experiences and their behavior (Engel and Weber, 2007). Others feel 'traits' are personality characteristics that are genetic in origin and thus difficult to modify (Eysenck, 1990). However, others feel that personality is a phenomenon within itself, and not as a result of individual environmental dynamics (Boyle, 2008). This is consistent with the previously discussed ETT, in which psychological causes are modeled into two sections including the roots and the trunk, with the trunk consisting of five psychological traits. These traits are the motive for achievement, future orientation and self-control, internal locus of control, moral reasoning, and attitude values and morals (Pimdee, 2017). Moreover, locus of control can measure a student's expectancies regarding their ability to affect what happens to them based on how they behave, with numerous studies suggesting that external locus of control is associated with many adverse personal, social, academic and health outcomes (Golding et al., 2017).

### 2.2. Situation (SIT)

Over the years, psychological researchers have placed great importance in studying the role of the college student, with numerous higher education institutions have become the focus of many situational analyses. However, these studies can never seem to agree on what factors play key roles in a student's situation (Salili and Hau, 1994; Shackle, 2019). Furthermore, situationism is a somewhat controversial theory in which an individual's situation is thought to influence their behavior instead of their personal traits. Moreover, their behavior is believed to be affected by external, situational factors rather than internal characteristics or motivations (Tett and Burnett, 2003). Additionally, it has been conceptualized that human behavior forms in the context of weak and strong situations, and that extreme circumstance constrain the expression of personality (Mischel, 1977). Therefore, their behavior is determined more by the situation than personality. In ETT, unlike the trunk, the roots contain four elements, including mental faculties, intelligence, social skills, and experience (Pimdee, 2017). Moreover, in the ETT, the behavior is thought to be more situation-specific, and those situations are more person-specific than is commonly recognized (Bowers, 1973).

### 2.3. Environmental education (EDU)

Research concerning EDU identified three goals in affecting pro-environmental behavior, which was identified as hedonic (pleasure), the enhancing one's resources (gain), and acting appropriately (normative) (Steg et al., 2016). Environmental education should also be involved

with developing a student's social and personal potential and the creation of environmental awareness, with the ultimate aim of education being the shaping of human behavior (Hungerford and Volk, 1990). Furthermore, understanding the importance of EDU in SCB is central to any paradigm shift in how society approaches environmental problems (Trudel, 2019).

Moreover, in Tbilisi, Georgia in 1977 an environmental education conference brought together global leaders for the first time to discuss five critical aspects in environmental education. These included how environmental awareness was created through knowledge, participation, attitudes, and skills (Tbilisi Declaration, 1977) However, even before the Tbilisi Declaration, previous research had reported that EDU should be involved with the production of citizens who are aware of their biophysical environment, its problems, its solutions, with motivation to work towards a standard solution (Stapp, 1969).

### 2.4. Psychological state (STATE)

In research concerning consumer responsibility and sustainable consumption, it was reported that consumer responsibility may be a better predictor of SCB than attitudes towards sustainability (Luchs et al., 2015). Furthermore, consumer responsibility was discussed in terms of cognition, emotion, a moral imperative, and finally, as socioculturally shaped. Other research has suggested that an individual's psychological state is a mental process, which is dynamic resulting from the present situation combined with the nature of the individual's spirituality (Vasilyuk, 1991). Therefore, STATE is closely related to behavior (Bhanthumnavin, 1995, 2000, 2017), which consists of attitude, stress, and knowledge (Pimdee, 2017). This is consistent from research from Brazil, in which the importance of teaching students the aspects of good mental health was detailed (Rodrigues et al., 2012). Finally, other studies have shown that attitude can play a significant role in an individual's unsustainable consumption behavior (Sharma and Rani, 2014).

### 2.5. Proposed hypotheses

From the analysis of the related literature, eight hypotheses were developed for each of the study's two groups. Figure 1 presents the proposed path model showing the latent variables and their hypotheses.

- H1. TRAITS directly and significantly influences EDU
- H2. TRAITS directly and significantly influences STATE
- H3. SIT directly and significantly influences EDU
- H4. SIT directly and significantly influences STATE
- H5. SIT directly and significantly influences SCB
- H6. EDU directly and significantly influences SCB
- H7. EDU directly and significantly influences STATE
- H8. STATE directly and significantly influences SCB

## 3. Materials and methods

Tool and methods used to assure reliability and validity included the use of a confirmatory factor analysis (CFA) and goodness-of-fit (GOF) assessment, before the use of structural equation modeling (SEM) to assess hypotheses validity. Approval and ethics clearance for the study were obtained from the King Mongkut's Institute of Technology Ladkrabang (KMUTL) Human Ethics Committee before consultation with experts relating to the questionnaire's design. An informed consent form for each of the study's pilot-survey group and main study's student teachers was also obtained. At every step, the anonymity of the participants was considered and ensured. The methods described are in detail sufficient to understand the approach used and appropriate statistical tests which are applied.

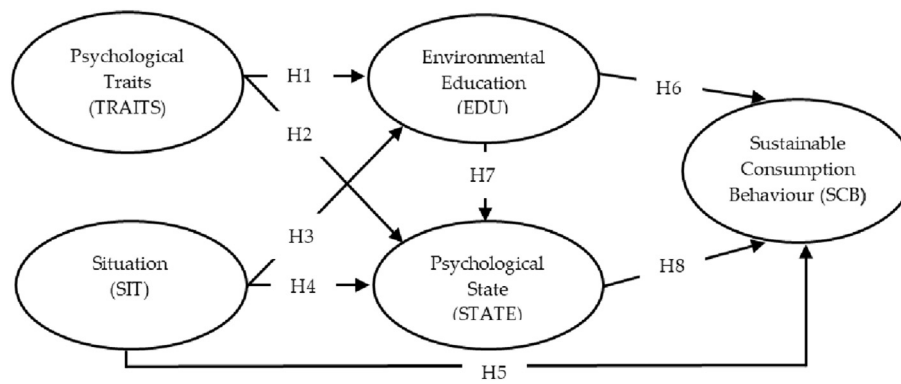


Figure 1. Thai student teacher's sustainable consumption behavior framework.

### 3.1. Population

The study's population was undergraduate student teachers in science-related fields (SG) (e.g., chemistry, biology, physics, mathematics, and environmental studies) and social science-related (SSG) fields (e.g., social studies, arts, languages, music education, elementary education, and childhood education). At the time of the study, the population size was approximately 94,600 student teachers who were enrolled in teacher training programs at ten Thai Universities.

Student teachers are assigned full-time to schools for their one-year teaching practicum internship (Prabjandee, 2019) in their fifth academic year. During this period, each student-teacher is assigned a 'mentor/advisor,' with each student-teacher expected to teach exactly as a full-time teacher during their one-year internship. Additionally, each month a supervising university professor/teacher from each student teacher's home university is sent to the student teacher's internship location to discuss any issues and evaluate their performance. At the end of each term, there is an evaluation from the mentor and the student teacher's university supervisor who jointly decide whether the student-teacher is passing or failing.

### 3.2. Sample size determination

Prior studies have suggested that the statistical power and precision of CFA and SEM parameter estimates are influenced by the sample size (Brown, 2015; Kyriazos, 2018). Additionally, Monte Carlo simulation results using CFA models suggest a research sample size  $\geq 200$  individuals is sufficient (Loehlin, 1992). In this study, the author defined the size of each sample group as being equal to 400, for a total of 800. The sampling was then undertaken using multistage random sampling (Kanyacome et al., 2012). According to Crawford (1990), this is a process in which the population is comprised of many primary sampling units (PSU's), each of

which is made up of second stage units in each selected PSU. This process then continues down to the final sampling unit, with the sampling ideally being random at each stage. Furthermore, simple random sampling using the lottery method for each of the 10 Universities in five Thai regions was used. This assured that each university had an equal chance of inclusion in the sample (Vantamay, 2018). Thereafter, from each institution's Faculty of Education, 40 science and 40 social science student teachers were selected. Stratified random sampling was subsequently conducted according to gender when the sample size of each gender from each region was the same.

### 3.3. Data collection

A research team was used to distribute and collect each questionnaire from each undergraduate student teacher identified for the study's survey. Table 1 details the initial sampling objectives of student teachers for each program, university, and region. From each university's Faculty of Education, 80 students were randomly selected. Multiple survey efforts were required due to incomplete questionnaires. Subsequently, the questionnaires were classified according to programs, with each group containing 400 student teachers.

### 3.4. Research tools

#### 3.4.1. Research characteristics

The research tool was a questionnaire related to SCB and each student teacher's characteristics. The survey was developed by the author and evaluated and improved by other academics and researchers. The survey contained a 5-level response scale (except for GPA scores) consisting of 130 total items examining 18 observed variables, of which 97 items were positive, while the remaining 33 items were negative. The questionnaire

Table 1. Proposed sample of student teachers by region, university, and program.

Region	University	SG (n = 400)		SSG (n = 400)		Total
		Male	Female	Male	Female	
North	Chiang Rai Rajabhat University	20	20	20	20	80
	Chiang Mai University	20	20	20	20	80
Northeast	Sisaket Rajabhat University	20	20	20	20	80
	Khon Kaen University	20	20	20	20	80
Central	Phetchaburi Rajabhat University	20	20	20	20	80
	Burapha University	20	20	20	20	80
Bangkok	Bansomdejchaopraya Rajabhat Univ.	20	20	20	20	80
	Srinakharinwirot University	20	20	20	20	80
Southern	Nakhon Si Thammarat Rajabhat Univ.	20	20	20	20	80
	Prince of Songkla University	20	20	20	20	80
Total		200	200	200	200	800

**Table 2.** Criteria for score rating of teacher opinions.

Opinion level	Criteria for score rating	
	Positive	Negative
Most/Agree Strongly	5	1
More/Agree	4	2
Moderate/Neutral	3	3
Less/Disagree	2	4
Least/Disagree Strongly	1	5

used a summated rating scale with five levels, which is presented in Table 2.

**3.4.2. Tool quality**

The questionnaire's content validity was evaluated by three education lecturers, who were experts in their related fields, after which, content validity verification was measured using the indexes of item-objective congruence (IOC) (Turner and Carlson, 2003). The minimum IOC value for this study was 0.67. Items with a value less than 0.67 were removed or re-written according to the experts' suggestions. The reliability of the questionnaire was then evaluated using 62 undergraduate students from a non-surveyed university's Faculty of Education. Assessment of the pilot-test reliability was done from the use of Cronbach's  $\alpha$  (George and Mallery, 2010).

**4. Results**

**4.1. Student-teacher survey characteristics (n = 800)**

From the student-teacher survey (Table 3), female student teachers were in the majority for both the SSG programs (67%) and the SG programs (57.5%). This male/female imbalance in Southeast Asian higher education has been identified as an ongoing and growing issue, especially in both Malaysia and Thailand, with females making up more than 64% of Malaysian university enrolments and 60% in Thai universities (Artachariya, 2012; SI News, 2015; Suksup et al., 2020). Moreover, most student teachers chose to reside in a dormitory type residence, either on

campus or off (science program = 77.25% - social science program = 70%). Family incomes for both programs' student teachers were highly dispersed. However, 29.25% of the students reported their family incomes to be \$325 - \$650, while another 29.25% reported their family incomes as over \$970. Concerning parents' educational level, it was interesting to find out that 32% of the SSG program students had parents with less than or equal to elementary education. Similarly, 26.25% of the SG program students also had parents with less than or equal to primary school education.

**4.2. CFA analysis results**

Table 4 shows the CFA testing results for both the SG and SSG student-teacher groups. The internal consistency reliability ( $\alpha$ ) was obtained from the questionnaire trial of 62 Faculty of Education Science Program undergraduate students. The data were then used to calculate the questionnaire's reliability by using Cronbach's coefficient formula (George and Mallery, 2010).

**4.3. Goodness-of-fit (GOF) appraisal**

The study's GOF appraisal was used to assess the model's fit with the data, with validity being measured by the use of convergent validity (CV) to assure that the expected relationships between the constructs do exist. Supporting theory suggests that CV should include the GFI, the CFI, the RMSEA, and the chi-square/df statistic (Hooper et al., 2008; Hu and Bentler, 1999; Rasch, 1980; Schumacker and Lomax, 2010). The relative

**Table 3.** Student-teacher personal and family characteristics.

General information	SG		SSG	
	Count	%	Count	%
<b>Gender</b>				
Male	170	42.50	132	33.00
Female	230	57.50	268	67.00
<b>Student Residence Characteristics</b>	400		400	
Personal house	63	15.75	111	27.75
Dormitory outside or at the institution	309	77.25	280	70.00
House of relatives or friends	27	6.75	7	1.75
Other	1	0.25	2	0.50
<b>Monthly Family Income</b>	400		400	
Less than \$325 per month	83	20.75	96	24.00
\$325 – \$650 per month	122	30.50	117	29.25
\$651 – \$970 per month	77	19.25	70	17.50
Over \$970 per month	118	29.50	117	29.25
<b>Highest Education Level of Parents</b>	400		400	
Less than or equal to an elementary education	105	26.25	128	32.00
Grade 1-3	41	10.25	45	11.25
Secondary school year 4–6 or vocational certificate	81	20.25	60	15.00
High School Diploma or High Vocational Certificate	60	15.00	37	9.25
Bachelor's degree or higher	113	28.25	130	32.50
	400		400	

**Table 4.** CFA of latent and observed variables classified by student teach program groups.

Latent and Observed variables	Label	Cronbach's $\alpha$ (n = 62)	SG (n = 400)				SSG (n = 400)			
			Loading*	R <sup>2</sup>	AVE	CR	Loading	R <sup>2</sup>	AVE	CR
<b>SCB</b>					0.41	0.77			0.46	0.81
Environmental knowledge dissemination	y1	0.72	0.70	0.49			0.73	0.54		
Product use selection	y2	0.61	0.67	0.45			0.68	0.47		
Product purchase selection	y3	0.69	0.66	0.43			0.69	0.48		
Learning and participation	y4	0.85	0.62	0.39			0.69	0.48		
Resource-saving	y5	0.77	0.52	0.27			0.61	0.37		
<b>STATE</b>					0.59	0.80			0.33	0.56
GPA -Y6	y6	-	0.97	0.93			0.68	0.46		
A good attitude toward sustainable consumption	y7	0.71	0.40	0.26			0.25	0.06		
Inspiration to have a public mind	y8	0.85	0.82	0.68			0.67	0.44		
<b>EDU</b>					0.62	0.87			0.57	0.84
Attitude toward the environment	y9	0.81	0.64	0.41			0.65	0.42		
Value to environment	y10	0.62	0.81	0.65			0.80	0.64		
Conservation evaluation	y11	0.68	0.81	0.66			0.79	0.63		
Conservation participation	y12	0.73	0.87	0.75			0.77	0.60		
<b>TRAITS</b>					0.48	0.70			0.28	0.48
Internal locus of control	x1	0.65	0.23	0.15			0.13	0.02		
Future orientation with self-control	x2	0.75	0.76	0.58			0.64	0.40		
Good mental health	x3	0.81	0.90	0.81			0.65	0.42		
<b>SIT</b>					0.47	0.72			0.44	0.69
Social norm awareness	x4	0.77	0.81	0.65			0.77	0.59		
Family parenting	x5	0.78	0.50	0.25			0.53	0.28		
Example from friends	x6	0.82	0.72	0.52			0.66	0.43		

\* Loading modified to standardized loading.

Chi-square ( $\chi^2/df$ ) is also suggested as  $\leq 2.00$ . Discriminant validity (DV) is also suggested in GOF assessments (Henseler et al., 2014). Other scholars have recommended that the values for RMSEA, RMR, and SRMR should be  $\leq 0.05$ . Moreover, the GFI, AGFI, NFI, and CFI should all be  $\geq 0.90$  (Jöreskog and Sörbom, 1996; Schumacker and Lomax, 2010). Finally, a commonly accepted value for Cronbach's Alpha is  $\alpha \geq 0.70$  (George and Mallery, 2010). From these criteria, each of the models was determined to be a good fit with their data (Table 5).

4.4. Descriptive analysis

The study's Table 6 details the results from the descriptive analysis of each observed variable using the kurtosis (kur), skewness (skew), mean ( $\bar{x}$ ), and standard deviation (S.D.). The p-values of the skewness and kurtosis are thus used to assess data normality (Kim, 2015). Further research has identified univariate values approaching 2.0 for skewness, and 7.0 for kurtoses are suspect (Curran et al., 1996).

Therefore, from the analysis of the 18 identified observed variables, both student-teacher groups revealed very similar dispositions in their

opinions. Attitude toward the environment (y9) was judged most important. Two additional items were judged nearly identical to the next most important. These were resource-saving (y5) and the student teacher's internal locus of control (x1). However, far down the scale as least significant, was the student teacher's perceived significance of their GPA score (y6) to SCB.

4.5. Science group and social science group student-teacher observed variables analysis

Table 7 details the results of the correlation coefficients of the 18 observed variables for both student-teacher groups. Results for the SSG are shown about the diagonal, while results for the Science group are shown below the diagonal. From the results, we can see the importance that both the SG and the SSG student teachers place in environment education (y9 - y12), as scores for the SG were .65-.68, while scores for the SSG were .51-.66. Attitudes towards the environment (y9) might be a partial result of the legislation being undertaken in Thailand, along with intense public relations awareness, of the ban and elimination by 2022 of

**Table 5.** Criteria, theory, and results for the GOF appraisal classified by subject groups.

Criteria Index	Criteria	Program Values		Validity	Theory Support
		SG	SSG		
Chi-square: $\chi^2$	$p \geq 0.05$	0.70	0.48	validated	(Rasch, 1980)
Relative Chi-square: $\chi^2/df$	$\leq 2.00$	0.85	0.99	validated	(Byrne et al., 1989)
RMSEA	$\leq 0.05$	0.00	0.00	validated	(Hu and Bentler, 1999)
GFI	$\geq 0.90$	0.99	0.98	validated	(Jöreskog and Sörbom, 1996)
AGFI	$\geq 0.90$	0.95	0.95	validated	(Hooper et al., 2008)
RMR	$\leq 0.05$	0.01	0.02	validated	(Hu and Bentler, 1999)
SRMR	$\leq 0.05$	0.01	0.02	validated	(Hu and Bentler, 1999)
NFI	$\geq 0.90$	0.99	0.99	validated	(Schumacker and Lomax, 2010)
CFI	$\geq 0.90$	1.00	1.00	validated	(Schumacker and Lomax, 2010)

**Table 6.** Descriptive analysis of the latent and observed variables classified by subject groups.

Latent and Observed variables	Label	Items	Science Group (SG)				Social Science Group (SSG)			
			Kur <sup>1</sup>	Skew <sup>2</sup>	$\bar{x}$	S.D.	Kur <sup>1</sup>	Skew <sup>2</sup>	$\bar{x}$	S.D.
<b>SCB</b>		<b>23</b>	<b>-.34</b>	<b>-.10</b>	<b>3.77</b>	<b>.43</b>	<b>.00</b>	<b>-.15</b>	<b>3.79</b>	<b>.45</b>
Environmental knowledge dissemination	y1	5	.19	-.24	3.50	.66	-.03	-.27	3.55	.70
Product use selection	y2	5	-.30	-.32	3.85	.58	.16	-.40	3.89	.58
Product purchase selection	y3	5	.25	-.10	3.66	.56	.92	-.09	3.70	.57
Learning and participation	y4	4	.74	-.41	3.75	.58	.61	-.54	3.74	.64
Resource-saving	y5	4	-.61	-.15	4.07	.52	-.12	-.23	4.06	.52
<b>STATE</b>	<b>y</b>	<b>34</b>	<b>-.13</b>	<b>-.10</b>	<b>3.76</b>	<b>.45</b>	<b>-.23</b>	<b>.12</b>	<b>3.82</b>	<b>.42</b>
GPA	y6	1	-1.03	.08	2.94	.54	-1.07	-.01	2.98	.54
A good attitude toward sustainable consumption	y7	12	-.44	.03	3.67	.52	-.43	.13	3.69	.49
Inspiration to have a public mind	y8	21	-.49	-.11	3.84	.50	-.17	-.24	3.95	.48
<b>EDU</b>	<b>y1</b>	<b>16</b>	<b>-.45</b>	<b>-.04</b>	<b>3.90</b>	<b>.49</b>	<b>-.15</b>	<b>-.10</b>	<b>3.99</b>	<b>.48</b>
Attitude toward the environment	y9	4	-.10	-.32	4.12	.59	.91	-.64	4.17	.60
Value to environment	y10	4	-.13	-.10	3.86	.59	-.29	-.13	3.96	.59
Conservation evaluation	y11	4	-.24	.11	3.79	.58	-.15	-.08	3.92	.58
Conservation participation	y12	4	-.29	.06	3.82	.56	-.45	-.06	3.93	.56
<b>TRAITS</b>		<b>24</b>	<b>.36</b>	<b>-.32</b>	<b>3.76</b>	<b>.42</b>	<b>1.36</b>	<b>-.55</b>	<b>3.81</b>	<b>.42</b>
Internal locus of control	x1	9	-.98	-.36	4.00	.68	-.71	-.52	4.08	.70
Future orientation with self-control	x2	8	-.05	.11	3.57	.54	.71	-.14	3.60	.58
Good mental health	x3	7	-.20	-.07	3.71	.55	.40	-.21	3.77	.55
<b>SIT</b>		<b>33</b>	<b>.17</b>	<b>.48</b>	<b>3.30</b>	<b>.52</b>	<b>1.38</b>	<b>.14</b>	<b>3.38</b>	<b>.52</b>
Social norm awareness	x4	13	-.13	.36	2.89	.79	-.05	.25	3.02	.75
Family parenting	x5	9	-.08	.32	3.25	.63	.01	.23	3.27	.66
Example from friends	x6	11	-.17	.12	3.76	.54	1.61	-.62	3.84	.57

<sup>1</sup> Kurtosis  $\leq |7|$ .

<sup>2</sup> Skewness  $\leq |2|$  (Curran et al., 1996).

**Table 7.** The SG and SSG student teacher observed a variable correlation matrix.

SSG	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	y11	y12	x1	x2	x3	x4	x5	x6
y1	1.00	.48**	.59**	.54**	.44**	.59**	.10*	.45**	.34**	.42**	.43**	.45**	.08	.57**	.50**	.53**	.38**	.41**
y2	.44**	1.00	.45**	.56**	.34**	.54**	.37**	.56**	.42**	.44**	.41**	.46**	.21**	.47**	.48**	.55**	.39**	.38**
y3	.64**	.43**	1.00	.40**	.44**	.54**	.19**	.40**	.26**	.44**	.42**	.42**	.08	.51**	.43**	.49**	.33**	.41**
y4	.55**	.41**	.55**	1.00	.31**	.55**	.17**	.53**	.34**	.39**	.40**	.49**	.09	.63**	.58**	.47**	.40**	.41**
y5	.40**	.35**	.44**	.30**	1.00	.53**	.22**	.41**	.40**	.38**	.33**	.36**	.24**	.40**	.34**	.47**	.24**	.31**
y6	.53**	.51**	.53**	.48**	.45**	1.00	.23**	.46**	.39**	.40**	.39**	.42**	.17**	.44**	.44**	.48**	.35**	.37**
y7	.17**	.47**	.22**	.17**	.23**	.38**	1.00	.50**	.46**	.36**	.25**	.28**	.60**	.08	.26**	.35**	.21**	.23**
y8	.45**	.51**	.45**	.52**	.35**	.43**	.55**	1.00	.66**	.65**	.56**	.66**	.36**	.51**	.61**	.62**	.39**	.55**
y9	.31**	.50**	.28**	.30**	.30**	.36**	.53**	.66**	1.00	.51**	.53**	.49**	.40**	.33**	.40**	.47**	.23**	.39**
y10	.45**	.53**	.41**	.39**	.39**	.35**	.44**	.61**	.67**	1.00	.64**	.62**	.26**	.45**	.53**	.56**	.29**	.44**
y11	.48**	.44**	.40**	.41**	.31**	.36**	.28**	.54**	.53**	.65**	1.00	.60**	.14**	.48**	.49**	.52**	.28**	.43**
y12	.52**	.50**	.44**	.51**	.34**	.38**	.33**	.64**	.56**	.59**	.68**	1.00	.16**	.56**	.61**	.54**	.27**	.54**
x1	.16**	.29**	.11*	.14**	.18**	.27**	.62**	.38**	.35**	.24**	.10*	.17**	1.00	.02	.08	.24**	.08	.11*
x2	.57**	.47**	.55**	.60**	.34**	.40**	.17**	.54**	.39**	.46**	.51**	.54**	.01	1.00	.66**	.60**	.40**	.51**
x3	.52**	.50**	.49**	.59**	.35**	.45**	.38**	.67**	.53**	.53**	.56**	.66**	.20**	.68**	1.00	.60**	.35**	.53**
x4	.53**	.50**	.51**	.52**	.37**	.41**	.35**	.63**	.48**	.55**	.57**	.61**	.24**	.56**	.67**	1.00	.42**	.50**
x5	.37**	.33**	.36**	.31**	.22**	.29**	.28**	.39**	.28**	.36**	.35**	.39**	.10*	.42**	.42**	.40**	1.00	.30**
x6	.39**	.43**	.41**	.45**	.38**	.34**	.32**	.62**	.46**	.44**	.50**	.59**	.15**	.51**	.65**	.58**	.37**	1.00

\*Sig.  $\leq .05$  and \*\*Sig.  $\leq .01$ .

plastic bags and straws, Styrofoam boxes, and single-use plastic cups (“Environment Ministry considers quicker ban,” 2019). The student-teacher agreement might also be a result of other stories in the Thai press, showcasing teacher involvement in successful conservation efforts (Rujivanaromit, 2019). Thus, the author feels that awareness is an underlying factor in SCB success.

#### 4.6. Latent variable correlation coefficient results

Table 8 shows the results from the correlation decomposition. Further interpretation of the analysis suggests that the strongest interrelationship pair is TRAITS and STATE (hypothesis H2) with a correlation coefficient = .73,  $*p \leq .01$ . Similar strength can be found in the relationship pair of

**Table 8.** Latent variable correlation coefficient results.

Groups/Variables		SSG program student teachers				
		SCB	STATE	EDU	TRAITS	SIT
SG program student teachers	SCB	1.00	.51**	.65**	.68**	.71**
	STATE	.53**	1.00	.68**	.68**	.58**
	EDU	.65**	.68**	1.00	.68**	.65**
	TRAITS	.70**	.73**	.67**	1.00	.68**
	SIT	.69**	.61**	.70**	.69**	1.00

\*\* $p \leq .01$ .

SIT and SCB (hypothesis H5) with a coefficient of correlation = .71,  $*p \leq .01$ . An interpretation of this data suggests that a student teacher's psychological traits have a significant influence on their mental wellbeing. This is consistent with other research that states educators are the agents of change, who also play a vital role in a student's socioemotional adjustment and academic performance (Split et al., 2011). Therefore, an emotionally healthy teacher helps make an emotionally healthy student.

Also, we see that their situation plays an essential role in their SCB. This is consistent with other research, which has suggested that attitudes and behavior are significantly affected by other trusted individuals who share membership in one's social identity (the 'in-group') (Trudel, 2019).

#### 4.7. Decomposition of influence analysis

Results detailed in Table 9, Table 10, and the final models in Figure 2 and Figure 3 show that the modeling is accurate and consistent with the empirical data. All the harmonized index values met theoretical criteria and were considered good to excellent. Furthermore, results from the SEM's analysis determined that all the causal variables positively influenced SCB for both groups. Specifically, when the variables are combined, they can explain 92% for the science program student teachers and 82% for the social science program student teachers of the variance in a student teacher's SCB. Additionally, Table 9 details the effect values (D.E., I.E., & T.E.) from the coefficient of influence (R) testing (Ladhari, 2009). Other scholars have stated that R values can range from  $-1$  to  $+1$ , whose variable relationship increases as the value of the coefficient increases (Ratner, 2009). Furthermore, four factors were determined to be influencing SCB. For the science education student teachers, these were situational (SIT = 0.87), environmental education (EDU = 0.34), psychological states (STATE = 0.22), and psychological traits (TRAITS = 0.22). For the social science education student teachers, these were SIT = 0.85, STATE = 0.25, EDU = 0.08, and TRAITS = 0.04.

#### 4.8. Final hypotheses testing results

Table 10, Figure 2, and Figure 3 detail the results of the final hypotheses testing. In Table 10, we note that of the eight hypotheses model for the SG student teachers, five were validated, and three were rejected. For the eight hypotheses model for the SSG student teachers, six hypotheses were validated, while two were rejected. Furthermore, standard Pearson's and Spearman's correlation coefficients strength interpretation indicates that values from 0.1–0.3 are the weakest, values from 0.4–0.6 are moderate, and 0.7–1.0 are strong (Akoglu, 2018; Ratner, 2009). Therefore, these values are used to assist with the interpretation of the results.

## 5. Discussion

From the research on psychological traits, the author notes the wide divergence in scholarly literature as to what constitutes TRAITS. Some view TRAITS as being inherited; while others state that it comes from environmental factors (Eysenck, 1990; Hopwood et al., 2011).

However, in a study from the University of Minnesota on 350 pairs of twins, it was concluded that TRAITS are inherited (Bouchard et al., 1990). This suggests that some personality aspects are under a great degree of genetic control (Goleman, 1996). Furthermore, genetically informed cross-sectional studies on personality psychology have demonstrated that higher-order traits are substantially and similarly heritable, but also influenced by non-shared environmental factors (such as environmental factors that make siblings within the same family different) (Loehlin, 2001). This could partially explain why both H1 and H2 were determined to be unsupported for the study for the SG student teachers. This was also true for the SSG student teachers in H1. However, in H2's relationship from TRAITS to STATE, the SSG student teachers did indicate a very weak but positive influence in the pair's relationship as the correlation coefficient = 0.13,  $t$ -test = 2.02,  $*p \leq .01$ . Although this study did not determine if TRAITS was inherited or environmental, the student teachers' opinions about the lack of importance of the environmental aspects of TRAITS suggests that future research might focus on TRAITS as an outcome of genetics and inheritance instead of the environment.

Furthermore, numerous studies have shown that humans have a strong desire to fit in and will conform to the behavior (social conformity) of those around them (White et al., 2019). Yu and Sun (2013) also suggested that social conformity serves as an emotional buffer that protects individuals from experiencing strong negative emotions when the outcomes are bad. This is confirmed by this study in which each student teacher's situation (SIT) was determined to have a strong influence on their environmental education (EDU). Specifically, in H3 we see strong influences being exerted from SIT on EDU for the SG student teachers (correlation coefficient = 0.75,  $t$ -test = 4.05,  $*p \leq .01$ ), and for SSG student teachers (correlation coefficient = 0.80,  $t$ -test = 9.84,  $*p \leq .01$ ).

As previously mentioned, Thailand is in the process of creating a social norm awareness concerning sustainable behavior. In Vantamay (2018) investigation of SCB amongst young Thai consumers, the author suggested that fostering peer-to-peer communication (e.g. social media platforms such as Line and Facebook) was useful in changing social norms about SCB. Collaboration is also a key element in ending plastic waste, with Thai government officials and local municipalities urging consumers to start modifying their lifestyles and behaviors (Achakulwisut, 2019; Mongkolnchaiarunya, 2005).

Moreover, in Thailand like China, parents play a key role in a student's situation, as parent stakeholders are crucial in the creation of an environment that is conducive to learning and teaching (Hill and Taylor, 2004; Westerman, 2012). Additionally, 'peer pressure', or examples from friends (Arttchariya, 2012), was found in this study to have the greatest effect on a student teacher's SIT for both groups as for SG the  $\bar{x} = 3.76$  and S.D. = .54, while for the SSG, the  $\bar{x} = 3.84$  and S.D. = .57 (Table 6).

In H4 we note the moderate strength relationship from SIT to STATE for the SG student teachers (correlation coefficient = 0.46,  $t$ -test = 2.49,  $*p \leq .01$ ), as well as the nearly moderate strength relationship from SIT to STATE for the SSG student teachers (correlation coefficient = 0.36,  $t$ -test = 3.30,  $*p \leq .01$ ).

For H5, the analysis determined that there was a moderate relationship from SIT to SCB for the SG student teachers (correlation coefficient



**Table 9.** Decomposition of direct (D.E.), indirect (I.E.), and total (T.E.) effects of the SEM classified by programs.

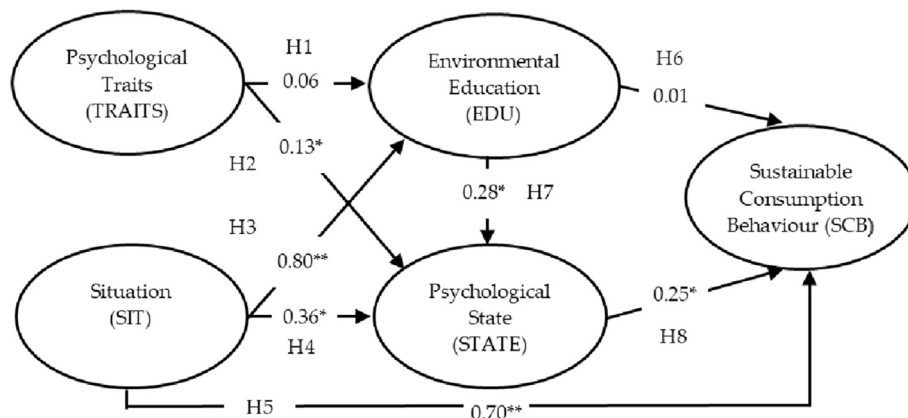
Path	SG			R <sup>2</sup>	SSG			R <sup>2</sup>
	DE	IE	TE		DE	IE	TE	
<b>SCB</b>				<b>.92</b>				<b>.82</b>
SIT → SCB	0.52**	0.35**	0.87**		0.70**	0.15	0.85**	
STATE → SCB	0.22*	-	0.22*		0.25*	-	0.25*	
EDU → SCB	0.31*	0.03	0.34*		0.01	0.07	0.08	
TRAITS → SCB	-	0.08	0.08		-	0.04	0.04	
<b>STATE</b>				<b>.63</b>				<b>.61</b>
TRAITS → STATE	0.21	0.01	0.22		0.13*	0.01	0.14*	
SIT → STATE	0.46*	0.09	0.55*		0.36*	0.22*	0.58**	
EDU → STATE	0.13	-	0.13		0.28*	-	0.28*	
<b>EDU</b>				<b>.77</b>				<b>.78</b>
TRAITS → EDU	0.11	-	0.11		0.06	-	0.06	
SIT → EDU	0.75**	-	0.75**		0.80**	-	0.80**	

\*Sig. ≤ .05 and \*\*Sig. ≤ .01.

**Table 10.** Hypothesis testing summary classified by subject groups.

Hypotheses	SG			SSG		
	Coef.	t-test	Accept	Coef.	t-test	Accept
H1: TRAITS directly and significantly influences EDU	0.11	0.66	×	0.06	1.20	×
H2: TRAITS directly and significantly influences STATE	0.21	1.20	×	0.13	2.02*	✓
H3: SIT directly and significantly influences EDU	0.75	4.05**	✓	0.80	9.84**	✓
H4: SIT directly and significantly influences STATE	0.46	2.49*	✓	0.36	3.30*	✓
H5: SIT directly and significantly influences SCB	0.52	3.26**	✓	0.70	5.63**	✓
H6: EDU directly and significantly influences SCB	0.31	2.33*	✓	0.01	0.12	×
H7: EDU directly and significantly influences STATE	0.13	1.47	×	0.28	2.46*	✓
H8: STATE directly and significantly influences SCB	0.22	2.34*	✓	0.25	3.03*	✓

\*Sig. ≤ .05, \*\*Sig. ≤ .01, coef. = correlation coefficient.

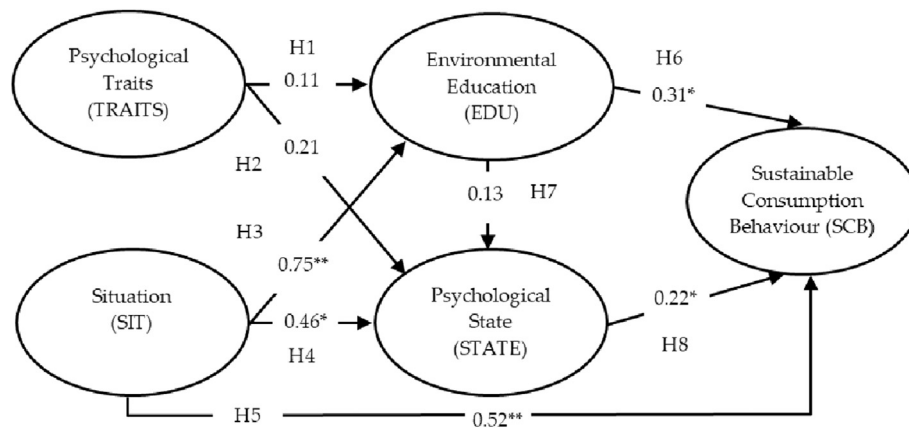


**Figure 2.** The results of the structural model for social science faculty students. Chi-Square = 61.69, df = 62, p-value = 0.48, RMSEA = 0.00.

= 0.52, t-test = 3.26, \*p ≤ .01), as well as a strong relationship from SIT to SCB for the SSG student teachers (correlation coefficient = 0.70, t-test = 5.63, \*p ≤ .01).

In H6, the relationship between EDU and SCB was also examined for both student-teacher groups. For the SG student teachers, it was determined there was a weak and positive influence between the variables (correlation coefficient = 0.31, t-test = 2.33, \*p ≤ .01). This is consistent with Arttachariya (2012) who determined that Thailand that environmental consciousness, concern for the environment, and peer pressure influence were significant predictors of green purchasing behavior. However, for the SSG student teachers, this relationship was

thought to be unimportant, and thus, the hypothesis was rejected (correlation coefficient = 0.01, t-test = 0.12). Moreover, Arabska (2018) has added that consumer behavior changes can be negatively affected by environmentally unstable, socially unfair, and exploitative large industrial production systems. Furthermore, speculative reasons for this discrepancy between the two groups might come from SG student teachers having greater exposure to the importance of EDU, whereas, the SSG student teachers not so much. Once again, awareness was determined to play a critical role in the perceived importance of EDU (Pachauri and Meyer, 2014; United Nations Environment Programme, 2015).



**Figure 3.** The results of the structural model for science faculty students. Chi-Square = 29.18, df = 34,  $p$ -value = 0.70, RMSEA = 0.00.

In **H7**, the relationship between EDU and STATE was also perceived with little importance by both groups. For the SSG student teachers, there was a weak but positive influence between the variables (correlation coefficient = 0.28,  $t$ -test = 2.46,  $*p \leq .01$ ). However, for the SG student teachers, this relationship was deemed of little importance, and the hypothesis was thus rejected.

Finally, in **H8** the relationships from STATE to SCB were examined, with results for both student-teacher groups reflecting weak and positive relationships as SG had a correlation coefficient = 0.22,  $t$ -test = 2.34, and  $*p \leq .01$ . For the SSG student teachers, the correlation coefficient = 0.25,  $t$ -test = 3.03, and  $*p \leq .01$ .

The results or data that support the conclusions shown directly or otherwise are available to the public in accordance with field standards.

## 6. Conclusion and recommendations

The study investigated how psychological traits, a student teacher's situation, environmental education, and their psychological state influence each other and a student teacher's sustainable consumption behavior. Although the sample was unique in that a science group and a social science group of student teachers were surveyed, the results were surprisingly similar. For the science education student teachers, their situation played the greatest role in their sustainable consumption behavior. The same was true for the social science student-teacher group as well.

However, for the science group, environmental education was next in importance, compared to the social science group, which viewed their psychological state as second in importance. The study also determined that student teachers perceived environmental education factors of attitude and conservation as critical, which most probably rose in prominence due to recent Thai governmental legislation and media awareness efforts. There also appears to be greater individual responsibility in SCB as well as the perceived need to conserve resources. The author suggests that the single most crucial factor in changing sustainable consumption behavior is an individual's awareness of the issues and a proposed pathway leading to these changes.

Moreover, this study contributed to the literature as it investigated 18 aspects related to four casual variables affecting a Thai student teacher's sustainable consumption behavior. The study was unique in that it classified and compared opinions from two diverse university teaching programs nationwide (Science and Social Science), whose results can help educational leaders identify and develop in-depth, SCB future programs. Additionally, the conclusions are a reasonable extension of the results.

Future studies might also give focus to the importance student teachers place on the psychological traits they inherited from their families as opposed to the environment's importance in determining them. Moreover, given the very strong influence that student teachers

place on their situation as an influencing factor in environmental education, an additional study should investigate deeper what these variables are and their overall importance.

## 7. Research limitations

Even though the study analyzed 800 student-teacher questionnaires from two highly diverse, nationwide programs in Thailand, the study is limited in that both science programs (e.g. biology, physics, and chemistry) and social science programs (e.g. languages, music, and arts) in each university offers various courses within each major. Therefore, data collection at each university may lead to differences in the sample's subjects at a major level.

## Declarations

### Author contribution statement

Paitoon Pimdee: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

### Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Competing interest statement

The authors declare no conflict of interest.

### Additional information

No additional information is available for this paper.

## References

- Achakulwisut, A., 2019, September 30. Collaboration Key to Ending Plastic Waste. Bangkok Post. <https://tinyurl.com/ungv4mo>.
- Akoglu, H., 2018. User's guide to correlation coefficients. *Turkish Journal of Emergency Medicine* 18 (3), 91–93.
- Arabska, E., 2018. Farmers' markets as a business model encouraging sustainable production and consumption. *Visegrad J. Bioecon. Sustain. Dev.* 7 (1), 2–6.
- Arttachariya, P., 2012. Environmentalism and green Purchasing Behavior: A Study on Graduate Students in Bangkok, Thailand. <https://tinyurl.com/y44z9lpv>.
- Bhanthumnavin, D., 1995. *Psychological Theory of Moral and Work Behaviors: Research and Applications*. National Institute of Development Administration (NIDA).
- Bhanthumnavin, D., 2000. *Ethical Tree Theory: Research and Development*, second ed. Chulalongkorn University Printing House.
- Bhanthumnavin, D., 2017. Psycho-social antecedents of research potentiality among graduate students: a SEM approach. *International Journal of Behavioral Science* 12 (2), 50–70. <https://tinyurl.com/yak3hhzb>.

- Boonrounruat, C., Huang, F., 2018. The Theory of Planned Behavior and Transtheoretical Model of Change: a systematic review on combining two behavioral change theories in research. *J. Publ. Health Dent.* 16 (1), 75–87. <https://tinyurl.com/ybcuk92>.
- Bouchard, T., Lykken, D., McGue, M., Segal, N., Tellegen, A., 1990. Sources of human psychological differences: the Minnesota study of twins reared apart. *Science* 250 (4978), 223–228.
- Bowers, K.S., 1973. Situationism in psychology: an analysis and a critique. *Psychol. Rev.* 80 (5), 307–336.
- Boyle, G.J., 2008. Critique of the five-factor model of personality. In: *The SAGE Handbook of Personality Theory and Assessment: Volume 1—Personality Theories and Models*. SAGE Publications Ltd, pp. 295–312.
- Brown, T.A., 2015. *Confirmatory Factor Analysis for Applied Research*, 2nd ed. The Guilford Press.
- Brundtland Report, 1987. *Our Common Future*, Butterworth.
- Byrne, B.M., Shavelson, R.J., Muthén, B., 1989. Testing for the equivalence of factor covariance and mean structures: the issue of partial measurement invariance. *Psychol. Bull.* 105 (3), 456–466.
- Challcharoenwattana, A., Pharino, C., 2015. Co-benefits of household waste recycling for local community's sustainable waste management in Thailand. *Sustainability* 7 (6), 7417–7437.
- Committee for Sustainable Development (CSD), 2017. Thailand's Voluntary National Review on the Implementation of the 2030 Agenda for Sustainable Development. <https://tinyurl.com/y72rokzy>.
- Crawford, I.M., 1990. Chapter 7: sampling in marketing research. In: *Marketing Research, Centre and Network for Agricultural Marketing Training in Eastern and Southern Africa*, Harare. Food and Agriculture Organization of the United Nations, pp. 36–48. <http://www.fao.org/3/w3241e/w3241e08.htm>.
- Curran, P.S., West, S.G., Finch, J.F., 1996. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychol. Methods* 1 (1), 16–29.
- de Zoysa, U., 2009. Emerging challenges of consumer activism: protecting consumers and advocating sustainable consumption in developing countries. In: Lebel, L., Lorek, S., Daniel, R. (Eds.), *Sustainable Production Consumption Systems*. Springer, pp. 61–77.
- Diego, M., Carlos, G., Jose, A., 2019. Adaptive learning objects in the context of eco-connectivist communities using learning analytics. *Heliyon* 5 (11), e02722.
- Di Fabio, A., 2017. The psychology of sustainability and sustainable development for well-being in organizations. *Front. Psychol.* 8, 1534.
- Endler, N.S., 1993. Personality: an interactional perspective. In: *Hettema, J., Deary, I.J. (Eds.), Foundations of Personality*. Springer.
- Engel, C., Weber, E.U., 2007. The impact of institutions on the decision how to decide. *J. Inst. Econ.* 3 (3), 323–349.
- Environment Ministry Considers Quicker Ban on 4 Plastic Products in Thailand, 2019, August 22. Thai PBS. <https://tinyurl.com/yxjfc8no>.
- Eysenck, H.J., 1990. Biological dimensions of personality. In: *Pervin, L.A. (Ed.), Handbook of Personality: Theory and Research*. Guilford, pp. 244–276.
- Figuerola-García, E.C., García-Machado, J.J., Yábar, D.C.P.-B., 2018. Modeling the social factors that determine sustainable consumption behavior in the community of Madrid. *Sustainability* 10, 2811.
- George, D., Mallery, P., 2010. *SPSS for Windows Step by Step: A Simple Guide and Reference 17.0 Update*. Pearson.
- Glasser, H., 2009. Minding the gap. In: *J. Wals, A.E. (Ed.), Social Learning towards a Sustainable World: Principles, Perspectives, and Praxis*. Academic Publishers, pp. 35–62.
- Golding, J., Gregory, S., Iles-Caven, Y., Nowicki, S., 2017. The antecedents of women's external locus of control: associations with characteristics of their parents and their early childhood. *Heliyon* 3 (1), e00236.
- Goleman, D., 1996, December 2. Major Personality Study Finds that Traits Are Mostly Inherited. *New York Times*. <https://tinyurl.com/ybvh13nh>.
- Haraty, R.A., Bitar, G., 2019. Associating learning technology to sustain the environment through green mobile applications. *Heliyon* 5 (1), e01141.
- Heiskanen, E., Pantzar, M., 1997. Toward sustainable consumption: two new perspective. *J. Consum. Pol.* 20, 409–442. <https://tinyurl.com/y3xfxu9n>.
- Henseler, J., Ringle, C.M., Sarstedt, M.A., 2014. New criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Market. Sci.* 43 (1), 115–135.
- Hill, N.E., Taylor, L.C., 2004. Parental school involvement and children's academic achievement: pragmatics and issues. *Curr. Dir. Psychol. Sci.* 13 (4), 161–164.
- Hooper, D., Coughlan, J., Mullen, M., 2008. Structural equation modelling: guidelines for determining model fit. *Electron. J. Bus. Res. Methods* 6 (1), 53–60. <https://tinyurl.com/y37qq4pe>.
- Hopwood, C.J., Donnellan, M.B., Blonigen, D.M., Krueger, R.F., McGue, M., Iacono, W.G., Burt, S.A., 2011. Genetic and environmental influences on personality trait stability and growth during the transition to adulthood: a three-wave longitudinal study. *J. Pers. Soc. Psychol.* 100 (3), 545–556.
- Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model.* 6 (1), 1–55.
- Hungerford, H.R., Volk, T.L., 1990. Changing learner behavior through environmental education. *J. Environ. Educ.* 21 (3), 8–21.
- Inayatullah, S.T., 2009. *Global Transformations and World Futures: Knowledge, Economy, and Society*. Eolss Publishers.
- Jöreskog, K., Sörbom, D., 1996. LISREL 8: User's Guide. Scientific Software International Inc.
- Kanyacome, S., Loipha, S., Numprasertchai, S., 2012. Needs of collaborative digital library for secondary school students in Thailand. In: *The Outreach of Digital Libraries: A Globalized Resource Network*, pp. 136–139.
- Kim, N., 2015. Tests based on skewness and kurtosis for multivariate normality. *Communications for Statistical Applications and Methods* 22 (4), 361–375.
- Kostadinova, E., 2016. Sustainable consumer behavior: literature overview. *Economic Alternatives* 2, 224–234. <https://tinyurl.com/y5ola27b>.
- Kyriazos, T.A., 2018. Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. *Psychology* 9 (8), 2207–2230.
- Ladhari, R., 2009. A review of twenty years of SERVQUAL research. *International Journal of Quality and Service Sciences* 1 (2), 172–198.
- Loehlin, J.C., 1992. *Latent Variable Models*. Lawrence Erlbaum Publishers.
- Loehlin, J.C., 2001. Behavior genetics and parenting theory. *Am. Psychol.* 56 (2), 169–170.
- Luchs, M.G., Phipps, M., Hill, T., 2015. Exploring consumer responsibility for sustainable consumption. *J. Market. Manag.* 1–23, 00.
- Mischel, W., 1977. The interaction of person and situation. In: *Magnusson, D., Endler, N.S. (Eds.), Personality at the Crossroads: Current Issues in Interactional Psychology*. Lawrence Erlbaum Associates, pp. 333–352.
- Mongkolnchaiarunya, J., 2005. Promoting a community-based solid-waste management initiative in local government: yala municipality, Thailand. *Habitat Int.* 29 (1), 27–40.
- Na Thalang, D.P., Sornsaruht, P., Pimdee, P., 2020. Hot, tropical and thirsty: an analysis of bottled water consumer satisfaction in Thailand. *African Journal of Hospitality, Tourism and Leisure* 5 (8), 1–15. <https://tinyurl.com/yy9t4u84>.
- Nam, C., Dong, H., Lee, Y., 2017. Factors influencing consumers' purchase intention of green sportswear. *Fash Text* 4, 2.
- Office of the National Economic and Social Development Board. (n/d). Summary the Twelfth National Economic and Social Development Plan (2017–2021). [https://www.nesdc.go.th/ewt\\_dl\\_link.php?nid=9640](https://www.nesdc.go.th/ewt_dl_link.php?nid=9640).
- Overtourism, 2019, May 9. Thailand's 'The Beach' to Close until 2021. BBC. <https://tinyurl.com/ya6qt4t>.
- Pachauri, R.K., Meyer, L.A., 2014. IPCC, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team]. IPCC, Geneva, Switzerland, p. 151. <https://tinyurl.com/y8j59m9o>.
- Pimdee, P., 2017. Causal relationship model of Thai student energy conservation behaviour. *Journal of Sustainability Science and Management* 12 (2), 218–227. <https://tinyurl.com/yck59ppn>.
- Prabjandee, D., 2019. Becoming English teachers in Thailand: student teacher identity development during teaching practicum. *Issues Educ. Res.* 29 (4), 1277–1294. <https://www.iier.org.au/iier29/prabjandee2.pdf>.
- Rasch, G., 1980. *Probabilistic Models for Some Intelligence and Attainment Tests*. University of Chicago Press.
- Ratner, B., 2009. The correlation coefficient: its values range between +1/–1, or do they? *J. Target Meas. Anal. Market.* 17 (2), 139–142.
- Rodrigues, J., dos Santos, S.M.A., Spricigo, J.S., 2012. Teaching nursing care in mental health in undergraduate nursing. *Acta Paul. Enferm.* 25 (6), 844–851. <https://tinyurl.com/y85fvcv7>.
- Rujivanaromit, P., 2019, March 20. Teacher's Conservation Dream Comes True. The Nation. <https://www.nationthailand.com/national/30366184>.
- Saili, F., Hau, K.-T., 1994. The effect of teachers' evaluative feedback on Chinese students' perception of ability: a cultural and situational analysis. *Educ. Stud.* 20 (2), 223–236.
- Shackle, S., 2019, September 27. The Way Universities Are Run Is Making Us Ill: inside the Student Mental Health Crisis. *The Guardian*. <https://tinyurl.com/yye2jo36>.
- Shah, D.V., Wells, C., Friedland, L.A., Kim, Y.M., Rojas, H., 2012. Communication, consumers, and citizens: revisiting the politics of consumption. *Ann. Am. Acad. Polit. Soc. Sci.* 644 (November), 6–18. <https://www.jstor.org/stable/23316139>.
- Stapp, W.B., 1969. The concept of environmental education. *Environ. Educ.* 1 (1), 30–31.
- Steg, L., Lindenberg, S., Keizer, K., 2016. Intrinsic motivation, norms and environmental behaviour: the dynamics of overarching goals. *International Review of Environmental and Resource Economics* 9 (1–2), 179–207.
- Schanes, K., Giljum, S., Hertwich, E., 2016. Low carbon lifestyles: a framework to structure consumption strategies and options to reduce carbon footprints. *J. Clean. Prod.* 139, 1033–1043.
- Schumacker, R.E., Lomax, R.G., 2010. *A Beginner's Guide to Structural Equation Modeling*. Routledge.
- Sharma, M., Rani, L., 2014. Environmentally sustainable consumption: a review and agenda for future research. *Global J. Finance Manag.* 6 (4), 367–374. <https://tinyurl.com/y9mjlgnz>.
- SI News, 2015, June 30. The growing gender imbalance in higher ed: where have all the boys gone? <https://tinyurl.com/yy2u2f7n>.
- Split, J.L., Koomen, H.M.Y., Thijs, J.T., 2011. Teacher wellbeing: the importance of teacher-student relationships. *Educ. Psychol. Rev.* 23 (4), 457–477.
- Suksup, C., Pimdee, P., Sirjarapat, P., 2020. Educational human resources management strategy SWOT analysis for Thailand's OBEC. *International Journal of Innovation, Creativity and Change* 13 (1), 105–120. <https://tinyurl.com/y5jhwoye>.
- Tbilisi Declaration, 1977. <https://www.gdrc.org/uem/ee/tbilisi.html>.
- Terborg, J.R., 1981. Interactional psychology and research on human behavior in organizations. *Acad. Manag. Rev.* 6 (4), 569–576.
- Tett, R.P., Burnett, D.D., 2003. A personality trait – based interactionist model of job performance. *J. Appl. Psychol.* 88 (3), 500–517.
- The Chaipattana Foundation, 2017. *Philosophy of Sufficiency Economy*. <https://tinyurl.com/y8evwpe4>.
- Trudel, R., 2019. Sustainable consumer behaviour. *Consumer Psychology Review* 2, 65–96.
- Tseng, M.-L., Tan, K.H., Geng, Y., Govindan, K., 2016. Sustainable consumption and production in emerging markets. *Int. J. Prod. Econ.* 181, 257–261.
- Turner, R.C., Carlson, L., 2003. Indexes of item-objective congruence for multidimensional items. *Int. J. Test.* 3 (2), 163–171.

- United Nations, 2015. Transforming Our World: the 2030 Agenda for Sustainable Development. A/RES/70/1. <https://tinyurl.com/z4o6pk4>.
- United Nations, 2020. Goal 12: Ensure Sustainable Consumption and Production Patterns. <https://tinyurl.com/yamgayyv>.
- United Nations Environment Programme, 2002. UNEP Contribution to Framework on Promoting Sustainable Consumption and Production Patterns. <https://tinyurl.com/y63bez6m>.
- United Nations Environment Programme, 2015. Sustainable Consumption and Production Global Edition. A Handbook for Policymakers. <https://tinyurl.com/y8t4htkl>.
- Vantamay, N., 2018. Investigation and recommendations on the promotion of sustainable consumption behavior among young consumers in Thailand. *Kasetsart Journal of Social Sciences* 39 (1), 51–58.
- Vasilyuk, F., 1991. *The Psychology of Experiencing*. Progress Publishers. <https://tinyurl.com/ya8tp8pn>.
- Walsh, W.B., Craik, K.H., Price, R.H., 1992. *Person-environment Psychology: Models And Perspectives*. Lawrence Erlbaum.
- Wangwongwatana, S., 2009. 3Rs and Waste Management in Thailand. Pollution Control Department, Ministry of Natural Resources and Environment, Thailand. <https://tinyurl.com/y2pzn5dq>.
- Westerman, J.A., 2012. A Comparison of Thai, Indian, Japanese, and American Parents' Views toward Parent Involvement in International Schools in Thailand [Unpublished doctoral dissertation]. Lehigh University. <https://tinyurl.com/y63j7wuf>.
- White, K., Hardisty, D.J., Habib, R., 2019. The Elusive green Consumer. *Harvard Business Review*, July–August. <https://hbr.org/2019/07/the-elusive-green-consumer>.
- Wibulwasdi, C., Piboolsravut, P., Pootrakool, K., 2012. Sufficiency Economy Philosophy and Development. The Crown Property Bureau. <https://tinyurl.com/y7lccsjt>.
- Wongkhajornpaibul, K., Sornsarut, P., 2019. An analysis of online purchase intentions of Thai hostel accommodations. *African Journal of Hospitality, Tourism and Leisure* 8 (5), 1–17. <https://tinyurl.com/y58yrcjt>.
- Yu, R., Sun, S., 2013. To conform or not to conform: spontaneous conformity diminishes the sensitivity to monetary outcomes. *PLoS One* 8 (5), e64530.