Research article

Merging Theory of Planned Behavior and Value Identity Personal norm model to explain pro-environmental behaviors

Hüseyin Ateş

Department of Science Education, Kırşehir Ahi Evran University, Kırşehir, 40100, Turkey

ARTICLE INFO

ABSTRACT

The current study attempted to understand factors influencing pro-environmental behaviors with Theory of Planned Behavior (TPB) and Value Identity Personal norm model (VIP) by proposing a new model. 16 hypotheses were tested using a total of 340 science teachers in several cities in central anatolia region in Turkey. Scales obtained from previous studies included eight psychological variables to measure antecedents of pro-environmental behaviors. Structural equation modeling revealed that the proposed model has acceptable fit data and was determined for hypothesis testing. The results of the data analysis showed that the biospheric values have significant influence on TPB constructs. In addition, attitude and perceived behavioral control had a direct influence on pro-environmental behavioral intentions which encourage active engagement in pro-environmental behaviors, while subjective norm had no direct effect on pro-environmental behavioral intentions. Lastly, considering VIP constructs, biospheric values and environmental self-identity had a direct influence on personal norm which in turn affected pro-environmental behaviors. Results of indirect relationship between constructs showed that attitude, perceived behavioral control, biospheric values and environmental self-identity had indirect influence on pro-environmental behaviors, while the indirect relationship between subjective norm and behaviors was insignificant. Consequently, 14 out of 16 hypotheses within the model that merged the TPB and the VIP were statistically supported in determining antecedents of pro-environmental behaviors.

1. Introduction

Globally unsustainable actions cause environmental problems such as pollution problems, global warming, destruction of biological diversity in nature, ozone depletion, disforestation and desertification (Dunlap et al., 2000; Steg, and Vlek, 2009). In addition, high economic growth, excessive use of natural resources, and reckless consumption cause disruption of the environment leading to global attention (Chen and Chai, 2010; Taufique and Vaithianathan, 2018). As a consequence of environmental problems, the concept of pro-environmental behavior (PEB) (e.g., Mostafa, 2006; Shrum et al., 1995) has come into existence as a new paradigm for researchers in environmental psychology-based studies (e.g., Lai and Cheng, 2016; Peattie and Belz, 2010). Accordingly, people are asked to alter their behaviors with the intent of decreasing the harmful effect on the environment (de Leeuw et al., 2015). For example, buying eco-friendly products (Kilbourne et al., 2009; Steg and Vlek, 2009), non-green consumption, dietary change, reduction of food waste and interiorizing of energy-saving (IPCC, 2016) indicated a great concern for environment. There-

fore, for a better understanding of the antecedents of PEB, there is a need for environmental protection, and in this context, studies on PEB play an important role (Thøgersen, 1995). If the driving forces of PEB are comprehended, then it could help in readiness to prepare for more influential support campaigns that expand awareness towards environmental problems and, especially, to bring this into force (Nguyen et al., 2016). Therefore, researchers often prefer to use Theory of Planned Behavior (TPB), and have recently started to include the Value Identity Personal norm (VIP) model to their studies in environmental psychology. In most of the studies, it was confirmed that TPB is suitable for predicting pro-environmental behavioral intentions (PEBI) and PEB (e.g., De Leeuw et al., 2015; Kim and Seock, 2019). Similarly, the VIP model was developed to understand PEB by investigating the relationship between biospheric value, environmental self-identity (ESI) and personal norm. The model also postulated that "*the stronger one's biospheric values, the stronger one's environmental self-identity, and the stronger personal norm, the more one is likely to actually participate*" (van der Werff and Steg, 2016; p.112).

Hence, the current study has attempted to understand factors influencing PEB and incorporate TPB (Ajzen, 1991) and VIP model (van der Werff and Steg, 2016). It was also aimed to merge TPB

E-mail address: huseyinates_38@hotmail.com

and VIP by developing a robust model. Merging these two models or theories has some benefits to conceptual model. First of all, the VIP model is based on leading models and theories including value belief norm theory (VBN) or the norm activation model (NAM) in environmental psychology aiming to predict PEB, while TPB builds on rational considerations and does not focus on moral issues (Ruepert et al., 2016). In addition, VIP model is more parsimonious compared to VBN and NAM (Ruepert et al., 2016). Accordingly, each model context supported being useful in understanding people' PEB, however, only a limited number of studies have empirically compared the theories or models to determine the superiority of a specific model (Han, 2015). Furthermore, the adequacy of the number of studies in which theories are tested in attempts to broadly understand PEB has been discussed (Onwezen et al., 2013). However, study endeavors to integrate different theoretical frameworks into a comprehensive conceptual model have rarely been made (e.g., Kiatkawsin and Han, 2017). Lastly, considering previous studies which merge theory or model, majority of them focus on only direct relationship between constructs, while only a limited number of study examine moderating role or indirect effect between constructs (e.g., Han, 2015; Zhang et al., 2017). With regard to this, especially in the PEB study context, for example, biospheric values rarely have direct influence on behavior. In another example, in most of time, attitude toward PEB is not directly related to PEB revealing attitude-behavior gap (e.g., Vermeir, and Verbeke, 2006). Therefore, as Ajzen (1991) and van der Werff and Steg (2016) stated, TPB and VIP are suitable for examining indirect association among constructs. Moreover, the current study merging the TPB and VIP is also first study examining the indirect relationship between constructs in the proposed model which may provide insight into determinant of PEB.

In particular, it is not sufficient to include the context of science education in the studies of predictors of PEBI and behaviors within the scope of theoretical frameworks (e.g., Ateş, 2019). Moreover, given the importance in environmental education, science education plays a fundamental role in improving comprehension of scientific principles supporting environmental issues (Littledyke, 2008). Science education has considerable potential and status in environmental education and provides a great deal of support to increase environmental conscience (Littledyke et al., 2013; Ross et al., 2005). In addition, science education can potentially make use of children's connection to environment to increase their curiosities toward science (Cobern, 2000). However, it is clear that there is a lack of literature in which merging TPB and VIP to predict science teachers' PEB has been examined. To address the study gaps, the following contributions were presented for the current study:

1. Considering the Turkish context, to the best of our knowledge, the present study is first attempt to predict PEB by merging TPB and VIP with a proposed model by using structural equation modeling (SEM).
2. The study examines the superiority of current proposed theoretical model compared to the TPB and VIP.
3. Determination of the relative importance between constructs within the proposed model is examined to account for PEBI and PEB.
4. Indirect relationship between constructs in the proposed model is examined.
5. The study validates the suitability of the proposed model in pro-social and PEB study context.
6. The study is important for the Turkish context since Turkey, a developing country, ranks number 17 in the list of countries by population (Worldometers, 2020) and is likely to have serious environmental problems. For example, total energy-based greenhouse gas emissions in 2014 as CO_2 equivalent increased

by 125% compared to 1990. In addition, between 1990 and 2014, greenhouse gas emissions equivalent to transport-related CO_2 increased by 173% (Republic of Turkey Ministry of Environment and Urbanization 2016).

2. Literature review

2.1. Pro-environmental behavior

PEB can be defined as "the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself" (Stern, 2000, p.408) or "any action that enhances the quality of the environment" (Steg et al., 2014, p. 104). The term PEB includes a variety of actions such as use of environmental goods and services, organic based products, recycling and waste disposal (Park and Ha, 2012). PEB was used interchangeably with some sustainable behavior types such as environmentally friendly behavior, environmentally responsible behavior, (Miller et al., 2015), ecologically conscious consumer behavior (e.g. Adrita and Mohiuddin, 2020), green purchase behavior (e.g., Chan, 2001) and purchasing eco-friendly apparel (e.g., Kim and Seock, 2019). Studies regarding PEB have caused tremendous excitement among researchers who study environmental issues (e.g. Barbarossa and de Pelsmacker, 2016; Tjärnemo and Södahl, 2015).

2.2. The combination of TPB and VIP and study hypotheses

The extended and respective study context of TPB and VIP provided in-depth information on understanding PEB. As mentioned before, VIP is interested in more pro-social or pro-environmental behavior study context (van der Werff and Steg 2016), while TPB is more convenient to explain the rational self-interest parts of PEB (Zhang et al., 2017). In addition, while the VIP model leaves open the possibility that the process leading to PEB is unconscious and intentional, TPB, in particular, suggests that PEB is caused by reasoned processes and weighing costs and benefits of behavioral preferences (Ruepert et al., 2016). Moreover, shortcomings of TPB have a lack of measuring people' sense of morality, and one of the most extensively preferred models to address the gap is VIP. Therefore, comprehension based exclusively on either the TPB or VIP may be insufficient, since PEB can be best accepted as a combination of pro-social motives and self-interest (Bamberg and Moser, 2007). Attempts to merge TPB and VIP constructs include both rational and moral considerations and may increase the explanatory power of the theories to understand people' PEBI or PEB. For example, Chen (2016) found that including moral considerations strengthened the explanatory power of the TPB model by 9%. In addition, biospheric values and self-identity impacts PEB at both behavior-specific levels such as recycling and consumption (e.g., Nigbur et al., 2010) and generically such as self-identification toward green purchase (e.g., Sparks and Shepherd, 1992). Yazdanpanah and Forouzani (2015) revealed that adding personal norm and self-identity enhanced the proportion of explained variance of the TPB model by 8%. In a study by Nguyen et al. (2016), it was reported that biospheric values significantly contribute to explanatory power of TPB. Accordingly, to better understand the factors of PEB, the current study merged TPB and VIP constructs and proposes a conceptual model as shown in Fig. 1.

2.2.1. Value identity personal norm model

The VIP model was developed by van der Werff and Steg (2016) to understand general determinants of environmental acts. The VIP model postulates that environmental behaviors are affected by feelings related to moral obligation to act in a behavior
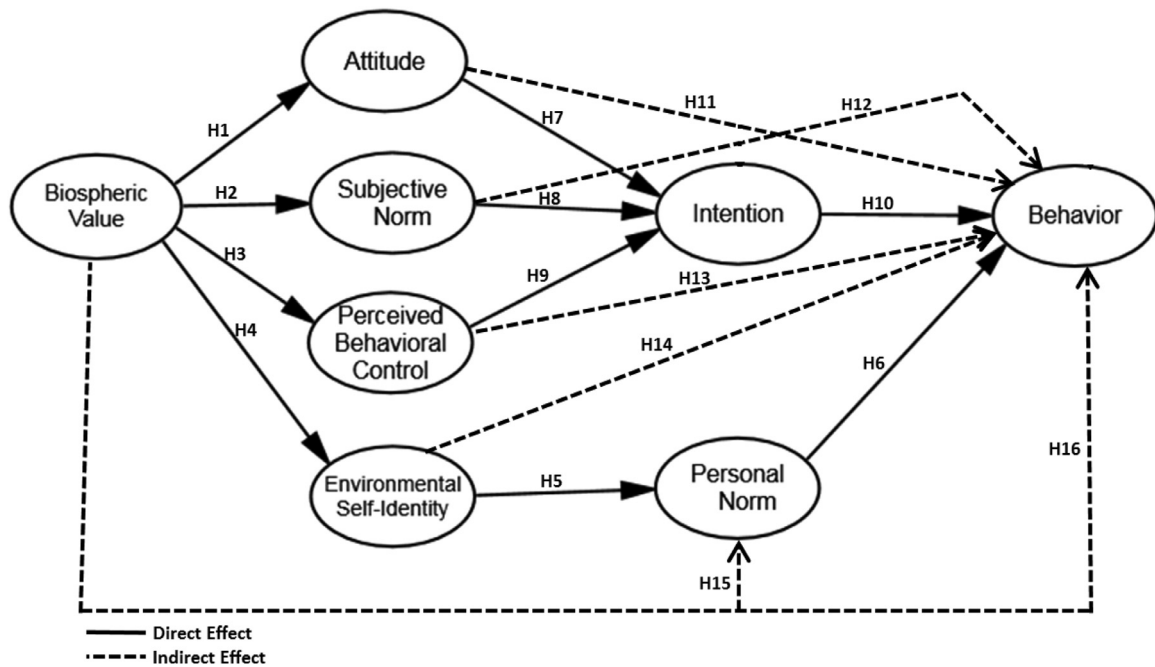
Fig. 1. Proposed research framework.

(personal norms). In addition, the VIP model farther proposes that personal norm is in turn affected by ESI related to environmental issues which is "*the salient part of an actor's self which relates to a particular behavior. It reflects the extent to which an actor sees him- or herself as fulfilling the criteria for any societal role*" (Conner and Armitage, 1998, p.1444). ESI is also affected by biospheric values. During the development process of the model, Van der Werff and Steg (2016) studied 64 females and 122 males. The results revealed that biospheric values accounted for 23% of the variance in ESI, which accounted for 35% of the variance in personal norm. In subsequent studies, VIP has been applied to various PEBI and behavior studies, since PEB was noted to be pro-social behavior. Since it is a recently-proposed model, only a limited number studies have used the VIP model to account for PEBI and behaviors (e.g., Ruepert et al., 2016; Schenk, 2019; Xu et al., 2019). For example, in a study conducted by Ateş (2019), science teachers' biospheric value, ESI and personal norm were examined. The study results revealed that science teachers have high mean values out of 5 regarding biospheric values ($M = 4.64$), ESI ($M = 4.32$) and personal norm ($M = 4.51$). In addition, it was reported that biospheric values had positive, large and significance influence on personal norm ($\beta=0.53$) and ESI had positive, medium and significance influence on personal norm ($\beta=0.44$).

2.2.1.1. Biospheric values. Value can be defined as desired objectives that present guiding principles in people' lives (Schwartz, 1992). Values exist in thoughts or ideas, but don't have a physical or concrete existence and sustain stability in the progress of time (Feather, 1995). For a long time, in particular, biospheric values have played an important role for many ecologists and environmentalist researchers (e.g., Leopold, 1948; Naess, 1989). Biospheric values are main beliefs which emphasize thoughts about the biosphere (Stern et al., 1993) and focus on the quality of environment, the regardless of the usefulness it presents for people (Steg and de Groot, 2012). People who have strong biospheric values thus place emphasis on the intrinsic value of the nature, which turns into a moral obligation to behave pro-environmentally (Stern and Dietz, 1994). Past studies also reported that people who strongly validate biospheric values are concerned about the environment, and more strongly base their

decision to take specific actions for the environment as a result of their behaviors (e.g., Perlaviciute and Steg 2015). Finally, biospheric values were found to be associated with a wide range of pro-environmental preferences and behaviors (e.g., Nguyen et al., 2016; Van der Werff et al., 2013b).

Given the constructs of TPB and VIP, earlier studies revealed that individuals' biospheric values also have an effect on their attitudes toward PEB (e.g., Dietz et al., 1998; Nguyen et al., 2016; Rahman and Reynolds, 2019). For example, in value-basis theory, a strong theoretical framework was provided to see the relationship between biospheric values and attitude (Stern and Dietz, 1994). This is all to say that people who attach values on emphasizing human-nature harmony, such as biospheric value, have positive pro-environmental attitudes (Kempton et al., 1995). However, the relationship between biospheric values and subjective norm has been rarely studied (e.g., Nguyen et al., 2016). In a study by Nguyen et al. (2016), Vietnamese citizens' biospheric values positively influenced their consumers' subjective norms ($\beta=0.59$). Similar findings obtained in Soyez' (2012) study revealed that eco-centric value orientation is the strongest predictor of subjective norms related to organic food purchase in four countries: Australia, Canada, German and USA. Namely, due to their concerns for nature itself, people can develop higher perceived subjectiveness toward PEB norms. Lastly, considering the relationship between biospheric values and perceived behavioral control (PBC), it was argued that perceived impracticable barriers or struggles such as time, limited choice and higher costs can affect actions in a pro-environmental way (Lindenberg and Steg, 2007). However, Steg and de Groot (2012) stated that people who have biospheric values toward environmental quality tend to purchase pro-environmental products, even if they have perceived barriers. In other study conducted by Van der Werff et al. (2013b), consumers who endorse powerful biospheric values stated that they often prefer eco-friendly products even though they are expensive. Perlaviciute and Steg (2015) also revealed that people with strong biospheric values deemphasized negative perceived consequences about renewable energy consumption such as extra effort and higher price. In the line with previous results, the following hypotheses were presented:

H1: Biospheric values are positively related to attitude toward pro-environmental behavior.

H2: Biospheric values are positively related to subjective norms.

H3: Biospheric values are positively related to perceived behavioral control.

Several researchers postulated a relationship between self-identity and values (e.g., Gatersleben et al., 2014). For example, Sparks and Shepherd (1992) stated that "*a person's self-identity would be reflected in that person's beliefs, values, and attitudes*" (p. 390). In environmental studies, empirical evidence also confirmed the positive influence of biospheric values on ESI (e.g., Gatersleben et al., 2014; van der Werff et al. 2013a,b). For example, Van der Werff et al. (2013b) reported that biospheric values explained 25% of the variance in ESI, implying that the stronger the individuals have biospheric values, the stronger their ESI. Similarly, Gatersleben et al. (2014) reported that people who have strong biospheric values define themselves as an environmentally friendly individual. Therefore, it was hypothesized that:

H4: Biospheric values are positively related to environmental self-identity.

2.2.1.2. Environmental self-identity. ESI can be defined as "*the extent to which one sees oneself as a type of person whose actions are environmentally-friendly.*" (Werff et al. 2013a; p.1258). Initial studies suggested that some kinds of self-identity may include a moral variable (Sparks and Shepherd, 1992) such as personal norm. From this viewpoint, considering environmental domain, VIP proposed that "*personal norm is influenced by one's environmental self-identity, which reflects the extent to which one sees oneself as a pro-environmental person*" (van der Werff and Steg, 2016, p.108). Furthermore, Van der Werff et al. (2013a) found that ESI accounted for 45.2% of the variance in the personal norm, implying that the people who have more powerful ESI have more powerful personal norm ($\beta = 0.67$). In Chan et al. (2020) study conducted with 239 people from a university in Hong Kong, it was revealed that ESI was positively associated with personal norm ($\beta=0.04$). On the basis of reviewed literature, the following hypothesis was proposed:

H5: Environmental self-identity is positively related to personal norm.

2.2.1.3. Personal norm. Personal norm defined as "feelings of moral obligation to perform or refrain from specific actions" (Schwartz and Howard, 1981, p. 191) is "used to signify the self-expectations for specific action in particular situations that are constructed by the individual. Activated personal norms are experienced as feelings of moral obligation." (Schwartz, 1977, p.227). In the environmental domain, people who have powerful personal norms to act pro-environmentally feel morally obliged to act accordingly (Van der Werff et al., 2013a). In line with this, Stern et al. (1999) argued that personal norm is associated with PEB. This means that the more powerful the moral obligation to act pro-environmentally, the more people engage in PEB. Considering the discussed literature, the following hypothesis was formulated:

H6: Personal norm is positively related to pro-environmental behavior.

2.2.2. Theory of planned behavior

TPB originated from the Theory of Reasoned Action, which was developed to account for behavioral intentions (Fishbein and Ajzen, 1975). TPB assumed that intentions are the best influential factor of human behavior and that people are rational in the systematic use of any existing information (Ajzen and Fishbein, 1980). In addition, TPB postulated that intention is influenced by "*attitude, subjective norm and perceived behavioral control*" (Ajzen and Madden, 1986, p.463). Briefly, "*the more favorable the attitude and sub-*

jective norm with respect to a behavior, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the behavior under consideration" (Ajzen, 1991; p.188). Studies on TPB has been extensively utilized by many researchers to confirm purchasing intention and purchasing behavior for sustainable or green products in the field of pro-environmental behavioral study areas, including organic products and vegetables (e.g., Paul and Rana, 2012), recycling behaviors (e.g., Cheung et al., 1999; White and Hyde, 2012), eco-friendly packaging (e.g., Prakash and Pathak, 2017), green hotels (e.g. Yarimoglu and Günay, 2020), skin care products (e.g., Hsu et al., 2017), and general green products (e.g., Chen and Tung, 2014; Ha and Janda, 2012).

2.2.2.4. Attitude. Attitude is defined as positive or negative assessment of a specific behavior (Ajzen, 1991). In the scope of the environmental domain, Bamberg (2003) defined attitude as "*cognitive and affective evaluation of the object of environmental protection.*" (p. 21). This argument was confirmed by the earlier studies which found that attitude is an important determinant of PEBI (e.g., Chen and Tung, 2014; Verma and Chandra, 2018; Yadav and Pathak, 2016). On the other hand, it is anticipated that people who exhibit a more positive attitude towards PEB will also have a high degree of intention to engage in environmental protection (Chen and Chai, 2010). Hence, the study hypothesized that:

H7: Attitude is positively related to pro-environmental behavioral intention.

2.2.2.5. Subjective norm. Subjective norm refers to "*the perceived social pressure to perform or not to perform the behavior*" (Ajzen, 1991, p. 188) such as family, relatives, friends, business partners and colleagues (Verma and Chandra, 2018). It is "*an individual's perception that most people who are important to his/her should (or should not) perform a particular behavior*" (Fishbein and Ajzen, 2011, p. 131). The subjective norm was also asserted to be effective in PEBI (e.g., Biswas and Roy, 2015; Choi and Johnson, 2019). For example, Yadav and Pathak (2016) reported that young consumers' subjective norm has an effect on their intentions toward purchasing green products. More recently, Si et al. (2020) confirmed that subjective norm has a positive influence on intention of sustainable usage of bikes. Hence, the literature revealed that the people who have a powerful perceived subjective norm from important people have high degree of intention to behave environmentally friendly (Chen and Tung, 2014). In consideration of empirical evidences, the following was hypothesized:

H8: Subjective norm is positively related to pro-environmental behavioral intention.

2.2.2.6. Perceived behavioral control. PBC is "perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles." (Ajzen, 1991, p. 188). PBC assesses how efficiently the individual can examine the contributing causes that enable or limit the actions required to overcome particular situations (Verma and Chandra, 2018). Considering the particular situation in the environmental domain, the main reasons why pro-environmental products are not chosen by environmentally friendly people can be explained with higher prices and lower availability (Barbarossa and Pastore, 2015). PEB necessitates people to cope with such barriers and discomforts (Barbarossa and Pastore, 2015). People who have high control over such barriers or discomforts have a better PEBI (Ko and Jin, 2017). Previous studies also suggested that PBC is strong factor to account for the PEBI (e.g., Bamberg, 2003). For example, Wang et al. (2019) confirmed that PBC has an influence

on residential on-line recycling willingness. Therefore, the assumed relationship was tested by forming the hypothesis:

H9: Perceived behavioral control is positively related to pro-environmental behavioral intention.

2.2.2.7. Pro-environmental behavioral intention. According to the TPB, the main predictor of behavior of people is their behavioral intentions, implying that the stronger the intention to involve in the behavior, the more likely it is for the behavior to perform (Ajzen, 1991). In the environmental domain, it was seen that behavioral intentions related to specific environmental actions were closely related to actual behavior (e.g., Lai and Cheng, 2016; Laudenslager et al., 2004). For example, De Leeuw et al. (2015) found that high school students' intentions to perform pro-environmentally are the strong antecedents of their PEB. In line with previous study results, the following was hypothesized:

H10: Pro-environmental behavioral intention is positively related to pro-environmental behaviors.

2.2.3. Indirect relationship between constructs

In the current study, indirect relationship between constructs was tested through TPB and VIP. The reason why examining the indirect influence is that in a three-variable system "*there are two causal paths feeding into the outcome variable: the direct impact of the independent variable and the impact of the mediator. There is also a path from the independent variable to the mediator.*" (Baron and Kenny, 1986, p. 1176). In recent studies on PEB, the significant indirect relationship between constructs of TPB has been discussed (e.g. Park and Ha, 2014; Taufique and Vaithianathan, 2018). For example, in a study conducted by Bamberg and Möser (2007), a meta-analytic SEM confirmed that attitude, subjective norm and PBC had an indirect influence on PEB through PEBI. Similarly, among constructs of VIP model, indirect association between biospheric values and PEB was examined through ESI (e.g., Gatersleben et al., 2014). Moreover, Van der Werff (2013a) found that personal norm was successfully confirmed as a mediator factor between ESI and PEB. In another study, van der Werff and Steg (2016) reported that biospheric values have positive and significant indirect effect on PEB via ESI and personal norm. On this premise, it was hypothesized that:

H11: Attitude has positive indirect influence on pro-environmental behavior via pro-environmental behavioral intention.

H12: Subjective norm has positive indirect influence on pro-environmental behavior via pro-environmental behavioral intention.

H13: Perceived behavioral control has positive indirect influence on pro-environmental behavior via pro-environmental behavioral intention.

H14: Environmental self-identity has positive indirect influence on pro-environmental behavior via personal norm.

H15: Biospheric values have positive indirect influence on personal norm via environmental self-identity.

H16: Biospheric values have positive indirect influence on pro-environmental behavior via environmental self-identity and personal norm.

3. Methods

3.1. Data collection and participants

The data collection process was completed during the fall semester of the academic year (September to December 2019) by using self-determined scales. The questionnaire used in this study can be found in Supplementary Information. The participants chosen with convenience sampling method include 340 science teachers (190 female, 150 male; aged 23 to 58, $M = 36.42$, SD=8.48). Participants work at public middle schools from 5 different medium-sized cities with populations ranging from 200 to 300 thousand people in the central anatolia region in Turkey. Science teachers' average duration of experience is 12.86 years. 61.4% of them are married, while 38.6% of them are single. In Turkey, the aim of science education is to raise a scientifically informed citizen which has "*the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity*" (OECD, 2004, p. 40). Therefore, the science teacher is responsible for providing science education to 5th, 6th, 7th and 8th grade students, who are educated at middle school level within the framework of the course subjects determined by the Turkish curriculum. In accordance with the aim of science education in Turkey, there are some private aims related to environmental issues: "a) to realize the interaction between individual, environment and society, b) to adopt scientific process skills and scientific research approach and produce solutions to the problems encountered in these fields in the process of discovering nature and understanding the relationship between human-environment and c) to arouse interest and develop an attitude towards the events taking place in nature" (Turkish Ministry of Education 2018, p. 9). In addition, before the getting to work, pre-service science teachers get several environment-based compulsory courses such as 'Environmental Education' and elective courses such as 'Chemical Wastes and Environmental Pollution' and 'Renewable Energy Resources' during their undergraduate education at university (The Higher Education Council of Turkey, 2018).

3.2. Measures

In the current study, TPB and VIP Model were merged to explain PEB. Accordingly, in this section, components of these theories were involved. VIP includes biospheric value, ESI and personal norm, while attitude, subjective norm and PBC are involved in TPB. Finally, the PEB scale is involved at the end of this section.

3.2.1. Biospheric value

Biospheric values are concerned for the biosphere (Stern et al., 1993) and stress the quality of nature, regardless of the benefits of the environment to people (Steg and De Groot, 2012). The biospheric value scale developed in previous studies (Stern, 2000) includes four items, including "unity with nature", "respecting the earth", "protecting the environment" and "preventing pollution". The scale was measured with a 7-point likert scale ranging from "not at all important" to "supreme importance". The cronbach alpha coefficient value was found to be 0.72, which is acceptable (Nunnally, 1994).

3.2.2. Environmental self-identity

The self-identity scale measures to what extent engaging in PEB is an important component of the person's self-concept (Terry et al., 1999). The first version of the scale of self-identity was used in the several studies (e.g., Armitage and Conner, 1999; Fekadu, and Kraft, 2001). However, the term of ESI was often involved in the studies of a series by Stern and his colleagues (e.g., van der Werff, et al., 2013a,b, 2014). Therefore, the items in the ESI scale are obtained from their studies (e.g., van der Werff, et al., 2013a,b). Three items were involved in a 7-point scale (from "*totally disagree*" to "*totally agree*"). The reliability analysis revealed that internal reliability is at an acceptable level (α=0.76).

Table 1
Factor loadings in exploratory factor analysis.

Constructs and items	Factor loadings							
	VIP constructs			TPB constructs				
	BV	ESI	PN	ATT	SN	PBC	PEBI	PEB
Biospheric value								
BV 4	0.79							
BV 2	0.75							
BV 1	0.72							
BV 3	0.61							
ESI								
ESI 3		0.75						
ESI 1		0.65						
ESI 2		0.61						
Personal norm								
PN 2			0.79					
PN 1			0.68					
PN 3			0.64					
Attitude								
ATT 2				0.81				
ATT 3				0.77				
ATT 1				0.67				
Subjective norm								
SN 3					0.79			
SN 2					0.68			
SN 1					0.60			
PBC								
PBC 1						0.72		
PBC 2						0.71		
PEBI								
PEBI 1							0.75	
PEBI 2							0.69	
PEB								
PEB 7								0.82
PEB 6								0.80
PEB 5								0.79
PEB 4								0.76
PEB 8								0.72
PEB 10								0.72
PEB 9								0.71
PEB 11								0.69
PEB 1								0.68
PEB 12								0.67
PEB 3								0.65
PEB 13								0.65
PEB 2								0.61

Note. BV= Biospheric Value, PN=Personal Norm, ATT=Attitude, SN=Subjective Norm.

3.2.3. Personal norm

Personal norm scale reflects items which are related to sense of moral obligation to start in a pro-environmental movement manner. The scale was originated from NAM developed by Schwartz' (1977). The Personal norm scale was adapted from van der Werff, et al. (2013a) and includes three items in a 7-point scale (from "*totally disagree*" to "*totally agree*"). The reliability value was determined as 0.81.

3.2.4. Attitude

In line with past studies (e.g., De Leeuw et al., 2015, p. 132; De Leeuw et al., 2014), attitude was measured with common stem, "*For me, performing pro-environmental behaviors on a regular basis during the next year would be …*" rated on three 7-point likert type scales. Measurement was done with semantic differential scales including "useless to useful", "annoying to pleasant", and "cool to uncool". Internal reliability was calculated as 0.80.

3.2.5. Subjective norm

The subjective norm scale adapted from De Leeuw et al. (2014) and includes three items on a 7-point likert response scale ranging from "extremely unlikely" to "extremely likely". For each item, the sentence "*How likely or unlikely would your …. be to advise you to perform pro-environmentally in the*

next 12 months?" is involved with three categories of people who are important for individual: your family, friends, university (Cronbach's α= 0.82).

3.2.6. Perceived behavioral control

The PBC scale is adapted from De Leeuw et al. (2015) and includes two items with 7-point scales: "*For me, performing pro-environmental behavior on a regular basis in the next year would be:*" (very difficult to very easy), and "*I feel that I'm able to perform pro-environmental behavior on a regular basis in the next year*" (definitely not to yes, definitely; α= 0.71).

3.2.7. Intention

The two items were involved in the intention scale adapted from De Leeuw et al. (2015; p.132). "I am determined to perform pro-environmental behavior on a regular basis in the next year" and "I have the will to perform pro-environmental behavior on a regular basis during the next year." The intention scale was rated on 7-point scales ranging from "definitely not" to "definitely yes" (α= 0.70).

3.2.8. Behavior

The behavior scale adapted from De Leeuw et al. (2015) measures the degree to which participants achieved environmentally

Table 2
Results of reliability and validity.

Construct	Items	Factor loading	α	AVE	Composite reliability
Biospheric value	BV 1	0.74	0.72	0.54	0.83
	BV 2	0.69			
	BV 3	0.70			
	BV 4	0.81			
ESI	ESI 1	0.73	0.76	0.52	0.77
	ESI 2	0.67			
	ESI 3	0.77			
Personal norm	PN 1	0.72	0.81	0.51	0.76
	PN 2	0.74			
	PN 3	0.69			
Attitude	ATT 1	0.69	0.80	0.58	0.81
	ATT 2	0.77			
	ATT 3	0.82			
Subjective norm	SN 1	0.65	0.82	0.51	0.75
	SN 2	0.67			
	SN 3	0.81			
PBC	PBC 1	0.74	0.71	0.55	0.71
	PBC 2	0.74			
PEBI	PEBI 1	0.72	0.70	0.55	0.71
	PEBI 2	0.76			
PEB	PEB 1	0.72	0.74	0.51	0.93
	PEB 2	0.65			
	PEB 3	0.67			
	PEB 4	0.70			
	PEB 5	0.72			
	PEB 6	0.77			
	PEB 7	0.85			
	PEB 8	0.71			
	PEB 9	0.75			
	PEB 10	0.69			
	PEB 11	0.73			
	PEB 12	0.61			
	PEB 13	0.73			

friendly behavior since last year. The behavior scale including 13 items show that how often participants performed each of the behaviors. The scale was rated on 7-point scales ranging from never to always. Internal reliability was calculated as 0.74.

3.3. Data analysis

Data analysis of the study was done with SPSS 21 and AMOS 20 since the combination of them is starting to be preferred in the latest pro-environmental studies (e.g., Jaiswal and Kant, 2018; Verma and Chandra, 2018; Yadav and Pathak, 2017). Firstly, an exploratory factor analysis (EFA) was performed to identify factor structure and factor loadings using SPSS 21. Then, via AMOS 20, confirmatory factor analysis (CFA) was used to test the fitness of proposed model and path analysis was performed to examine relationship among constructs using SEM. Before EFA, multivariate normality and sampling adequacy were evaluated. Since Bartlett's test of sphericity showed significant result ($p < 0.05$) and the value of Kaiser-Meyer-Olkin (0.864) was higher than 0.60 (Tabachnick and Fidell, 2001), it was appropriate for the factorability of the data.

During EFA, principal component analysis with varimax rotation was carried out to extract salient factors. The results of EFA revealed that total variance explained was 73.58%, the eigenvalues were above 1.0 and all items had a factor loading score higher than 0.5. Factor loadings of items in the proposed model are indicated in Table 1.

A structured equation model was carried out in two steps using AMOS 20 in accordance with Anderson and Gerbing' (1988) suggestions: the measurement model and the structured model. In the first stage, CFA was performed to examine convergent and divergent validity of the measurement model. The second stage included testing goodness of fit of the structured model and hypothesis testing (Hair et al., 2014). In the current study, since the factor loadings are higher than 0.5, the composite reliabilities of constructs were significant and above 0.70, and since the values of Average Validity Extracted (AVE) of variables were higher than 0.50, it could be stated that convergent validity indicated in Table 2 was established (Hair et al., 2014; Kline, 2005).

Since the square root of AVE was larger than squared correlation between variables, the adequacy of discriminant validity depicted in Table 3 was confirmed (Fornell and Lacker, 1981). Goodness of fit assessment was evaluated with following criteria: $\chi2$/df ratio should be between 2 and 5 (Hair et al., 2010), CFI, TFI and GFI values should higher than 0.90 (Kline, 2005) and SRMR and RMSEA values should be less than 0.08 (Hu and Bentler, 1999). Therefore, all variables were subjected to CFA via maximum likelihood estimation and found above the recommended criteria (χ^2=508.46, df=156; $p<$ 0.05; $\chi2$/df=3.26; GFI=0.90 TFI=0.92; CFI=0.92; RMSEA=0.05; SRMR= 0.06).

4. Results

4.1. Assessment of goodness of fit

In the structured model, SEM was conducted for TPB, VIP and proposed model. After SEM, the structural model was obtained to fit data acceptably for TPB (χ^2=477.31, df=175; $p<$ 0.05; $\chi2$/df=2.73; GFI=0.93 TLI=0.94; CFI=0.95; RMSEA=0.03; SRMR= 0.03), VIP (χ^2=498.46, df=172; $p<$ 0.05; $\chi2$/df=2.90; GFI=0.90 TLI=0.91; CFI=0.90; RMSEA=0.06; SRMR=0.05) and proposed model (χ^2=476.14, df=179; $p<$ 0.05; $\chi2$/df=2.66; GFI=0.94 TLI=0.95; CFI=0.96; RMSEA=0.03; SRMR=0.03). The result of goodness fits revealed that the proposed model had better fit than both original TPB and VIP models. In addition, the proposed model had a greater predictive power for PEB (R^2=0.488) than the original TPB (R^2=0.464) model and VIP model (R^2=0.412). The comparison summary of goodness fit statistics was involved in Table 4.

4.2. Path analysis

According to the results of the path analysis, considering the relationship between VIP variables, the biospheric value had a direct effect on attitude (β=0.48, $t = 10.651$, $p<0.01$), subjective

Table 3
Construct mean, standard deviation and correlation between constructs.

	M	SD	BV	ESI	PN	ATT	SN	PBC	PEBI	PEB
BV	5.42	1.12	**0.734**							
ESI	5.64	0.97	0.547	**0.721**						
PN	5.29	1.18	0.456	0.321	**0.714**					
ATT	5.57	1.01	0.321	0.654	0.566	**0.761**				
SN	5.35	1.12	0.387	0.588	0.589	0.759	**0.714**			
PBC	5.45	0.98	0.298	0.698	0.623	0.689	0.544	**0.741**		
PEBI	5.07	0.87	0.456	0.458	0.468	0.645	0.568	0.489	**0.741**	
PEB	5.22	1.02	0.579	0.587	0.599	0.622	0.634	0.568	0.456	**0.714**

Note. Diagonal values show $\sqrt{AVE}$ for each variable.

Table 4
Result of goodness fit statistics of the models.

Goodness fit statistics & R^2	TPB	VIP	Proposed model
χ^2	477.31	498.46	476.14
df	175	172	179
χ^2 /df	2.73	2.90	2.66
CFI	0.95	0.90	0.96
GFI	0.93	0.90	0.94
TLI	0.94	0.91	0.95
RMSEA	0.03	0.06	0.03
SRMR	0.03	0.05	0.03
R^2 (Adjusted)	0.464	0.412	0.488

Table 5
SEM results of the proposed model.

Relations	Standardized estimate (β)	t-value	Hypothesis	Hypothesis situation
Direct Effect				
BV → ATT	0.48	10.651	H1	Supported
BV → SN	0.42	8.142	H2	Supported
BV → PBC	0.40	7.965	H3	Supported
BV → ESI	0.49	10.723	H4	Supported
ESI → PN	0.45	8.645	H5	Supported
PN → PEB	0.32	5.267	H6	Supported
ATT → PEBI	0.34	4.247	H7	Supported
SN → PEBI	0.08	2.953	H8	Rejected
PBC → PEBI	0.39	4.812	H9	Supported
PEBI → PEB	0.24	3.656	H10	Supported
Indirect Effect				
ATT → PEB	0.17	1.997	H11	Supported
SN → PEB	0.05	1.127	H12	Rejected
PBC → PEB	0.19	2.364	H13	Supported
ESI → PEB	0.22	2.759	H14	Supported
BV → PN	0.34	3.236	H15	Supported
BV → PEB	0.18	2.168	H16	Supported

norm (β=0.42, t = 8.142, p<0.01), PBC (β=0.40, t = 7.965, p<0.01) and ESI (β=0.49, t = 10.723, p<0.01). Furthermore, ESI was directly related to personal norm (β=0.45, t = 8.645, p<0.01). Lastly, personal norm had a direct effect on PEB (β=0.32, t = 5.267, p<0.01). Considering TPB constructs, attitude toward PEB (β=0.34, t = 4.257, p<0.01) and PBC (β=0.39, t = 4.812, p<0.01) explained PEBI, while subjective norm (β=0.08, t = 2.953, p>0.01) was not directly related to PEBI. The effect of PEBI on PEB was found to be direct and significant (β=0.24, t = 3.656, p<0.01).

Subsequently, indirect influence of constructs in the proposed model was examined. Among constructs of TBP, attitude (β=0.17, t = 1.887, p<0.01) and PBC (β=0.19, t = 2.364, p<0.01) had indirect influence on PEB, while subjective norm (β=0.05, t = 1.127, p>0.01) had no significant indirect association with PEB. In addition, results of indirect relationship in the constructs of VIP model showed that biospheric values had significant indirect influence on personal norm (β=0.34, t = 3.236, p<0.01) and PEB (β=0.18, t = 2.168, p<0.01) and there was a significant indirect relationship between ESI and PEB (β=0.22, t = 2.759, p<0.01). SEM results toward direct and indirect relationships are included in Table 5.

5. Discussion

The main purpose of the study was to determine factors influencing PEB within the scope of the TPB and VIP models as a theoretical framework. In the study, TPB and VIP models were merged to obtain a robust conceptual model. The empirical results of the study indicated that model fitting results for TPB, VIP and proposed model was found to be at an acceptable level. The goodness fit statistics of the models of three models had the standard adaptation, implying that the explanatory quality of the models is well and useful to determine antecedents of PEB. The explanatory power of the study revealed that compared to TPB, the predictive

ability of proposed model increased 2% after adding constructs of VIP (i.e., biospheric value, personal norm and ESI). However, adding constructs of TPB (i.e., attitude, subjective norm, PBC and PEBI) increased 8% of total variance of the proposed model when compared to VIP. These results revealed that since proposed model has strong predictive power to explain PEB, it can be inferred that the proposed model is widely comprehensive, sufficient, effective and utilizable in understanding PEB.

Results of path analysis indicated that the p-value of each construct had a good level of significance. The results indicated that biospheric values had a direct effect on attitude, subjective norm, PBC and ESI (H_1, H_2, H_3 and H_4 were supported). In addition, biospheric values indirectly influenced personal norm via ESI and PEB via personal norm and ESI (H_{15} and H_{16} were supported). Furthermore, ESI was indirectly related to PEB (H_{14} was supported). This implies that science teachers attaching great importance biospheric value believe that their perceptions depend on their social environments about performing or not performing the PEB. Accordingly, biospheric values can indirectly affect PEB and this is consistent with the idea that behavioral determinants can have a crucial important indirect effect on behaviors by means of their effects on constructs of TPB (Ajzen, 1988; Ajzen and Fishbein 1980; Bamberg, 2003). In addition, there is increasing empirical evidence that PEB is associated with specific or general determinants such as biospheric values (Gärling et al., 2002; Nguyen et al., 2016; Perlaviciute and Steg, 2015).

In line with previous recent TPB studies based on PEB (e.g., De Leeuw et al. 2015; Liu et al., 2020; Taufique and Vaithianathan, 2018), results demonstrated that attitudes and PBC are directly and positively related to PEBI (H_7 and H_9 were supported) and had an indirect and positive influence on PEB (H_{11} and H_{13} were supported). In addition, PEBI had a positive influence on PEB (H_{10} was supported). However, subjective norm did not have direct or indirect influence on PEBI (H_8 and H_{12} were rejected), which implies that acting pro-environmentally could yet become a social norm (Yadav and Pathak, 2016). In addition, receiving science teachers' friends/family members/peer groups' approvals does not provide any importance concerning a reason for acting pro-environmentally (Paul et al., 2016) in Turkey. Hence, people believe that adoption of behaving pro-environmentally cannot be acceptable behavior in terms of social aspects (Fransson and Gärling, 1999) since people who are important to the person are not conscious of importance of acting pro-environmentally (Paul et al., 2016). Considering past studies where the theory partially supported the PEBI, subjective norms obtained were insignificant in terms of direct and indirect effect on PEBI and PEB in several studies (e.g., Liu et al., 2020; Park & Ha, 2014; Taufique and Vaithianathan, 2018).

One of the big contributions to the current study was to successfully test the VIP model, since it was previously proposed that VIP model allows testing to what extent and how biospheric values and ESI predict personal norm, which in turn affects PEB (Ruepert et al., 2016). In the current study, the findings justified that science teachers with powerful biospheric values have high ESI, which in turn enhanced their moral obligations and feelings to act in an environmentally-friendly way and to be more likely to behave environmentally-friendly (H_5, and H_6 were supported). Despite not being tested via the VIP model, in line with these findings, earlier studies also provided some preliminary support for this reasoning (e.g., Cook et al., 2002; Hitlin, 2003; Nguyen et al., 2016).

5.1. Implications

Since Ajzen' (1991) first version, the TPB has been tested in various studies based on environmental psychology for many years. However, since VIP developed by van der Werff and Steg (2016) has

been proposed recently, it has not yet widely recognized in wider study areas. In this regard, this study contributes to the literature on pro-environmentally behaviors in several ways. First, the present study made an effort to increase current insights on how well TPB and VIP can be integrated to explain factors influencing PEB. In addition, with this study, a new robust conceptual model, including constructs of different theories or models including NAM (Schwartz, 1977) and VBN (Stern, 2000), was developed. Accordingly, the key position of the model were volitional (attitude and subjective norm; Fishbein and Ajzen, 1975), non-volitional (PBC; Ajzen, 1991), motivational basis (biospheric value; Schwartz 1992), identification (ESI; Sparks and Shepherd, 1992), and morality (personal norm; Schwartz, 1977) factors, which together explain pro-environmental behavior. As a matter of fact, even though a few researchers are embarking on an enterprise to merge more than one theory to explain PEB (e.g., Han, 2015; Han and Hyun, 2017), there is lack of studies conducted within the frame of TPB and VIP. Consequently, the current research took existing literature much further and established a new robust research model that merges two theories/models to develop the comprehension of PEB. In addition, the superiority of the proposed model was compared to TPB and VIP and was confirmed empirically. Theoretical implications of the current study are largely due to an important value of the effectiveness of the proposed model in explaining behaviors, its comprehensiveness and applicability to future research with regards to deepening and expansion of the model, which leads to the achievement of the study aims.

The results of the present study revealed that personal norm was the best predictor of PEB. The interest of personal norm in explaining PEB was found by several studies (e.g., Lopez-Mosquera et al., 2014; Zhang et al., 2017). In addition, PBC was the strongest determinant of PEBI in line with past empirical studies (e.g., Liu et al., 2020; Ru et al., 2019). These implied that feelings of moral obligation to act and the considerations of how efficiently the people can control the perceived factors or barriers to act environmentally friendly are major factors in determining people' intentions and behaviors. A more theoretical implication of this current study is that biospheric value was an important determinant of TPB constructs and that subjective norm is not among predictors of PEBI, apart from most of previous TPB-based pro-environmental studies. The present study also confirmed the indirect influence of attitude, PBC, biospheric values and ESI on PEB through intention, ESI and personal norm. This indicated that people's evaluation about PEB, and perceived ease or difficulty of performing the PEB would impact the PEBI. Accordingly, the stronger the intention to engage in PEB, the more likely it is for the PEB to act. In addition, the results imply that the stronger a person's biospheric values, the stronger a person's ESI, which inclines to stronger feelings of moral obligation to engage in PEB, which affects her/his PEB (van der Werff and Steg, 2016). In the current Turkish setting, major science teachers are individuals in the middle age group, well informed and perceive themselves as self-oriented persons. Hence, they are controlled internally, rather than older people, and are well-educated in terms of making decisions towards acting pro-environmentally, and the idea is that if they notice that their attempts positively affect the environment, they will definitely turn to pro-environmentally behaviors (Jaiswal and Kant, 2018). The study has several useful managerial implications for governments, policy makers, and science educators. To sum up: attitude, PBC, and personal norm were found to be important determinants in motivating people' PEBI and PEB. Accordingly, it is necessary for governments and policy makers to design and prepare conservation programs to increase population' attitude and personal norm and remove perceived barriers to ensure pro-environmentally life styles (Gao et al., 2017; Wang et al., 2018). Furthermore, the study revealed that participants have good level of PEB, so the imple-

mented programs may focus on the underlying causes of the results and turn daily behaviors into a conscious long life PEB process (Gkargkavouzi et al., 2019). To ensure the usefulness and effectiveness of the programs, the findings could be announced with community and subsequent multiple interventions can be initiated (Zhang et al., 2018). Given the importance of environmental issues in science education, science teachers play important role in educating future generations and making crucial decisions that influence the whole society. In addition, science teachers have crucial responsibilities in terms of preparing students to become active citizens for sustainable world (Summers et al., 2004). Accordingly, the results of the study can be implied that science teachers' pro-environmental behaviors and its antecedents have an impact upon students' psychological characteristics.

5.2. Limitations and future studies

Although this study is thought to contribute to the literature, it has some limitations due to various reasons such as time, transportation and economy. First of all, the sampling method is limited to convenience sampling and several hypotheses, so future researchers may determine a more representative sampling method with more hypotheses and better measurement tools. The study is limited to the science teachers who are middle-aged and educated in several cities and regions in Turkey, therefore, it may not be possible to generalize the results to a less educated population, students or younger educators such as pre-service science teachers. Earlier studies revealed that young people tend to behave less consciously (Kollmus and Agyeman, 2002). Accordingly, in the future studies, the range of the samples may be extended to younger people in different cities and geographical regions. In addition, to further increase the validity of the study's results, cross-cultural studies can make major contributions to literature beyond one country, as most of the behavioral-based theories or models are highly dependent on cultural values (Liu et al., 2016; Sreen et al., 2018). Moreover, as the study was based on correlational design, it could be suggested that the causal inferences aren't drawn (Yazdanpanah and Forouzani, 2015). Therefore, longitudinal studies may increase the ability of causality. Similarly, although the answers are thought to be honest and complete, the participants may be reluctant to reflect their real opinions due to ethical and moral pressures to demonstrate their willingness to act in the public interest. Therefore, qualitative research can provide better comprehensive understanding through interviews and observations. It is also a limitation to rely on self-reported measures of PEB, which may result in the influence of socio-psychological attributes on behavior in real situations being unclear. Since the study was focused on general behaviors, to strengthen more explanatory power, the scope of future studies may be restricted to specific PEB such as green purchase behavior, consumption behavior and recycling. In addition, considering factors affecting PEB, only a limited number of variables under the two postulated model and a proposed model were used, therefore, it causes conceptual gap. In subsequent studies, more comprehensive studies can be conducted using different physiological variables, including belief (NEP, Dunlap et al., 2000), egoistic and altruistic value (Stern, 2000), personal responsibility, locus of control, situational factors, action skills and knowledge of issues and knowledge of action strategies (Hines et al., 1987), altruism and empathy (Schwartz, 1977) and demographic variables including education, age, gender, income and residential area (Liere and Dunlap, 1980).

6. Conclusion

Understanding the determinants of science teachers' pro-environmental behaviors has hardly been examined in the litera-

ture. The current study contributed some important elements to existing body of environmental psychology literature. The current study also goes beyond existing conceptual models of testing the TPB and VIP in Turkish context by presenting a new and robust model that is not revealed in the current literature, focusing on behavior rather than intention. In general, even though TPB and VIP demonstrated a good efficiency in understanding science teachers' pro-environmental behaviors, predictive power of integrated proposed model was superior to the original TPB and VIP models. That is to say, merging TPB which provides rational choice with VIP including pro-social motives and moral considerations increased the utility and predictive power of the integrated model in explaining science teachers' pro-environmental behaviors. In addition, the proposed model, including eight constructs and 16 causal links (direct and indirect relationship), was successfully supported. Among these links, personal norm and PEBI had directly influenced PEB and attitude, PBC, biospheric values and ESI as mediators are effective to explain PEB. However, subjective norm had neither direct nor indirect effects on PEB. Consequently, in spite of scarcity of existing study attempts to merge TPB theory and the VIP into one conceptual framework, the current study can present specific and meaningful conclusions and express some degree of value and original view on this emerging issue.

Declaration of Competing Interest

No potential conflict of interest was reported by the author.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.spc.2020.07.006.

References

Adrita, U.W., Mohiuddin, M.F., 2020. Impact of opportunity and ability to translate environmental attitude into ecologically conscious consumer behavior. J. Market. Theory Pract. 1–14.

Ajzen, I., 1988. Attitudes, personality, and behaviour. Dorsey Press, Chicago, IL.

Ajzen, I., 1991. The theory of planned behavior. Organiz. Hum. Decis. Process. 50, 179–211. doi:10.1016/0749- 5978(91)90020-T.

Ajzen, I., Fishbein, M., 1980. Understanding Attitudes and Predicting Social Behavior. Prentice Hall, Englewood Cliffs, NJ.

Ajzen, I., Madden, T.J., 1986. Prediction of goal-directed behavior: attitudes, intentions, and perceived behavioral control. J. Exp. Soc. Psychol. 22 (5), 453–474.

Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychol. Bull. 103 (3), 411–423.

Armitage, C.J., Conner, M., 1999. Distinguishing perceptions of control from self-efficacy: Predicting consumption of a low-fat diet using the theory of planned behavior. J. Appl. Soc. Psychol. 29 (1), 72–90.

Ateş, H., 2019. A Conceptual Model of Relationships Among Ecological worldview, Fundamental values, Personal Norm and Self-Identity. Middle East Technical University, Ankara, Turkey.

Bamberg, S., 2003. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. J. Environ. Psychol. 23 (1), 21–32.

Bamberg, S., Möser, G., 2007. Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour. J. Environ. Psychol. 27 (1), 14–25.

Barbarossa, C., De Pelsmacker, P., 2016. Positive and negative antecedents of purchasing eco-friendly products: a comparison between green and non-green consumers. J. Bus. Ethics 134 (2), 229–247.

Barbarossa, C., Pastore, A., 2015. Why environmentally conscious consumers do not purchase green products. Qual. Market Res. 18 (2), 188–209.

Baron, R.M., Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J. Pers. Soc. Psychol. 51 (6), 1173–1182.

Biswas, A., Roy, M., 2015. Green products: an exploratory study on the consumer behaviour in emerging economies of the East. J. Cleaner Prod. 87, 463–468.

Chan, H.W., Pong, V., Tam, K.P., 2020. Explaining participation in Earth Hour: the identity perspective and the theory of planned behavior. Clim. Change 158 (3), 309–325.

Chan, R.Y., 2001. Determinants of Chinese consumers' green purchase behavior. Psychol. Market. 18 (4), 389–413.

Chen, M.F., 2016. Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan–moral obligation matters. J. Cleaner Prod. 112, 1746–1753.

Chen, M.F., Tung, P.J., 2014. Developing an extended theory of planned behavior model to predict consumers' intention to visit green hotels. Int. J. Hosp. Manage. 36, 221–230.

Chen, T.B., Chai, L.T., 2010. Attitude towards the environment and green products: consumers' perspective. Manage. Sci. Eng. 4 (2), 27–39.

Cheung, S.F., Chan, D.K.S., Wong, Z.S.Y., 1999. Reexamining the theory of planned behavior in understanding wastepaper recycling. Environ. Behav. 31 (5), 587–612.

Choi, D., Johnson, K.K., 2019. Influences of environmental and hedonic motivations on intention to purchase green products: an extension of the theory of planned behavior. Sustain. Prod. Consump. 18, 145–155.

Cobern, W.W., 2000. The nature of science and the role of knowledge and belief. Sci. Educ. 9 (3), 219–246.

Conner, M., Armitage, C.J., 1998. Extending the theory of planned behavior: a review and avenues for further research. J. Appl. Soc. Psychol. 28 (15), 1429–1464.

Cook, A.J., Kerr, G.N., Moore, K., 2002. Attitudes and intentions towards purchasing GM food. J. Econ. Psychol. 23 (5), 557–572.

De Leeuw, A., Valois, P., Ajzen, I., Schmidt, P., 2015. Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high--school students: Implications for educational interventions. J. Environ. Psychol. 42, 128–138.

De Leeuw, A., Valois, P., Morin, A.J., Schmidt, P., 2014. Gender differences in psychosocial determinants of university students' intentions to buy fair trade products. J. Consum. Policy 37 (4), 485–505.

Dietz, T., Stern, P.C., Guagnano, G.A., 1998. Social structural and social psychological bases of environmental concern. Environ. Behav. 30 (4), 450–471.

Dunlap, R.E., Van Liere, K.D., Mertig, A.G., Jones, R.E., 2000. New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale. J. Soc. Issues 56 (3), 425–442.

Feather, N.T., 1995. Values, valences, and choice: the influences of values on the perceived attractiveness and choice of alternatives. J. Pers. Soc. Psychol. 68 (6), 1135–1151.

Fekadu, Z., Kraft, P., 2001. Self-identity in planned behavior perspective: past behavior and its moderating effects on self-identity-intention relations. Soc. Behav. Pers. 29 (7), 671–685.

Fishbein, M., Ajzen, I., 1975. *Belief, Attitude, Intention and Behavior: an introduction to Theory and Research*. Addison-Wesley Publishing Co, Reading, MA.

Fishbein, M., Ajzen, I., 2011. *Predicting and Changing Behavior: the Reasoned Action Approach*. Psychology Press, New York, NY.

Fornell, G., Lacker, R.N., 1981. Introduction to Linear Regression Analysis. John Wiley and Sons, New York.

Fransson, N., Gärling, T., 1999. Environmental concern: conceptual definitions, measurement methods, and research findings. J. Environ. Psychol. 19 (4), 369–382.

Gao, L., Wang, S., Li, J., Li, H., 2017. Application of the extended theory of planned behavior to understand individual's energy saving behavior in workplaces. Resour. Conserv. Recycl. 127, 107–113.

Gärling, T., Eek, D., Loukopoulos, P., Fujii, S., Johansson-Stenman, O., Kitamura, R., … Vilhelmson, B., 2002. A conceptual analysis of the impact of travel demand management on private car use. Transp. Policy 9 (1), 59–70.

Gatersleben, B., Murtagh, N., Abrahamse, W., 2014. Values, identity and pro-environmental behaviour. Contemp. Soc. Sci. 9 (4), 374–392.

Gkargkavouzi, A., Halkos, G., Matsiori, S., 2019. Environmental behavior in a private–sphere context: integrating theories of planned behavior and value belief norm, self-identity and habit. Resour. Conserv. Recycl. 148, 145–156.

Ha, H.Y., Janda, S., 2012. Predicting consumer intentions to purchase energy-efficient products. J. Consum. Market. 29 (7), 461–469.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., Tatham, R.L. others (2014). Multivariate data analysis, 5.

Hair, J., Anderson, R., Tatham, R., Black, W., 2010. Análisis Multivariante. Pearson Prentice Hall, Madrid.

Han, H., 2015. Travelers' pro-environmental behavior in a green lodging context: converging value-belief-norm theory and the theory of planned behavior. Tour. Manage. 47, 164–177.

Han, H., Hyun, S.S., 2017. Drivers of customer decision to visit an environmentally responsible museum: merging the theory of planned behavior and norm activation theory. J. Travel Tour. Market. 34 (9), 1155–1168.

Hines, J.M., Hungerford, H.R., Tomera, A.N., 1987. Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. J. Environ. Educ. 18 (2), 1–8.

Hitlin, S., 2003. Values as the core of personal identity: drawing links between two theories of self. Soc. Psychol. Q. 66 (2), 118–137.

Hsu, C.L., Chang, C.Y., Yansritakul, C., 2017. Exploring purchase intention of green skincare products using the theory of planned behavior: testing the moderating effects of country of origin and price sensitivity. J. Retail. Consum. Serv. 34, 145–152.

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.

Intergovernmental Panel on Climate Change, IPCC, (2016). https://www.ipcc.ch/news_and_events/docs/misc/160111_PR_AR5_Synthesis_Report_language_versions_final.pdf.

Jaiswal, D., Kant, R., 2018. Green purchasing behaviour: a conceptual framework and empirical investigation of Indian consumers. J. Retail. Consum. Serv. 41, 60–69.

Kempton, W., Boster, J., Hartley, J., 1995. *Environmental Values in American Culture*. MIT Press, Cambridge, MA.

Kiatkawsin, K., Han, H., 2017. Young travelers' intention to behave pro-environmentally: merging the value-belief-norm theory and the expectancy theory. Tour. Manage. 59, 76–88.

Kilbourne, W.E., Dorsch, M.J., McDonagh, P., Urien, B., Prothero, A., Grünhagen, M., ... Bradshaw, A., 2009. The institutional foundations of materialism in western societies: a conceptualization and empirical test. J. Macromarket. 29 (3), 259–278.

Kim, S.H., Seock, Y.K., 2019. The roles of values and social norm on personal norms and pro-environmentally friendly apparel product purchasing behavior: the mediating role of personal norms. J. Retail. Consum. Serv. 51, 83–90.

Kline, R.B., 2005. Principles and Practice of Structural Equation Modelling, second ed. The Guilford, New York.

Ko, S.B., Jin, B., 2017. Predictors of purchase intention toward green apparel products. J. Fashion Market. Manage. 21 (1), 70–87.

Kollmuss, A., Agyeman, J., 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? Environ. Educ. Res. 8 (3), 239–260.

Lai, C.K., Cheng, E.W., 2016. Green purchase behavior of undergraduate students in Hong Kong. Soc. Sci. J. 53 (1), 67–76.

Laudenslager, M.S., Holt, D.T., Lofgren, S.T., 2004. Understanding air force members' intentions to participate in pro-environmental behaviors: an application of the theory of planned behavior. Percept. Mot. Skills 98, 1162–1170.

Leopold, A., 1948. A Sand County Almanac. Oxford, New York.

Liere, K.D.V., Dunlap, R.E., 1980. The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. Public Opin. Q. 44 (2), 181–197.

Lindenberg, S., Steg, L., 2007. Normative, gain and hedonic goal frames guiding environmental behavior. J. Soc. Issues 63 (1), 117–137.

Littledyke, M., 2008. Science education for environmental awareness: approaches to integrating cognitive and affective domains. Environ. Educ. Res. 14 (1), 1–17.

Littledyke, M., Lakin, L., Ross, K., 2013. Science Knowledge and the Environment: a guide for Students and Teachers in Primary Education. Routledge.

Liu, M.T., Liu, Y., Mo, Z., 2020. Moral norm is the key: an extension of the theory of planned behaviour (TPB) on Chinese consumers' green purchase intention. Asia Pac. J. Market. Logist..

Liu, M.T., Yan, L., Phau, I., Perez, A., Teah, M., 2016. Integrating Chinese cultural philosophies on the effects of employee friendliness, helpfulness and respectfulness on customer satisfaction. Eur. J. Market. 50 (3/4), 464–487.

López-Mosquera, N., García, T., Barrena, R., 2014. An extension of the Theory of Planned Behavior to predict willingness to pay for the conservation of an urban park. J. Environ. Manage. 135, 91–99.

Miller, D., Merrilees, B., Coghlan, A., 2015. Sustainable urban tourism: understanding and developing visitor pro-environmental behaviours. J. Sustain. Tour. 23 (1), 26–46.

Mostafa, M.M., 2006. Antecedents of Egyptian consumers' green purchase intentions: a hierarchical multivariate regression model. J. Int. Consum. Market. 19 (2), 97–126.

Naess, A., 1989. *Ecology, Community and Lifestyle, trans. David Rothenberg*. Cambridge University Press, Cambridge, England.

Nguyen, T.N., Lobo, A., Greenland, S., 2016. Pro-environmental purchase behaviour: the role of consumers' biospheric values. J. Retail. Consum. Serv. 33, 98–108.

Nigbur, D., Lyons, E., Uzzell, D., 2010. Attitudes, norms, identity and environmental behaviour: Using an expanded theory of planned behaviour to predict participation in a kerbside recycling programme. Br. J. Soc. Psychol. 49 (2), 259–284.

Nunnally, J.C., 1994. Psychometric Theory 3E. Tata McGraw-Hill Education.

OECD, O., 2004. The OECD principles of corporate governance. Contaduría y Administración (216).

Onwezen, M.C., Antonides, G., Bartels, J., 2013. The Norm Activation model: an exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. J. Econ. Psychol. 39, 141–153.

Park, J., Ha, S., 2012. Understanding pro-environmental behavior: a comparison of sustainable consumers and apathetic consumers. Int. J. Retail Distrib. Manage. 40 (5), 388–403.

Park, J., Ha, S., 2014. Understanding consumer recycling behavior: Combining the theory of planned behavior and the norm activation model. *Family and consumer*. Sci. Res. J. 42 (3), 278–291.

Paul, J., Rana, J., 2012. Consumer behavior and purchase intention for organic food. J. Consum. Market. 29 (6), 412–422.

Paul, J., Modi, A., Patel, J., 2016. Predicting green product consumption using theory of planned behavior and reasoned action. J. Retail. Consum. Serv. 29, 123–134.

Peattie, K., Belz, F.M., 2010. Sustainability marketing—An innovative conception of marketing. Market. Rev. St. Gallen 27 (5), 8–15.

Perlaviciute, G., Steg, L., 2015. The influence of values on evaluations of energy alternatives. Renewable Energy 77, 259–267.

Prakash, G., Pathak, P., 2017. Intention to buy eco-friendly packaged products among young consumers of India: a study on developing nation. J. Cleaner Prod. 141, 385–393.

Rahman, I., Reynolds, D., 2019. The influence of values and attitudes on green consumer behavior: a conceptual model of green hotel patronage. Int. J. Hosp. Tour. Admin. 20 (1), 47–74.

Republic of Turkey Ministry of Environment and Urbanization, 2016. Environmental Indicators 2016 obtained from https://webdosya.csb.gov.tr/db/ced/icerikler/env-romental-ind-cators-2016-20180618144837.pdf on 01 March 2020.

Ross, K., Lakin, L., Burch, G., Littledyke, M., 2005. Science Issues and the National Curriculum. University of Gloucestershire, Cheltenham.

Ru, X., Qin, H., Wang, S., 2019. Young people's behaviour intentions towards reducing PM2. 5 in China: extending the theory of planned behaviour. Resour. Conserv. Recycl. 141, 99–108.

Ruepert, A., Keizer, K., Steg, L., Maricchiolo, F., Carrus, G., Dumitru, A., Moza, D., 2016. Environmental considerations in the organizational context: A pathway to pro-environmental behaviour at work. Energy Res. Soc. Sci. 17, 59–70.

Schenk, P., 2019. A matter of principle: comparing norm-based explanations for fair trade consumption. J. Consum. Policy 42 (3), 397–423.

Schwartz, S.H., 1977. Normative influences on altruism. Adv. Exp. Soc. Psychol. 10 (1), 221–279.

Schwartz, S., 1992. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. Adv. Exp. Soc. Psychol. 25, 1–65.

Schwartz, S.H., Howard, J.A., 1981. A normative decision-making model of altruism. Altruism Help. Behav. 189–211.

Shrum, L.J., McCarty, J.A., Lowrey, T.M., 1995. Buyer characteristics of the green consumer and their implications for advertising strategy. J. Advertising 24 (2), 71–82.

Si, H., Shi, J.G., Tang, D., Wu, G., Lan, J., 2020. Understanding intention and behavior toward sustainable usage of bike sharing by extending the theory of planned behavior. Resour. Conserv. Recycl. 152, 104513.

Soyez, K., 2012. How national cultural values affect pro-environmental consumer behavior. Int. Market. Rev. 29 (6), 623–646.

Sparks, P., Shepherd, R., 1992. Self-identity and the theory of planned behavior: assesing the role of identification with "green consumerism". Soc. Psychol. Q. 388–399.

Sreen, N., Purbey, S., Sadarangani, P., 2018. Impact of culture, behavior and gender on green purchase intention. J. Retail. Consum. Serv. 41, 177–189.

Steg, L., Groot, J.I.M., 2012. In: Clayton, S.D. (Ed.). Oxford University Press, New York,NY, pp. 81–93.

Steg, L., Vlek, C., 2009. Encouraging pro-environmental behaviour: An integrative review and research agenda. J. Environ. Psychol. 29 (3), 309–317.

Steg, L., Bolderdijk, J.W., Keizer, K., Perlaviciute, G., 2014. An integrated framework for encouraging pro-environmental behaviour: the role of values, situational factors and goals. J. Environ. Psychol. 38, 104–115.

Stern, P.C., 2000. New environmental theories: toward a coherent theory of environmentally significant behavior. J. Soc. Issues 56 (3), 407–424.

Stern, P.C., Dietz, T., 1994. The value basis of environmental concern. J. Soc. Issues 50 (3), 65–84.

Stern, P.C., Dietz, T., Kalof, L., 1993. Value orientations, gender, and environmental concern. Environ. Behav. 25 (5), 322–348.

Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A., Kalof, L., 1999. A value-belief-norm theory of support for social movements: the case of environmentalism. Hum. Ecol. Rev. 81–97.

Summers, M., Corney, G., Childs, A., 2004. Student teachers' conceptions of sustainable development: the starting-points of geographers and scientists. Educ. Res. 46 (2), 163–182.

Tabachnick, B.G., Fidell, L.S., 2001. Using Multivariate Statistics, fourth ed. HarperCollins. Chapter 13, New York.

Taufique, K.M.R., Vaithianathan, S., 2018. A fresh look at understanding Green consumer behavior among young urban Indian consumers through the lens of Theory of Planned Behavior. J. Cleaner Prod. 183, 46–55.

Terry, D.J., Hogg, M.A., White, K.M., 1999. The theory of planned behaviour: self-identity, social identity and group norms. Br. J. Soc. Psychol. 38 (3), 225–244.

The Higher Education Council of Turkey, 2018. Science Education Undergraduate Curriculum. Ankara, Turkey.

ThØgersen, J., 1995. Understanding of consumer behaviour as a prerequisite for environmental protection. J. Consum. Policy 18 (4), 345–385.

Tjärnemo, H., Södahl, L., 2015. Swedish food retailers promoting climate smarter food choices—trapped between visions and reality? J. Retail. Consum. Serv. 24, 130–139.

Turkish Ministry of Education, 2018. Science Course Curriculum, (Primary and Middle School 3, 4, 5, 6, 7 and 8th Grades) Ankara, Turkey.

van der Werff, E., Steg, L., 2016. The psychology of participation and interest in smart energy systems: comparing the value-belief-norm theory and the value-identity-personal norm model. Energy Res. Soc. Sci. 22, 107–114.

Van der Werff, E., Steg, L., Keizer, K., 2013a. It is a moral issue: the relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour. Glob. Environ. Change 23 (5), 1258–1265.

Van der Werff, E., Steg, L., Keizer, K., 2013b. The value of environmental self-identity: the relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. J. Environ. Psychol. 34, 55–63.

Van der Werff, E., Steg, L., Keizer, K., 2014. I am what I am, by looking past the present: the influence of biospheric values and past behavior on environmental self-identity. Environ. Behav. 46 (5), 626–657.

Verma, V.K., Chandra, B., 2018. An application of theory of planned behavior to predict young Indian consumers' green hotel visit intention. J. Cleaner Prod. 172, 1152–1162.

Vermeir, I., Verbeke, W., 2006. Sustainable food consumption: exploring the consumer "attitude–behavioral intention" gap. J. Agric. Environ. Ethics 19 (2), 169–194.

Wang, B., Ren, C., Dong, X., Zhang, B., Wang, Z., 2019. Determinants shaping willingness towards on-line recycling behaviour: an empirical study of household e-waste recycling in China. Resour. Conserv. Recycl. 143, 218–225.

Wang, B., Wang, X., Guo, D., Zhang, B., Wang, Z., 2018. Analysis of factors influencing residents' habitual energy-saving behaviour based on NAM and TPB models: egoism or altruism? Energy policy 116, 68–77.

White, K.M., Hyde, M.K., 2012. The role of self-perceptions in the prediction of household recycling behavior in Australia. Environ. Behav. 44 (6), 785–799.

Worldometers (2020). Turkey Population, obtained from https://www.worldometers.info/world-population/turkey-population/ at 01 of March 2020.

Xu, Y., Wei, X., Chen, S.C., 2019. Determinants and mechanisms of tourists' environmentally responsible behavior: applying and extending the value-identity-personal norm model in China. Sustainability 11 (13), 3711.

Yadav, R., Pathak, G.S., 2016. Young consumers' intention towards buying green products in a developing nation: extending the theory of planned behavior. J. Cleaner Prod. 135, 732–739.

Yadav, R., Pathak, G.S., 2017. Determinants of consumers' green purchase behavior in a developing nation: Applying and extending the theory of planned behavior. Ecol. Econ. 134, 114–122.

Yarimoglu, E., Günay, T., 2020. The extended theory of planned behavior in Turkish customers' intentions to visit green hotels. Bus. Strat. Environ. 29, 1097–1108.

Yazdanpanah, M., Forouzani, M., 2015. Application of the Theory of Planned Behaviour to predict Iranian students' intention to purchase organic food. J. Cleaner Prod. 107, 342–352.

Zhang, X., Geng, G., Sun, P., 2017. Determinants and implications of citizens' environmental complaint in China: integrating theory of planned behavior and norm activation model. J. Cleaner Prod. 166, 148–156.

Zhang, X., Liu, J., Zhao, K., 2018. Antecedents of citizens' environmental complaint intention in China: an empirical study based on norm activation model. Resour. Conserv. Recycl. 134, 121–128.