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Future Teachers' Sustainable Water Consumption Behavior: A Test of the Value-Belief-Norm Theory

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Abstract: The impact of climate change and the demand of people for water resources are dramatically increasing. In order to protect water supply in the world, it is essential to develop individuals' sustainable water consumption behaviors. Teachers play a key role in fostering students' beliefs, attitudes, values and behaviors about sustainable water consumption. Therefore, the aim of this study was to explore pre-service teachers' sustainable water consumption behaviors using the Value-Belief-Norm theory. 481 pre-service teachers completed a questionnaire measuring sustainable water consumption behavior, universal values, personal norms and beliefs that were categorized as awareness of consequences and ascription of responsibility. The results revealed that the Value-Belief-Norm theory could successfully explain sustainable water consumption behaviors of pre-service teachers. The study revealed that personal norm was a strong predictor to explain sustainable water consumption behavior. Mediation analysis confirmed the causal order of the variables in the model. In other words, personal norms mediated the relationship between ascription of responsibility and sustainable water consumption behavior; ascription of responsibility mediated the relationship between awareness of consequences and personal norms; awareness of consequences mediated the relationship between biospheric-altruistic values and ascription of responsibility; and lastly, personal norms mediated the relationship between biospheric-altruistic values and sustainable water consumption behavior. The results have important implications for education programs and environmental program designers. Through designing water conservation education programs, teachers and students' sustainable water consumption behaviors can be fostered by strengthening their biospheric-altruistic values, environmental beliefs and personal norm to act for the environment.

Keywords: sustainable water consumption behavior; pre-service teachers; Value-Belief-Norm Theory

1. Introduction

Throughout history, humans' relation with water has been very important, and with population growth and urbanization, the demand for water resources has increased [1]. Over the last decades, some regions have encountered severe drought that influenced water supply security [2]. Water crises affect many parts of the world and by 2050, more than 40% of the world population is expected to be living in water-stressed regions [1]. Turkey is one of those water-stressed regions. Because of overpopulation and the overconsumption of water for irrigation purposes, the pressure on water resources has increased in Turkey [1]. Furthermore, because of climate change, the water cycle has been broken, and while this problem caused floods in some places, it caused drought in other places [1]. Because of overpopulation, urbanization and industrialization, water pollution has increased and clean water resources have decreased. Based on the Intergovernmental Panel on Climate Change (IPCC) report [3], because of climate change, water scarcity will increase in many regions of Turkey. With the

increase in temperatures and the decrease in the amount of precipitation, barren areas will increase in Turkey [4]. Water management is not only important for agriculture and industry, but it is also important for sustainability of the ecosystems [1]. The city of Ağrı, where this study was conducted, is located in the east border of Turkey. This city is famous for its long and harsh winters. Agriculture and animal husbandry are the most important sources of livelihood in the city. A large river passes through the middle of the city. Although there are water supplies such as rivers, streams and lakes, the problem in this region is the insufficient water management strategies because of financial problems and lack of awareness of water conservation in the society. Water pollution is an important problem. Insufficiency of the water treatment system and lack of environmental awareness of people cause water pollution in the rivers, lakes and streams in the city [5].

As mentioned above, the study area has several environmental problems and people are not aware of these problems. Therefore, this study is important to develop the sustainable water consumption behaviors (SWCB) of pre-service teachers as they will be role model to the society in the future.

To achieve SWCB, it is necessary to increase water supply through desalinization and recycling waste water, to reduce water demand, and to conserve water resources [6]. In addition to sustainable water management strategies, it is essential that individuals' SWCB should be increased [7]. Moreover, understanding the factors leading to SWCB such as environmental attitudes, values and beliefs can improve water management strategies, policy development and education [8,9].

Education for sustainable development (ESD) is a key strategy to increase public awareness and training related to sustainability and to empower everyone to make informed decisions regarding sustainability issues [10,11]. ESD focuses on major social, economic and environmental problems [10]. ESD can be provided in all levels of education from early childhood to higher education and improves knowledge, skills, attitudes and values to contribute to sustainability [12,13]. According to Chawla [14], environmental characteristics that influence pro-environmental behaviors are shaped by several factors which are childhood experiences in nature, pro-environmental values held by the family, pro-environmental organizations, role models (friends and teachers) and education. Teachers touch millions of people's life and shape their worldviews, values and attitudes and help individuals to take actions for the environment [10]. Teachers have a significant role in bringing major changes in society and creating a sustainable future [15]. The first goal of ESD is to provide quality basic education. Therefore, teacher availability and teacher quality are important in ESD [10]. The second goal of ESD is to reorient education programs to address sustainability principles [10,11]. In other words, there is a need to reorient teacher education programs to reach the sustainability goals. At this point, teacher education for ESD is important to shape future generations' worldviews, attitudes and abilities for a sustainable future [11]. There is a need to develop teachers' knowledge, skills, attitudes, behaviors and values for sustainability issues [10]. Moreover, teachers should be equipped with necessary competencies related to ESD (e.g., knowledge, emotions, values and ethics and action) [16]. Future teachers should also have the necessary values, beliefs, awareness and responsibility to take action for sustainability [17,18]. For this reason, factors such as beliefs, attitudes, and values have an influence to shape individuals' sustainable behaviors. That is to say, these socio-psychological factors play an important role in promoting environmentally responsible behaviors [19]. As the literature reveals, only attitude and knowledge variables are not effective to explain sustainable behaviors (e.g., [20,21]). More knowledge on and improved attitudes toward environment do not always lead to behavior change. Other factors such as beliefs, values and norms should also be addressed to understand sustainable behaviors [19].

The Value-Belief-Norm theory (VBN), which constituted the framework of this study, is one of the most important theories that explain environmental decision making and pro-environmental behaviors [19]. VBN focuses on values, beliefs and personal norms (PN) and it is accepted as a value theory [22,23]. Therefore, VBN is a useful theory to explain sustainable behaviors [19]. More specifically, the current study examines pre-service teachers' SWCB through the application of the VBN theory. In the literature, there is a considerable number of studies investigating the energy conservation,

eco-friendly and sustainable behaviors of different samples such as college students, customers and teacher candidates (e.g., [17,19,24,25]). However, not many studies have yet focused on the SWCB through socio-psychological factors. For this reason, in this study, we explore factors affecting SWCB by using VBN theory.

2. Theoretical Approach: VBN Theory

The VBN theory proposed by Stern, Dietz, Abel, Guagnano and Kalof [26] forms a link among the values theory (e.g., [22,23]), the norm activation theory and the beliefs. The VBN theory connects these three constructs through a causal chain of five variables that are values (biospheric, altruistic and egoistic), environmental beliefs, PN for pro-environmental behaviors and environmental behaviors. [26]. Within environmental beliefs awareness of consequences (AC) and ascription of responsibility (AR) are considered [17,25,26]. Specific to this current study, Table 1 shows the variables and definitions based on the VBN theory. According to Stern and his colleagues [26], each variable in the chain is related to each other and is directly linked with the next variable. The authors suggest that environmental behaviors result from PN, such as feeling moral obligation to act for the environment, and these norms are activated through environmental beliefs (AR and AC beliefs). AC beliefs refer to being aware of the consequences of the environmental threats and AR beliefs refer to the sense of responsibility to act for reducing these threats [26,27]. Steg et al. [25] pointed out that AC and AR beliefs could be behavior-specific. In this study, AR and *AC* beliefs were considered within the beliefs related to water consumption behaviors. Based on the VBN theory, AR and AC beliefs are also dependent on general beliefs on human-environment relationship and value orientations [26]. Therefore, beliefs are highly significant in the VBN theory as they directly influence norms, and indirectly and directly influence environmental behaviors [28].

Another VBN factor utilized in this study is values. Stern, Dietz and Kalof [29] described values as biospheric value orientation (BV), feeling concern for non-human species and the biosphere; altruistic value orientation (AV), reflecting concern for the welfare of other people; and egoistic value orientation (EV), feeling concern for the environment for their own sake. According to the *VBN* theory, values are associated with each variable (AC, AR, PN and pro-environmental behavior) in the chain [29]. For example, in order to change the current norms, individuals' biospheric value orientation (BV) sho-uld be fostered first [19]. PN as another factor in the VBN theory was developed to predict humans' target behavior based on the norm activation theory [30]. The theory indicates that pro-environmental behaviors can occur when people feel a moral obligation to perform the behaviors and when they realize the adverse consequences of their actions for the environment (AR and AC beliefs) [17,25,31].

The VBN theory has been widely used to explain the relationship between the socio-psychological factors and pro-environmental behavior and has been applied to various populations. For instance, it has been used to understand energy conservation behaviors (e.g., [17,25,32,33]), customers' eco-friendly behaviors (e.g., [24,34,35]) and university students' sustainable behaviors such as food and energy consumption and transportation choices (e.g., [19]). In these studies, the VBN theory was tested to reveal what predictor variables (values, beliefs, attitudes and PN) explain pro-environmental behaviors. On the other hand, water conservation behaviors have been studied within different disciplines such as psychology, sociology, political science and economics [36].

In the literature, various psychological determinants such as attitudes, beliefs, PN, environmental values, environmental concern, self-efficacy and motivation have been studied in order to predict water conservation behaviors (e.g., [7,36–42]). Kang et al. [38] examined consumers' SWCB by creating a model examining how water beliefs (e.g., utilitarian water belief, ecological water belief) affect attitude, subjective norm, perceived control and moral obligation related to water consumption and how they respectively affect SWCB. The authors have not tested the VBN theory yet. They developed a comprehensive model to explain water consumption behaviors. They explored the significant effects of utilitarian water belief, ecological water belief and water resource concern on consumers' perceptions and SWCB. In another study, Schultz and his colleagues [37] examined the impact of

norm-based messages on the water consumption behaviors of residents. The authors measured residents' environmental beliefs, attitudes, conservation behavior, personal values and personal water conservation norms. They found that normative messages might have an impact to reduce water consumption and that the residents holding strong PN about SWCB were influenced less by normative messages than the residents with low PN.

Table 1. Definition of the variables in the study. AV: altruistic value orientation; EV: egoistic value orientation; BV: biospheric value orientation; AC: awareness of consequences; AR: ascription of responsibility; PN: personal norm; SWCB: sustainable water consumption behavior.

Variable		Definition
1. Values	1.a. AV 1.b. EV 1.c. BV	Feeling concern for the welfare of other people. Feeling concern for the environment for their own sake. Feeling concern for non-human species and the biosphere [29].
2. Beliefs	2.a. AC 2.b. AR	Being aware of the consequences of the environmental threats. The sense of responsibility to act for reducing environmental threats [25].
3. PN		Feeling a moral obligation to act for the environment [25].
4. SWCB		Pro-environmental activities to conserve water [40].

The studies in the literature showed that the VBN theory is successful in explaining various pro-environmental behaviors; however, there are not enough studies to explain SWCB through the VBN theory. Thus, the current study contributes to the literature in several ways. First, based on the literature mentioned above, we constructed a theoretical model, which is shown in Figure 1. We tested this model using the structural equation modeling (SEM) analysis. Then, we conducted mediation analysis with the bootstrapping method. In this way, the relationships in the model were better understood. Most researchers addressed the indirect effect on specific pro-environmental behaviors through mediation of the variables in the VBN model [25,43,44]. Therefore, we investigated meditation analysis among variables, since several researchers reported that values and behaviors might be mediated by other factors like beliefs and PN [25,44]. In line with the literature review, we tested the mediation effect on SWCB.

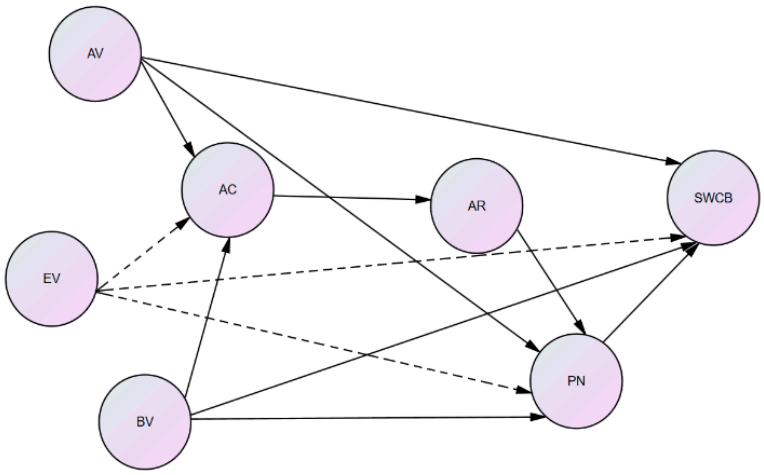

Figure 1. Conceptual framework of the proposed model showing the hypothesized relationships Dashed lines represent negative relationships. Straight lines represent positive relationships.

Based on the model, we hypothesized that:

- BV and AV have a positive impact on AC.
- EV has a negative impact on AC.
- BV and AV have a positive impact on PN.

- EV has a negative impact on PN.
- BV and AV have a positive impact on SWCB.
- EV has a negative impact on SWCB.
- AC has a positive impact on AR.
- AR has a positive impact on PN.
- PN has a positive impact on SWCB.

The mediation effects among variables:

- AR indirectly influences SWCB through PN.
- AC indirectly influences PN through AR.
- AC indirectly influences SWCB through PN and AR.
- Values indirectly influence AC through AR.
- Values indirectly influence SWCB through PN.
- Values indirectly influence SWCB through AC, AR and PN.

3. Method

3.1. Sample

The number of participants in the pilot study was 151 pre-service teachers. The main study was conducted with 481 pre-service teachers at the Faculty of Education in a public university located in the east part of Turkey. These participants were selected through convenience sampling. The majority of the participants (64%) were female and 36% of the participants were male. The average age of the participants was 22.1. Of the 481 participants, 39.5% were enrolled in the early childhood teacher education program; 33.5% were in the primary school teacher education program; 14% were in the mathematics teacher education program; and 13% were in the science teacher education program. Among these participants, 11% were freshman, 13.7% were sophomore, 48% were junior and 26% were senior students. As for the income of the participants' families, the income was mostly between 3000–5000 TL or less than 1600 TL (Table 2). Thus, it can be said that many of the pre-service teachers came from middle or low income families. Table 3 shows the number of family members. 54% of the participants had more than six people in their families. Table 4 shows the education level of participants' parents. It was revealed that the majority of participants' mothers were illiterate. As far as fathers' education level was concerned, the majority (44%) graduated from primary school.

Table 2. The monthly income of participants' families.

Less than 1600TL	1600–3000 TL	3000–5000 TL	5000–6000 TL	More than 6000 TL
133 (28%)	82 (17%)	166 (35%)	86 (18%)	10 (2%)

Table 3. Number of family members.

Two People	Three People	Four People	Five People	Six People	More than Six People
4 (0.8%)	16 (3%)	42 (8.7%)	72 (15%)	73 (15%)	260 (54%)

Table 4. Education level of parents.

Mother's Education Level		Father's Education Level	
Illiterate	203 (42%)	Illiterate	41 (9%)
Primary School	187 (39)	Primary School	211 (44%)
Middle School	45 (9%)	Middle School	66 (14%)
High School	32 (7%)	High School	84 (17%)
College	10 (2%)	College	49 (10%)
Missing data	4 (1%)	Missing Data	30 (6%)

3.2. Instruments

The data were collected quantitatively through a survey. The first part of the survey consisted of demographic questions (i.e., gender, age, department, grade, the number of family members, family income and the education level of parents). The other parts of the questionnaire focused on the following constructs; universal values, AC, AR, PN and SWCB (see Appendix A). All the instruments were adapted to Turkish. To evaluate the construct validity of the instruments, a confirmatory factor analysis was conducted and more than one index were taken into consideration. Among various goodness-of-fit indexes, the ratio of chi-square to the degree of freedom ($\chi 2/df$), comparative fit index (CFI), root mean square error of approximation (RMSEA), 90% confidence interval for RMSEA (90% CI) and standardized root mean square error of approximation (SRMR) indexes were evaluated [45]. The survey was conducted in paper format in the class. Before collecting the data, the participants' consent was obtained.

3.2.1. Sustainable Water Consumption Behavior

SWCB was measured through a scale that was developed by Dascher et al. [7], which has recently been used by Kang et al. [38]. The instrument included four items on a seven-point Likert scale (1—strongly disagree, 7—strongly agree), which focuses on the behavioral tendency of consumers toward water conservation (e.g., "I purposefully select products that let me conserve water, "Whenever possible, I take measures to conserve water"). The instrument was adapted into Turkish by the authors of the current study. To test the validity of the scale, three experts, one environmental education instructor, one science instructor and one English language instructor, read and revised the questions. The pilot study was conducted to 151 pre-service teachers. Exploratory factor analysis was used to test the construct validity. Principal component analysis was applied as an extraction method and oblique rotation with Kaiser Normalization was applied [46]. The analysis revealed one factor with a total of 74.4% of variance. The reliability was represented by Cronbach alpha and it was found to be 0.88.

3.2.2. Personal Norms, Ascription of Responsibility and Awareness of Consequences

Steg et al. [25] used these three scales in their study in energy conservation context and Şahin [17] adapted these scales into Turkish. The original scale included 24 items. In this study, the items in these scales were transformed into the water conservation context. The items were revised by three experts and a pilot study was conducted to test the validity and reliability of the scales. The scales included 24 items and participants rated their opinion on a five-point Likert scale (1—trongly disagree, 2—disagree, 3—undecided, 4—agree, 5—strongly agree) in these instruments. PN scale consisted of eight items, which reflect personal moral obligation for water conservation (e.g., "I feel personally obliged to save as much water as possible", "I would be a better person if I saved water").

Environmental beliefs were measured through 16 items. Among these items, the AR included a total of six items, which were based on participants' awareness of their impact on water use and environment (e.g., "I feel jointly responsible for global warming", "Not only the government and industry are responsible for high water consumption levels, but me too"). AC included 10 items. This scale measures awareness on how water conservation influences environment (e.g., "Water savings help reduce global warming", "The exhaustion of water sources is a problem").

Exploratory factor analysis was used to test construct validity of each variable in the pilot study. Principal component analysis was applied with oblique rotation and Kaiser Normalization [46]. The results supported that PN, AR and AC were uni-dimensional and the explained variance was found to be 61.2%, 60.7% and 60.2%, respectively. Cronbach alpha value was found to be 0.83 for PN, 0.85 for AR and 0.90 for AC.

3.2.3. Universal Values

Participants' values that influenced their own lifestyle were measured using a short version of Schwartz's [22] Universal Values Scale. This short version of the scale adapted by Stern et al. [26] was translated into Turkish by Şahin [17]. This Turkish version of the scale was used in this study. Therefore, this instrument was not involved in the pilot study. The scale included 12 items (among which: authority, wealth, social justice, equality, preventing pollution and unity with nature). These items were represented by three value orientations which were EV, AV and BV. The participants rated their agreement level on how important these 12 values are in guiding their own lifestyle. The scale is an eight-point Likert type scale ranging from 0 (not at all important) to 7 (of supreme importance). Besides, (−1) option was provided in case participants were opposed to the values.

3.3. Data Analysis

Descriptive statistics, correlation analysis and reliability test were applied with SPSS 24. Structural equation modeling (SEM) was utilized through AMOS version 24 with the maximum likelihood estimation method. SEM is a suggested method to test the hypothesized relationships among a large number of latent variables in a theoretical model while controlling measurement errors [45,47]. Data analysis was conducted by considering two stages approach of Anderson and Gerbing [48] and bootstrapping method. First, the measurement model was tested and a confirmatory factor analysis (CFA) was conducted to assess the construct validity of measurements. Next, SEM was tested to explore the hypothesized relationships in the model. While evaluating the model fit, various fit indexes (i.e., $\chi 2/df$, CFI, SRMR, RMSEA) were taken into consideration [45]. Finally, the bootstrapping method was used to test the mediation effects hypothesized in the VBN model. When compared with other methods (e.g., Sobel test), bootstrapping method provides better statistical power since it reduces Type 1 error [49,50]. We performed 5000 bootstrap samples and used 95% bias-corrected bootstrap confidence interval (Boot LLCI and Boot ULCI) in mediation analysis.

4. Results

4.1. Descriptive Results

In order to understand the descriptive features of the instruments, means and standard deviations were used, and the results are presented in Table 5. According to the Table 5, pre-service teachers were aware of the impacts of sustainable water use on the environment, and they accepted responsibility for leading to or preventing disastrous consequences of unsustainable water consumption. Concerning the subjective norms, they had a sense of moral responsibility to consume water in a sustainable way. Regarding universal values, AV and BV outweighed EV. However, standard deviation of the AV was higher than that of the *BV*. It means that respondents' opinions on AV showed a great variation. However, their mean score of water consumption behavior was relatively low (by considering seven Likert type), which indicates that they did not display satisfactory behaviors regarding SWCB. Besides, standard deviation of this behavior is quite high, which means that pre-service teachers' responses on the behavior items were not homogenous.

Table 5. Descriptive statistics of instruments used to explain sustainable water consumption behavior.

Scale	Mean	Standard Deviation
AV	6.33	0.93
EV	4.70	1.25
BV	6.23	0.57
AR	4.12	0.69
AC	4.48	0.57
PN	4.24	0.63
SWCB	5.33	1.36

4.2. Reliability and Validity of the Measurement Model

Confirmatory factor analysis (CFA) was applied to assess the construct validity of the measurements and the model fit of measurement model prior to the interpretation of the relationships among the variables [45]. The measurement model is composed of seven latent variables and 40 observed variables. While applying CFA, all latent variables correlated with each other. In the assessment of measurement model, model fit indexes, factor loadings of observed variables on their respective latent variables and the correlation among the latent variables were examined. In the assessment of fit indexes, more than one index was taken into consideration [45]. The results revealed that $\chi 2 = 1683.345$; df = 719; $\chi 2/df = 2.341$; CFI = 0.89; SRMR = 0.06; RMSEA = 0.05 [90% CI: 0.05, 0.06]). The results of factor loadings showed that factor loading of one item in AR was lower than 0.30 ($\beta = 0.19$). It has been suggested to drop factors with factor loading smaller than 0.30 [51]. Therefore, this item was removed from the analysis. Factor loadings of all observed variables were shown in Table 6. Furthermore, the correlation between AV and BV was found to be 0.95. This means that these two factors did not measure distinct factors and violated the discriminant validity [45]. Therefore, these factors were combined and labeled as biosheric-altruistic value orientation (BAV). Theoretically, combining these two value types is supported in the literature (e.g., [28,52]). The model was improved with these modifications and was represented in Figure 2.

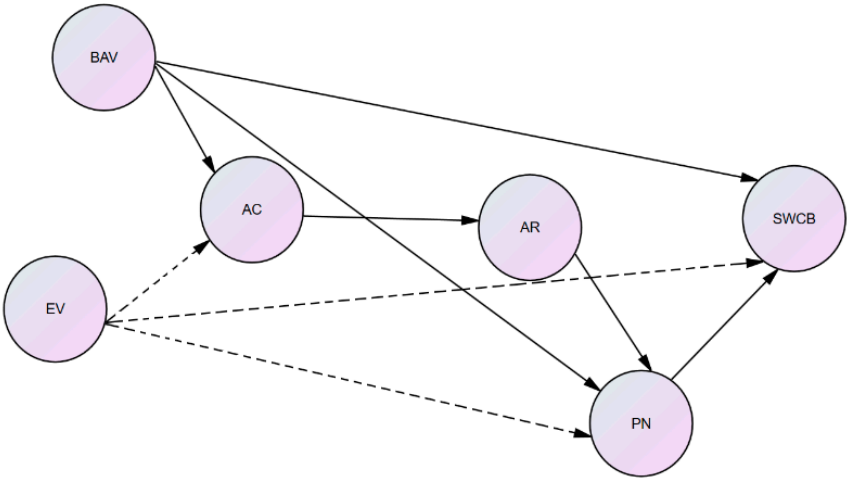

Figure 2. Improved path model. Dashed lines represent negative relationships. Straight lines represent positive relationships.

Followed by these modifications, CFA was applied with six latent variables and 39 observed variables. The results revealed that $\chi 2 = 1621.685$; df = 687; $\chi 2/df = 2.361$ (less than 5); CFI = 0.90 (close to 0.90); SRMR = 0.06 (less than 0.08); RMSEA = 0.05 (less than 0.08) [90% CI: 0.05, 0.06]). As a result, CFA showed that the goodness of fit indexes fit the data well. Table 6 shows the factor loadings of each item and the reliability of the scales. The reliability of instruments was explored by Cronbach's α value and it was found to be 0.90, 0.70, 0.87, 0.77, 0.73 and 0.87 for BAV, EV, AC, AR, PN and SWCB, respectively. Among these variables, only EV had a relatively low reliability value. However, when compared with the studies in the literature (e.g., [25]) this value is acceptable.

Table 7 shows the correlation analysis, and all variables except for EV were significantly related to each other. BAV had a positive and significant relationship with EV, AC, AR, PN and SWCB. AC was significantly and positively related to AR, PN and SWCB. AR had a positive and significant relationship with PN and SWCB. Lastly, PN was related to SWCB. However, EV had a relationship only with BAV. Ultimately, this correlation analysis provides evidence for the path model proposed in this study.

Table 6. The standard factor loadings of items and the reliability of the scales. BAV: biospheric value orientation.

Variables	Measurement Items	Standardized Loading	Cronbach's α
BAV	BAV1	0.73	0.90
	BAV2	0.71	
	BAV3	0.64	
	BAV4	0.73	
	BAV5	0.70	
	BAV6	0.76	
	BAV7	0.78	
	BAV8	0.74	
EV	EV1	0.58	0.70
	EV2	0.69	
	EV3	0.75	
	EV4	0.41	
AC	AC1	0.74	0.87
	AC2	0.66	
	AC3	0.80	
	AC4	0.75	
	AC5	0.78	
	AC6	0.76	
	AC7	0.60	
	AC8	0.75	
	AC9	0.66	
	AC10	0.34	
AR	AR1	0.80	0.77
	AR2	0.86	
	AR3	0.73	
	AR4	0.40	
	AR5	0.53	
PN	PN1	0.77	0.73
	PN2	0.71	
	PN3	0.74	
	PN4	0.57	
	PN5	0.61	
	PN6	0.51	
	PN7	0.71	
	PN8	0.51	
SWCB	SWCB1	0.83	0.87
	SWCB2	0.79	
	SWCB3	0.83	
	SWCB4	0.69	

Table 7. Results of the correlation analysis.

Variable	BAV	EV	AC	AR	PN	SWCB
B-AV		0.19 **	0.58 **	0.33 **	0.49 **	0.25 **
EV			0.03	−0.08	−0.01	0.04
AC				0.48 **	0.58 **	0.30 **
AR					0.50 **	0.25 **
PN						0.50 **

** $p < 0.01$.

4.3. Structural Equation Modeling

While constructing the structural equation modeling (SEM) for SWCB, we proposed a number of hypotheses based on the VBN theory. The latent variables (i.e., value orientations, AC, AR, PN and SWCB) constitute the basis of this model. According to the results of the measurement model, modifications were applied to the model and SEM analysis was performed. The results of goodness of fit statistics revealed that the improved model demonstrated good fit indexes ($\chi 2$ = 1681.862; df = 692; $\chi 2/df$ = 2.430 (less than 5); CFI = 0.89 (close to 0.90); SRMR = 0.06 (less than 0.08); RMSEA = 0.05 (less than 0.08) [90% CI: 0.05, 0.06]). There were four statistically insignificant paths, namely from EV to AC from EV to PN, from EV to SWCB and from BAV to SWCB. The insignificant paths were removed and the final model (Figure 3) was tested.

The final model also indicated good model fit: $\chi 2$ = 1415.870; df = 555; $\chi 2/df$ = 2.551 (less than 5); CFI = 0.90 (close to 0.90); SRMR = 0.05 (less than 0.08); RMSEA = 0.05 (less than 0.08 [90% CI: 0.05, 0.06]). Furthermore, when comparing improved and final models, Bayesian Information Criterion (BIC) or Akaike Information Criterion (AIC) indexes were used. AIC value for the improved model was found to be 1857.862, and it was found to be 1565.870 for the final model. The smaller values of BIC and ACI indicated better model fit. All these results suggest that the final model explained the data better. Therefore, we selected the final model to interpret the results below. Furthermore, since all paths from EV were found to be statistically insignificant, EV was removed from the final model. Therefore, the mediation analysis did not involve EV.

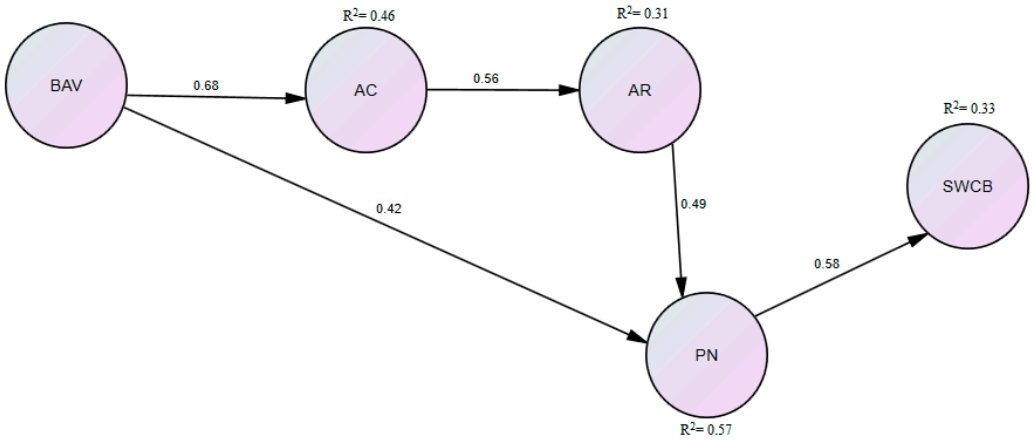

Figure 3. The structural equation modeling findings of the final model.

Table 8 summarizes both the standardized and unstandardized path coefficients in the final model. BAV was found to be significantly related to AC (β = 0.68, t = 12.11, $p < 0.001$) and PN (β = 0.42, t = 7.49, $p < 0.001$). The explained variance in AC was found to be 0.46. AC was significantly related to AR (β = 0.56, t = 10.35, $p < 0.001$). The explained variance in AR was 0.31. AR was found to be significantly related to PN (β = 0.49, t = 8.11, $p < 0.001$). The explained variance in PN was found to be 0.57. Lastly, PN was found to be significantly related to SWCB (β = 0.58, t = 8.69, $p < 0.001$). The explained variance in SWCB was 0.33.

Table 8. Path coefficient estimate of the final model.

Paths	Unstandardized Coefficient (*B*)	Standardized Coefficient β	Standard Error S.E.	*t*
BAV → AC	0.52	0.68 ***	0.043	12.11
BAV → PN	0.26	0.42 ***	0.035	7.49
AC → AR	0.60	0.56 ***	0.059	10.35
AR → PN	0.36	0.49 ***	0.044	8.11
PN → SWCB	1.57	0.58 ***	0.181	8.69

*** $p < 0.001$.

In order to test the mediating relationships in the VBN model, a bootstrapping analysis was conducted and the findings were presented in Table 9. The results showed that EV did not reveal an indirect effect on AR and SWCB. On the other hand, BAV yielded indirect effects on AR and SWCB. Specifically, BAV had an indirect effect on AR through AC (indirect effect = 0.32, $p < 0.001$). Moreover, BAV had an indirect effect on SWCB through PN (indirect effect = 0.41, $p < 0.001$) and through AC, AR and PN (indirect effect = 0.18, $p < 0.001$). AC had an indirect effect on PN through AR (indirect effect = 0.22, $p < 0.001$) and it had an indirect effect on SWCB through AR and PN (indirect effect = 0.35, $p < 0.001$). Lastly, AR yielded an indirect effect on SWCB through PN (indirect effect = 0.57, $p < 0.001$).

Table 9. Results of mediation analysis using bootstrapping.

Paths	Bootstrapping		95% Bias-Corrected CI		*p*
	Indirect Effect	Boot S.E.	Boot LLCI	Boot ULCI	
BAV → AC → AR	0.32	0.056	0.223	0.449	0.00
BAV → PN → SWCB	0.41	0.090	0.265	0.624	0.00
BAV → AC → AR → PN → SWCB	0.18	0.045	0.106	0.285	0.00
AC → AR → PN	0.22	0.056	0.131	0.359	0.00
AC → AR → PN → SWCB	0.35	0.01	0.198	0.572	0.00
AR → PN → SWCB	0.57	0.122	0.355	0.829	0.00

To summarize, all these results showed that EV was not related to AC, AR, PN and SWCB. BAV was related to AC and PN; AC was related to AR; AR was related to PN; and PN was related to SWCB. In order to analyze these relationships in a more detailed way, mediation analysis was conducted by applying the bootstrapping method. It was found that except for paths with EV, all the mediation hypotheses were supported, and the causal chain model worked for the model. That is, although BAV did not have a direct relationship with SWCB, it did influence SWCB through AC, AR and PN. In a similar vein, AC had an indirect relationship with SWCB through AR and PN. Lastly, AR had an indirect effect on SWCB through PN.

5. Discussion and Conclusions

The results of this study have both theoretical and practical importance. In the literature, the VBN theory has mostly been used to predict general pro-environmental behaviors (e.g., [24,34,35,43]), specifically energy conservation behaviors (e.g., [17,25,32,33]), and college students' sustainability behaviors (e.g., [19]). However, there is a lack of studies predicting SWCB of pre-service teachers using the VBN theory. Theoretically, this study focused on Turkish pre-service teachers' SWCB by testing the VBN theory.

According to the descriptive results, the pre-service teachers were aware of the consequences of their actions on water resources and they accept responsibility towards unsustainable water consumption. They also had a sense of moral responsibility to save water. Moreover, they held higher BV and AV than EV. The reason for high scores in these socio-psychological factors may be the environmental consciousness of participants, which can be attained through mass media, and environmental and sustainability education courses. Environmental and sustainability education courses have recently been involved in the teacher education programs in Turkey (e.g., [53,54]). Therefore, pre-service teachers are required to take these courses.

However, it was found that the pre-service teachers in the current study had a low level of SWCB, although they had positive beliefs and values. The reason behind this result can be socio-economic factors as these participants are studying in a rural city and they come from the rural cities in the east of Turkey. More than half of the participants' family income is minimum wages, and most of them had parents with low level of education. Family education is important since most of the pro-environmental behaviors are shaped in the family [14]. Therefore, one of the reasons for showing low SWCB can be family education in the current study.

There are also other factors that influence especially water conservation behaviors (e.g., [36]). These factors can be water prices, family income, age, education and household size. In the literature, there are different results about these determinants. For example, several researchers explored that higher income homes consume more water than lower income homes (e.g., [55,56]). According to some researchers, well-educated people consume more water than less educated people (e.g., [57,58]). In this study, the socio-economic status of the pre-service teachers is not high. Therefore, apart from these socio-economic factors, there might be other factors that influence the pre-service teachers' water consumption behaviors in this study. These factors could be water prices and location. Water and waste water prices for citizens living in the east of Turkey are a little cheaper compared to other cities in the west (e.g., [59]). Corral-Verdigo et al. [60] pointed out that water prices are significantly related to water consumption behaviors. Several studies also (e.g., [61,62]) argued that an increase in water prices decreases water use of people. On the other hand, some studies (e.g., [63,64]) pointed out that demand for water use is poorly sensitive to water price. As Carter and Milon [65] emphasized, increasing water prices may not influence sustainable water use; however, it may help increase the awareness of people about their amount of water use. Water price is a debatable issue. Therefore, the relationship between water prices and water consumption behaviors can be investigated in the future studies.

Based on the SEM analysis in the current study, the relationship between PN and SWCB was found to be quite high. Similar results were found in the literature (e.g., [40,66]), and PN was accepted as an inner motivator. That is, when people hold a strong PN for water conservation, they display the behavior even if other people do not display the behavior [37,67]. Similarly, Corral-Verdugo and Frias-Armenta [40] conducted a study with Mexican residents and they found that there was a positive relationship between PN and water conservation behaviors. In this sense, there is a need to establish PN which can be improved through environmental and sustainability education [68].

Concerning the results related to values, it was found that EV was not related to AC, AR, PN and SWCB. Some studies showed a significant and negative relationship between EV and pro-environmental behaviors (e.g., [17,43]). Aprile and Fiorillo [36] explored that EV and AV are the positive drivers of water conservation behavior. However, in the current study, it was indicated that having EV such as authority, social power and wealth had no influence on SWCB. On the other hand, it was explored that BAV had a significant and positive relationship with SWCB. In this study, the pre-service teachers' mean scores for AV and BV were higher than their EV. That is to say, they seemed to attribute a higher value to the impact of environmental problems on other people and non-human beings. Moreover, in this study, the BV and AV were clustered. Several researchers also pointed to the combination of BV and AV (e.g., [28,52]).

Some empirical studies supported that individuals who have BV and AV tend to show more pro-environmental behaviors [17,36,43,69]. In the current study, it was explored that BAV is indirectly related to SWCB through beliefs (AC, AR) and PN. Stern and Dietz [52] described that values can be directly or indirectly related to pro-environmental behaviors through beliefs. In this sense, this study supported the indirect relationship between BAV and SWCB. It means that the pre-service teachers who give importance to social justice, equality and world peace (AV) and who respect earth protect environment (BV) and are aware of the impact of their actions on water resources. Thus, they take the responsibility in terms of water consumption problems. They also have a higher level of moral obligation to behave sustainably and they tend to show more SWCB. This result is slightly different from other studies (e.g., [43]). Liu et al. [43] found that AV has a significant positive influence on the pro-environmental behaviors, while BV does not have a positive significant relationship with pro-environmental behaviors. On the other hand, in their study, EV was found to have a negative significant influence on the pro-environmental behaviors. In another study, Şahin [17] found that BV orientation made the highest contribution to the explanation of energy conservation behavior of pre-service teachers. In our study, a direct relationship with any type of values was not found. The reason may be related to the context. Liu et al. [43] explored pro-environmental behavior as a general manner, and Şahin [17] explored the energy conservation behavior. In the context of sustainable

water consumption in our study, values contributed to the model indirectly. However, future studies with different samples from various different universities located in different regions are needed to generalize this finding.

Lastly, in this study, mediational effects were investigated and the results revealed that the model for SWCB was supported with the VBN theory. The results suggest that BAV leads to increased awareness of the consequences of water conservation and a greater sense of responsibility for sustainable water use. Furthermore, an increased sense of responsibility leads to an increase in PN for sustainable water use, which in turn leads to an improved SWCB. These results are in parallel with those of several previous studies conducted on various environmental behaviors [19,25,43,44,70,71] explained the willingness to reduce car use with the VBN theory, and the mediation analysis showed that the causal chain model worked for the model. This mediation results suggest that sustainable water use behavior is complex in nature and a number of variables affect this behavior directly and indirectly. Considering this result, environmental education practices focusing on water conservation should aim to improve BAV, awareness of the consequences of wasteful water use, sense of responsibility for sustainable water use, and personal moral obligation for water conservation. In this way, SWCB can be improved among pre-service teachers.

As a result, this study revealed that the VBN theory was successful in explaining the SWCB of the pre-service teachers. The results give educators, researchers and policy makers some insights to develop pre-service teachers' SWCB, while considering values, PN, beliefs and attitudes. In Turkey, the elementary science education curriculum has recently been changed and now it includes some objectives related to sustainable development [53]. However, these objectives are limited to objectives regarding the use of natural resources sustainably and especially supporting recycling practices [53]. However, water issue is not sufficiently covered in the curriculum. In the curriculum, there are only objectives related how the water cycle works and there are no explanations about the impact of climate change on water resources and how to conserve water supplies [53]. These issues should be covered in the curriculum in detail. There should be environmental and sustainability courses in the elementary education. Students should even take these courses from early childhood to higher education. There is a need to increase the awareness of students related to sustainable water consumption and to develop their SWCB. Pre-service teachers are the key agents to shape future students' awareness, values, attitudes, beliefs and behaviors related to water conservation. For this reason, the number of environmental and sustainability education courses should be increased in teacher education programs to influence the SWCB of pre-service teachers positively.

The limitation of this study is that the data were collected in one university located in the east of Turkey. Therefore, it may not be generalized to other regions. Therefore, there is a need to conduct this study with pre-service teachers from different disciplines in higher education and more samples from different regions of Turkey. Moreover, this study can be conducted with elementary school teachers to explore their values, beliefs, norms and behaviors related water consumption. It is necessary to conduct more studies within the context of sustainable water consumption to produce additional theoretical and practical results.

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Appendix A

Items used in the scales:

Ascription of Responsibility
(five-point Likert scale ranging from 1- Strongly disagree to 5- Strongly agree)

- I am jointly responsible for the problems related to water consumption.
- I feel jointly responsible for the exhaustion of water sources.
- I feel jointly responsible for global warming.
- My contribution to problems related to water consumption is negligible
- Not only the government and industry are responsible for high water consumption levels, but I am too.
- In principle, individuals on their own cannot contribute to the reduction of problems related to water consumption.

Awareness of Consequences
(five-point Likert scale ranging from 1- Strongly disagree to 5- Strongly agree)

- Climate change is a problem for all plant and animal species.
- Water saving helps reduce global warming.
- Environmental quality will improve if we use less water.
- Global warming is a problem throughout the country.
- Our country will benefit from water saving.
- Saving water will benefit me and my family.
- Climate change is a problem affecting my life.
- The exhaustion of water sources is a problem.
- Glacial melting is a problem.
- It is not certain whether global warming is a real problem.

Personal Norms
(five-point Likert scale ranging from 1- Strongly disagree to 5- Strongly agree)

- I feel personally obliged to save as much water as possible.
- I feel morally obliged to save water, regardless of what others do.
- Anyone like me should do anything they can to reduce water use.
- I feel guilty when I waste water.
- If I would buy a new dishwasher, I would feel morally obliged to buy a water-efficient one.
- I feel guilty when I buy products that require too much water in the production phase.
- I feel obliged to bear the environment and nature in mind in my daily behavior.
- I would be a better person if I saved water.

Sustainable Water Consumption Behavior
(seven-point Likert scale ranging from 1-Strongly disagree to 7- Strongly agree)

- Whenever possible, I take measures to conserve water.
- I purposefully select products that let me conserve water.
- I try to limit my use of water when performing household tasks.
- I purposefully purchase products that allow me to conserve water.

Universal Values
(eight-point Likert scale ranging from 0- not at all important to 7- of supreme importance)

- Helpfulness (striving for the welfare of other)
- Social Justice (helping poor, weak people)
- A world at peace
- Equality (equal opportunities for everyone)
- Preventing pollution
- Respecting the earth
- Unity with nature
- Protecting the environment
- Authority (having authority, leadership)
- Social power (Controlling others)
- Wealth
- Influential (being influential on people and events)

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