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ARAŞTIRMA

Açık Erişim

Turkish Adaptation of Basic Psychological Needs For Energy Conservation: Reliability and Validity Study

Enerji Tasarrufu İçin Temel Psikolojik İhtiyaçlar Ölçeğinin Türkçe'ye Uyarlanması: Güvenilirlik ve Geçerlik Çalışması

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ABSTRACT

In this study the Basic Psychological Needs for Energy Conservation Scale developed by Sweeney, Webb, Mazzarol and Sautar (2014) was adapted to Turkish by ensuring its validity and reliability. Pilot study and main study were conducted with two different samples. Pilot study consists of 172 preservice science teachers and main study consists of 1136 preservice science teachers. While adapting the scale to Turkish, content and construct validity along with back-to-back translation were achieved. In terms of construct validity exploratory factor analysis and confirmatory factor analysis were applied to different samples to test the structure of the scale. Both analyses revealed that the scale has two factors: autonomy/competence and relatedness. The desired goodness of fit values was attained for CFA. In order to address the reliability of the scale, item analysis, Cronbach Alpha reliability and item-total correlation analysis were conducted. All these analyses confirmed the reliability of the scale. All of the validity and reliability analysis revealed that Turkish version of Basic Psychological Needs for Energy Conservation Scale is valid and reliable, and it can be used for further studies.

Article Information

Keywords

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ÖZET

Bu çalışmada; Sweeney, Webb, Mazzarol ve Sautar (2014) tarafından geliştirilen Enerji Tasarrufu İçin Temel Psikolojik İhtiyaçlar Ölçeği'nin Türkçe'ye uyarlanması geçerlik ve güvenilirlik çalışmasının yapılarak gerçekleştirilmiştir. İki farklı örnekleme pilot çalışma ve ana çalışma gerçekleştirilmiştir. Pilot çalışma 172 fen bilgisi öğretmen adayından, asıl çalışma ise 1136 fen bilgisi öğretmen adayından oluşmaktadır. Ölçeğin Türkçe'ye uyarlanması sırasında "back to back translation" ile birlikte içerik ve yapısal geçerlik analizleri yapılmıştır. Yapısal geçerlik çalışmaları kapsamında ölçeğin yapısını test etmek için farklı örneklemlere açıklayıcı faktör analizi ve doğrulayıcı faktör analizi uygulanmıştır. Her iki analiz de ölçeğin iki faktöre sahip olduğunu ortaya koymuştur: özerklik/yeterlilik ve ilişkililik. İstenilen uyum iyiliği değerleri DFA'da ortaya konmuştur. Geçerlik çalışmaları, ölçeğin geçerli bir ölçme aracı olduğunu göstermektedir. Ölçeğin güvenilirliğini sağlamak için madde analizi, Cronbach Alpha güvenilirliği ve madde-toplam korelasyon değerlerine bakılmıştır. Tüm bu bulgular ölçeğin güvenilirliği yüksek bir ölçme aracı olduğunu doğrulamaktadır. Bütün geçerlik ve güvenilirlik analizleri Enerji Tasarrufu için Temel Psikolojik İhtiyaçlar Ölçeği'nin (ENTAPI) Türkçe versiyonunun geçerli ve güvenilir olduğunu ve daha sonraki çalışmalarda kullanılabileceğini ortaya koymuştur.

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INTRODUCTION

From the beginning of industrial period, energy production has been a main concern of nations for economic growth. The dependence on energy has been increasing dramatically, and how to generate energy is a critical issue for the environment. The main energy resource is still fossil fuels for many countries, and excess use of fossil fuels leads the increase of CO₂ concentration in the atmosphere, which causes climate change problem in global scale (Muller, 2012; Huang, Zhang, Zhang, Guan, Wei, & Guo, 2020). Climate change is accepted as one of the most critical threats for humanity today (Intergovernmental Panel on Climate Change, 2014). In order to deal with this problem, all societal actors need to be involved in solution of this problem (Ojala, 2015). As a critical step, CO₂ emissions should be decreased to mitigate climate change. Although energy efficiency has been increasing with the progression in technical devices, and the advancements in renewable energy have been improving, CO₂ emissions are still increasing. It shows that energy conservation still has an important role in order to help climate change mitigation (Johnson, 2016). In this sense,

young people in schools and teachers are accepted as vital actors, and variables affecting their energy conservation behaviors (ECB) are important. Preservice science teachers as the future teachers are also important actors in addressing ECB. Another important thing influencing ECB are psychological variables. According to self-determination theory (SDT) satisfaction of basic psychological needs (i.e., autonomy, competence, and relatedness) has a crucial role in ECB (Sweeney et al., 2014). The following section is devoted to explain the role of basic psychological needs in ECB and how it is measured.

Theoretical Background of Psychological Needs

Basic psychological needs are defined within the framework of self-determination theory (SDT). SDT, proposed by Deci and Ryan (1985), is a theory of human motivation that focuses on the process of internalizing goals and values (Deci & Ryan, 2000). SDT assumes that a person may engage in a particular environmentally conscious behavior for external reasons, e.g., to obtain monetary reimbursement, or for internal reasons, e.g., a sense of having protected the environment (Darner, 2014; Pelletier et al., 1998). Nearly all human behaviors, including pro-environmental behaviors, usually are not intrinsically motivated (Osbaldiston & Sheldon, 2003). When humans are socialized and engage in public norms, they discover how to perform behaviors through socialization. This kind of socialization occurs by using a process called internalization: Externally regulated behaviors are assimilated in the individual's cognitive design so that they are no longer understood as outside regulations but as originating from the individual's self (Deci & Ryan, 1990; Ryan & Deci, 2002). In this particular internalization process, satisfaction of basic psychological needs is an exclusive place in SDT considering that the degree of satisfaction of the needs influence the degree of internalization and how much internalized a behavior can determine the motivation type for the actions (Baxter & Pelletier, 2020; Deci et al., 1994; Osbaldiston & Sheldon, 2003).

Deci and Ryan (1985, 1990) address three psychological needs, which are vigorously promote self-determined motivation. These needs are namely, autonomy, competence and relatedness. Autonomy refers to feeling volitional about the behavior (Ryan & Deci, 2008). With respect to ECB, the term autonomy refers to acting for energy conservation willingly (Sweeney et al., 2014). Competence refers to feeling effective in performing the behavior (Ryan & Deci, 2008). People having competence also know where to find the required information and help. Along these lines, feeling of competence matches with perceived self-efficacy of Bandura, which focuses on the beliefs of a person about himself/herself

regarding to achieving certain things (Cooke, Fielding & Louis, 2016). It is important to note here that if competence is not associated with autonomy, intrinsic motivation is not raised (Ryan & Deci, 2000). People having competence with regard to energy conservation would feel that they are capable of conserving energy or that they know how to conserve energy and how to find information about it (Sweeney et al., 2014). The final basic psychological need is relatedness, which refers to feeling of being connected to a social environment or a community (Ryan & Deci, 2008). It is assumed that these three psychological needs are innate and are universal regardless of differences among cultures or gender (Vansteenkiste et al., 2020).

According to SDT, social environments are either facilitators or thwarts to satisfy basic psychological needs. In educational context, when basic psychological needs are satisfied in a context, students' motivation, vitality and their behavior are supported (Vansteenkiste et al., 2020). For instance, Darner (2012) designed a SDT based course to improve students' environmental motivation. In this educational context, the course fulfilled basic psychological needs of the participants. For example, to support their competence and autonomy need, students engaged in real life environmental problems and in these problems they had autonomy to decide how to solve the problem (Darner, 2012, 2014). The study of Darner (2012) showed that student's environmental motivation was increased when their basic psychological needs were fulfilled. In a similar vein, Karaarslan, Ertepinar and Sungur (2013) designed an environmental science course supporting basic psychological needs of PSTs to support their self-determined motivation, and they found that PSTs' self-determined motivation for environment and their pro-environmental behavior were improved throughout the course (Karaarslan et al., 2013).

There has been evidence that the relationship between basic psychological needs and pro-environmental behavior is significant. The study of Osbaldiston and Sheldon (2003) showed that to engage students in pro-environmental behavior, their need for autonomy should be supported. When this condition is provided, the students internalized the pro-environmental behavior and they develop self-determined motivation for these behaviors. All these results show that basic psychological needs have an important role in predicting pro-environmental behaviors. As a type of pro-environmental behavior, ECB can be predicted from basic psychological needs. There are researchers who claim that psychological needs are important since they have a critical role in motivation for displaying ECB (Sweeney et al., 2014; Webb et al., 2013). For instance, Sweeney et al. (2014) conducted an experimental study via internet with 696 householders in Australia. In that study word of mouth, which offers an online community to share experiences and provide support for the community, was used to satisfy basic psychological needs of participants. The study revealed that satisfaction of basic psychological needs helped participants internalize ECB and their ECB was enhanced.

In this era, climate change as one of the most serious problems is waiting for individual and collective solutions. Abovementioned studies showed that mitigating climate change has a psychological side, and basic psychological needs are critically important to enhance ECB which is a part of solution for mitigating climate change. For this purpose, in the first place it is necessary to determine people's energy conservation behavior while considering their basic psychological needs. As it was stated above determining preservice science teachers' ECB is critically important in order to have future citizens who have well developed ECB. The purpose of this study was to adapt the Basic Psychological Needs for Energy Conservation Scale developed by Sweeney, et al. (2014) into Turkish by ensuring its validity and reliability.

METHOD

Participants

Two different samples of preservice science teachers (PST) were used in the pilot and real study. Convenience sampling, which is also labelled as accidental or opportunity sampling, method was used to determine the participants for both study samples. In this sampling method, the researcher chooses participants, who are easily accessible (Cohen, Manion & Morrison, 2011). For pilot study 172 participants, who were third and fourth grade PSTs from two universities participated in the study. Among them, 130 (75.6%) were female and 42 (24.4%) were male. In addition, 78 PSTs (45.3%) were third graders and 93 (54.1%) were fourth graders, and one participant did not specify her/his class. The reason for having 3rd and 4th grade PSTs in the sample was that they had taken basic sciences and environmental education courses.

Junior and senior class pre-service science teachers from eleven universities in Central Anatolia region in Turkey was selected conveniently as the sample for the real study. The total number of universities in Central Anatolia region is eleven and all these eleven universities were reached for the purpose of this study. Of the 2200 PSTs enrolled at these universities, 1136 PSTs participated in this study. Thus, 52% of the target population constituted the sample of this study. Of the PSTs, 912 (80.3%) were female, 218 (19.2%) were male and 6 (0.5%) did not specify their gender- and 519 (45.7%) were in the third grade and 617 (54.3%) were in the fourth grade.

Ethical Statements

This study was completed in accordance with the Helsinki Declaration. In line with this, the study was permitted by Middle East Technical University, Applied Ethics Research Center (Date: 10/03/2014; Number: 286208161/124-222).

Basic Psychological Needs For Energy Conservation Scale and Its Adaptation Process

Basic psychological needs for energy conservation scale (BPNEC) was developed by Sweeney et al. (2014) based on self-determination theory. The instrument is in English and includes nine items on a seven-point Likert scale (1- strongly disagree, 7-strongly agree). It consists of two factors, which are autonomy/competence (six items; e.g., "I feel confident in my ability to save energy") and relatedness (seven items; e.g., "I feel that I have similar concerns with people who are saving energy") (Sweeney et al., 2014). Autonomy/competence refers to feeling volitional and effective in performing the behavior. People having autonomy/competence in energy conservation would feel that they are capable of conserving energy, they know how to conserve energy, and feel volitional control for this behavior (Sweeney et al., 2014).

BPNEC was translated to Turkish by both authors and two bilingual translators who are working as English instructors in academic writing center in a well-known English medium university. Through the adaptation process, a back-to-back translation was done and then, the back translation was also completed by another translator. Afterwards, interview with 15 PSTs were conducted to see whether items were easy to understand. During the interviews in order to determine their energy conservation behavior two open ended questions were asked: Which factors facilitate your energy conservation behaviors? What do you need to conserve energy? Interviews revealed that PSTs agreed that translated version of the items were easy to follow. But based on their answers for the questions the researchers

agreed to add new items to the BPNEC. Four new items were added (I am knowledgeable about energy conservation; I feel that I have similar concerns with people saving energy; I am not being restricted about what to do about energy conservation, I have a voice about what to do about energy conservation) to the Turkish version of the scale. Of these four items, one of them (I am knowledgeable about energy conservation) is competence need, one of them (I feel that I have similar concerns with people saving energy) is relatedness need, and the other two items (I am not being restricted about what to do about energy conservation, I have a voice about what to do about energy conservation) were autonomy needs. The original scale includes items for autonomy, competence and relatedness, and some items are similar with the items we added. However, these items emerged from the interviews. We thought that PSTs might expressed their feeling for their needs to conserve energy in this way and we added these items to see how they are working in the pilot study. Afterwards, all items were sent to an expert committee, which consists of three experts in motivation theories, environmental education and a psychological counseling and guidance. They reviewed the items and provided comments. All these comments were addressed by the researchers and final version of the scale was completed. As a final step, two PSTs reviewed the final version of the scale and provided their ideas regarding the format and the design of the scale as well as the clarity of the sentences. Based on their responses the scale was finalized, and a pilot study was conducted with 13 items. With the data obtained through pilot study, BPNEC was revised and real study was conducted with 1136 PSTs.

Data Analysis

To explore construct validity, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted. In instrument adaptation studies, running EFA as an initial step for construct validity is suggested to capture problems raised from the translation process (Orçan, 2018). Therefore, EFA was conducted in the pilot study. Then, CFA was conducted to a new sample to confirm the factorial structure which was explored in the pilot study (Orçan, 2018; Worthington & Whittaker, 2006). To explore the reliability of the scale Cronbach's alpha coefficient was conducted.

The factorial structure of Turkish BPNEC was examined in pilot study with EFA through principal axis factoring analysis with direct oblimin rotation (Field, 2013). In order to specify the factor structure, KMO measure of sampling adequacy and eigenvalues larger than one were used. EFA was performed with IBM SPSS 24 for Windows. Two basic issues were considered before conducting EFA. One of them was the sample size, and the other one was the strength of the relationship among items (Pallant, 2007). Sample size is suggested as 5:1 ratio that 5 participants for each items (Tabachnick & Fidell, 2013). This assumption was satisfied that BPNEC included 13 items in the pilot study and the sample size was 172. In addition to this, sample size assumption was tested with the Kaiser-Meyer-Olkin (KMO) measure. KMO index ranges from 0 to 1. The minimum value with .6 is suggested for KMO index (Tabachnick & Fidell, 2013). Additionally, Bartlett's test of sphericity provides evidence for the appropriateness of data for factor analysis. The test result should be significant ($p < .05$). EFA showed that KMO value was .89 and

Bartlett's test of sphericity was found to be significant ($p < .05$). The assumptions for EFA were satisfied. While deciding on the number factors, suggested Kaiser criteria (Kaiser, 1974) and scree plot criteria were considered (Pallant, 2007). Item analysis and reliability was performed with IBM SPSS 24 software.

CFA was conducted in the main study with Analysis of Moment Structures (AMOS) 21 (Arbuckle, 2011). Before running CFA the assumptions, namely sample size, normality and linearity, outliers, and absence

of multicollinearity and singularity were checked. Sample size is suggested as at least 200 (Kline, 2011). The sample size of main study was 1136, which was more than the reference point. Missing value for each item was between 0% and 3.5%. The missing value lower than 5% is not as a problematic issue that any method for missing data can be used (Tabachnick & Fidell, 2013). Missing values were replaced with mean in the main study. The outliers were examined with Mahalanobis Distance values by AMOS. The analysis revealed 34 cases as outlier. These cases were removed from the data and further analyses were conducted with 1102 cases. Normality assumption was checked with skewness and kurtosis values. Skewness and kurtosis values were within ± 1.5 acceptable range (Tabachnick & Fidell, 2013). Thus, the data showed a normal distribution (kurtosis -0.46; skewness = -0.18) (Tabachnick & Fidell, 2013). When the variables are highly correlated (above .90) multicollinearity and singularity problem arises. To check this assumption, bivariate correlations among the variables were investigated. It was found that the bivariate correlation between autonomy/competence and relatedness was 0.61 ($p < .05$). It means that multicollinearity and singularity assumption was satisfied. These results showed that all assumptions for CFA were satisfied.

In order to evaluate whether the hypothesized construct tested through CFA is valid or not, a variety of model fit indices were used. Among them, chi-square (χ^2), CFI, SRMR, RMSEA and 90% confidence interval for RMSEA were used as suggested by Kline (2011).

RESULTS

The construct validity of BPNEC instrument was explored through EFA and CFA. Two different samples were used for this purpose.

The Exploratory Factor Analysis (EFA)

EFA was conducted with 172 participants. The KMO value was 0.89. The Barlett Sphericity Test result was significant ($\chi^2=871.457$, $df=78$), which means that the data is suitable for factor analysis. Results produced by the Principal Axis Factoring technique showed that three items had communality values less than 0.40. Thus, these items were removed from the initial 13 items. These three items were autonomy needs. Two of them were the items we added to the scale (I am not being restricted about what to do about energy conservation, I have a voice about what to do about energy conservation) and the other was from the original scale (I'm free to choose what I do to save energy). With the remaining 10 items, two factorial structures, which explained 54% of the total variance were obtained and these two factor structures were similar with the original scale and also in parallel with the theoretical explanations. Table 1 shows the factor loadings of EFA. Factor one included the items 1, 2, 4, 6, 7, and 8. All of the six items were belong to PSTs' autonomy/competence needs. The item we added to competence need (I'm knowledgeable about energy conservation) was loaded in this factor, which is expected theoretically and all other items in this factor loaded similarly as in the original scale. Therefore, the first factor was named as autonomy/competence similar to the original scale factor solution. Factor two had the items 3, 5, 9, and 10. These 4 items were belonged to PSTs' sense of relatedness needs. The item we added to relatedness (I feel that I have similar concerns with people saving energy) was loaded in relatedness scale as we had thought, and all other items in this factor loaded similarly as in the original scale. The second factor was called as relatedness.

Table 1. Rotated Factor Matrix of Exploratory Factor Analysis

Item Number	Factor	
	1	2
B2	.831	
B7	.755	
B1	.693	
B6	.659	
B4	.599	
B8	.432	
B10		-.891
B9		-.829
B5		-.646
B3		-.477

Item Analysis and Reliability of the BPNEC

Item analysis was conducted to determine power of items for understanding the quality of the items. The item analysis showed that item-total correlation coefficients varying from .55 to .73. The minimum value for this index is expected to be 0.30 (Büyüköztürk, 2004; Kline, 2013). It can be concluded that items in BPNEC were within the acceptable limits. Findings revealed from item analysis are shown in Table 2.

Table 2. Item analysis of BPNEC

Item	Mean	Standard Deviation	Item Total Correlation
1. I have a say in choosing what I do to save energy.	5.16	1.268	.613
2. I am knowledgeable about energy conservation.	4.95	1.174	.614
3. I feel a sense of camaraderie with other people who are saving energy.	4.66	1.398	.568
4. I feel confident in my ability to save energy.	5.41	1.143	.702
5. I feel that I have similar concerns with people saving energy.	5.20	1.204	.576
6. I feel able to meet the challenge of reducing my energy use.	5.05	1.110	.691
7. I decide what I do to save energy	5.41	1.148	.599
8. I am capable of controlling the amount of energy I use	4.92	1.338	.601
9. I share a common bond with other people who are saving energy.	5.09	1.251	.732
10. I feel connected with other people who are saving energy.	4.80	1.327	.625

N=172

In order to report the reliability of the scale, Cronbach's alpha coefficient was examined for each dimension (see Table 3). Both dimensions' alpha values in the pilot and the real study were higher than 0.80, which indicated good internal consistency.

Table 3. Cronbach's Alphas Coefficients

	Factors	
	Autonomy/competence	Relatedness
Cronbach's Alpha	0.86 (pilot study) 0.86 (real study)	0.83 (pilot) 0.82 (real study)
Number of items	6	4

Confirmatory Factor Analysis

CFA was conducted to validate the two-factorial structure of BPNEC in the main data. AMOS 21 was used for this purpose. According to Sumer (2000), a model is accepted as a good fit if the $\chi^2 / df \leq 5$ point. CFA of our study showed that χ^2 / df value was 3.8 which indicates a good fit. RMSEA and SRMR values smaller than 0.05 means that the model is a good fit. If RMSEA value is smaller than 0.08, it indicates the model fits well with reasonable error (MacCallum, Browne, & Sagawara, 1996). CFI value with higher than 0.9 indicates evidence for a strong model (Finch, Immekus, & French, 2016). CFI value was found to be 0.98 in this study. Overall, the analysis provided evidence for reasonably good fit indices and the model fit the hypothesized factor structure ($\chi^2/df= 3.8$; CFI= .98; SRMR= .03; RMSEA= .05; 90% CI for RMSEA= .04-.06). Figure one below shows the standardized factor loadings of items for each factor. The factor loadings vary between 0.59 and 0.85.

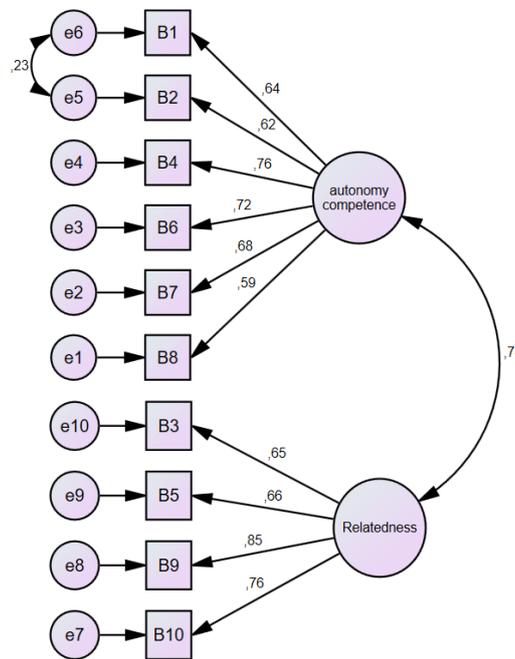


Figure 1. Confirmatory Factor Analysis with Standardized Results.

These findings show that the BPNEC adapted to Turkish can be used to measure PSTs' basic psychological needs for energy conservation context.

DISCUSSION

The aim of this study was to adapt the Basic Psychological Needs for Energy Conservation (BPNEC) instrument developed by Sweeney et al. (2014) into Turkish. The results of exploratory and confirmatory factor analysis conducted in the pilot and main study provided evidence for the construct validity of the Turkish version of the scale, which included 10 items and two dimensions. The dimensions were autonomy/competence and relatedness similar to the original scale. In addition, the reliability coefficients of these dimensions indicated the dimensions had good internal consistency.

According to EFA results, autonomy and competence factors were merged in our adapted scale. The original scale revealed the same result. This result does not contradict with SDT. Basic psychological needs consists of three factors, namely autonomy, competence and relatedness (Deci & Ryan, 2000;

Niemiec & Ryan, 2009; Ryan & Deci, 2000). According to SDT, intrinsic motivation for an activity is raised by satisfaction of autonomy and competence together. When competence is not associated with autonomy, intrinsic motivation is not raised (Ryan & Deci, 2000). It can be inferred that to raise intrinsic motivation for ECB, autonomy and competence needs should be satisfied together. Furthermore, item analysis was conducted for construct validity. Item analyses are used to figure out if the items of a scale result in generating meaningful data, both together and within sub dimensions of the scale (Tabachnick & Fidel, 2013). All evidence showed that the instrument is both valid and reliable.

As mentioned above, we added four items (I am knowledgeable about energy conservation, I feel that I have similar concerns with people saving energy, I am not being restricted about what to do about energy conservation, I have a voice about what to do about energy conservation) to the scale as a result of the interviews with PSTs. During the interviews all of participants talked about their knowledge about how to conserve energy. Even though they stated that they are knowledgeable about energy conservation they still need to learn specific energy conservation behaviors, which help them to consume less energy. For example, they need to know which home supplies consumed more energy. That is, they still needed to know which behaviors have more impacts to environment. During the courses they took at the universities, they had a little chance to talk and learn about energy conservation issues. Moreover, they mentioned that their courses also did not include real life issues for energy conservation. Rather than inquiring this issue by themselves, their want to learn necessary knowledge and gain experiences regarding energy conservation during the courses offered at the universities. The educational system in Turkey is mainly based on national examination and high levels of competition (Kingir, Tas, Gok & Sungur Vural, 2013). Since, the PSTs mostly used to learn knowledge through memorization and apply algorithms to given situations in these high-stake exam questions, they had difficulty in developing their research skills and epistemic beliefs at the universities. This might be one reasons for these PSTs to expect university instructors to provide necessary knowledge behavior relationships regarding energy conservation. This item worked properly, and analyses supported that having knowledge for energy conservation is a competence. This item was a unique contribution of this study to the literature.

Another item we added was “I feel that I have similar concerns with people saving energy” which belongs to relatedness factor. In interviews, many PSTs explained that they felt themselves as being connected to significant others in their life. For instance, one of the participants indicated that her roommate taught her that even leaving TV on standby caused energy consumption and increasing their carbon footprints. Then they decided not to leave TV on standby mode. She told that learning more about carbon footprint helped her to consider and perform more pro-environmental behaviors. Then she ended up feeling more connected to people who made an effort for energy conservation, and she thought that they both hold similar concerns. Since this daily life experiences are very similar among people, we decided to add an item to measure it under the relatedness dimension of the scale. The added item worked properly. This item was a unique contribution of this study to the literature. In a similar vein, two items were added to autonomy dimension which were “I am not being restricted about what to do about energy conservation, I have a voice about what to do about energy conservation.” However, these two items did not work well in the pilot study.

ECBs are critically important for climate change mitigation strategies (IPCC, 2014; Ojala, 2015). PSTs as future science teachers have critical role in shaping students’ energy conservation behaviors. SDT points out that satisfaction of basic psychological needs is very crucial for intrinsic motivation (Deci & Ryan,

2000). In the literature, there were studies exploring the role of self-determination theory in pro-environmental behavior within educational settings (e.g., Darner 2012, Karaarslan et al., 2013). However, studies are lacking to explore how PSTs' ECB are improved by satisfying their basic psychological needs for energy conservation. Therefore, this study revealed that the PSTs' basic psychological needs for energy conservation had several aspects and open to development during teacher education programs. The BPNEC can be used by university instructors to better address and develop PSTs energy conservation behaviors. We believe that this scale has higher potential to help researchers to further explore how to meet PSTs' basic psychological needs through qualitative and experimental studies.

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Author Contributions

This study was a part of BÇY's doctoral dissertation. Both authors worked on the adaptation of items. Data collection, data analysis and the reporting parts were carried out by BÇY under the supervision of ÖYT.

Conflict of Interest

It has been reported by the authors that there is no conflict of interest.

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Ethical Statement

This study was completed in accordance with the Helsinki Declaration. In line with this, the study was permitted by Middle East Technical University, Applied Ethics Research Center.

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