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RESEARCH ARTICLE

Investigation of Pre-Service Science Teachers' Behavior towards Sustainable Environmental Education

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Abstract

The purpose of this study is to investigate pre-service science teachers' sustainable environmental education behaviour and the factors affecting them in terms of some variables (gender and grade level). The study group of the current research is comprised of 206 pre-service teachers attending the Department of Science Education in the Faculty of Education of Kırsehir Ahi Evran University. The study employed the descriptive survey method, one of the quantitative research methods. As the data collection tool, "The Sustainable Environmental Education Behavior Scale" developed by Demirci Güler and Afacan (2012) was used in the study. The calculated Cronbach alpha value of the scale was found to be α=0.90. In the statistical analysis of the data, SPSS was used. In the analysis of the data, Independent Samples t-Test and One Way ANOVA were run. It was found that the pre-service science teachers' scores of behavior towards sustainable environmental education do not vary significantly by gender. In addition, a significant difference was found between the 2nd and 3rd grade pre-service science teachers' average scores in favor of 2nd grade in the Environment-Friendly and Recyclable Products sub-factor of the scale.

Keywords: Sustainable environmental education, behaviour, pre-service science teachers, gender, grade level

Introduction

Ecological changes such as the use of energy resources, the use of radioactive reactors and the thinning of the ozone layer as a result of them, global warming, climate change, nuclear disasters and the destruction of species have made environmental protection important since the 1970s. Giving importance to the environment where development cannot only be of economic originthe necessity of sustainable development for the first time, then the concept of sustainable environment has come up.

The notion of sustainable development, which started to gain importance specifically after the mid-1980s, promptly tended towards the education of sustainable environment and became the contemporary dominant view. This is evident in UNESCO's replacement of the program "International Environment Education" which was carried out during the years 1975-1995, with the program "Education for Sustainable Future" (cited by Tanrıverdi, 2009).

Sustainability is a term that presented itself especially in the late 1970s, when there was a considerable increase in environmental problems. In general, it can be defined as satisfying the present requirements with a consideration into future needs without using up natural resources. Education is part of the process of achieving it. Accordingly, education for sustainable environment includes enabling individuals to gain an awareness of environmental issues, to attain certain values and attitudes, and to adopt positive behaviours (Demirci Guler & Afacan, 2012). Sustainability should not be imposed from above, people should be actively involved in this process (DEFRA, 2003). Sustainability is achieved as long as human values, attitudes and behavior change (Bonnes & Bonaiuto, 2002; DETR 2000).

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The work carried out under the leadership of the UN especially in the implementation of the idea of sustainable development is prominent. The UN Environment and Development Program (UNDEP) and the World Commission on Environment and Development (WCED), the Brundtland Report prepared in 1987, the Rio Summit in 1992 and the Johannesburg Summit in 2002 are some of these studies (Karalar & Kiracı, 2011).

Sustainability generally meets the needs of today's humanity. It is based on the principle of preserving the balance between natural capital without being consumed and allowing future generations to meet their own requirements and has environmental, institutional, economic and social indicators. Mong environmental indicators, forestry land and wood cutting density, important ecosystems, species and the proportion of protected areas, damaging the ozone layer consumption of substances in agriculture and the use of chemicals in agricultural struggle (Bal, 2009). The application of sustainable development stages is defined in relation to diverse strategies, which cover subjects such as “climate change and clean energy, sustainable transportation, sustainable consumption and production, public health, conservation and management of natural resources, social integration, demography and migration, global poverty” (WCED, 1987). Sustainable development is a model that requires economic development to be sustained within the limits of sustainability. In other words, sustainable development deals with economic growth and ecological balance, it endeavors to meet today's requirements without endangering the needs of future generations (Karalar & Kiracı, 2011).

According to Smith, the attitude is in a tendency attributed to an individual and constitutes a regular form of the thoughts, feelings and behaviors of an individual about a psychological object. Attitudes are handled and measured individually. However, when the attitudes of a large number of individuals are measured using methods such as sample research, group attitudes can be mentioned or various groups can be compared with each other in terms of their attitudes (Kağıtçıbaşı, 2006).

Attitude is a tendency attributed to an individual. That is, we see that attitude is not a feature that can be observed directly, but is assumed to be indirectly assumed by the individual's observable behavior, and that there is a tendency attributed to that individual (Kağıtçıbaşı, 2006). It is difficult to measure as attitudes are affective, that is, feelings and emotions. In order to understand human attitudes, it is necessary to examine his behavior.

The attitudes towards behavior is a person’s general positive or negative evaluations related to exhibition of the behavior and the attitude towards behavior is the positive or negative evaluation of the individual in achieving a specific behavior of interest (Ajzen 2002; Ajzen, 2005).

Considering the environmental attitude as the behavioral means of people, it can be said that there is a strong connection between a person's attitude and behaviour (Kaiser, Oerke & Bogner, 2007). Some researchers have stated that environmental problems will be much more dependent on behavior than just a linear computing process. Behavior depends on a broader range of action, rather than a linear information processing (Barr, 2003).

Waste strategy 2000 stated that raising awareness and training in recycling and waste is a top priority (DETR, 2000).

Changes in consumer behaviors are of great importance for sustainable development, on the basis of technological and organizational innovation as well as an appropriate political and economic framework, responsible demand and supply (Terlau & Hirsch, 2015). Researchers pointed three pillars of sustainability as environmental, social and

economic factors and the relationships among, them need to be considered systemically (cited by Ateş & Gül, 2018). An actual and tangible connection exists between attitudes to the environment and behaviours. Nevertheless, it is sometimes necessary to know the attitude underlying a particular behavior.

Transferring our world and our environment to future generations in a habitable way is only possible through environmental education. Within the scope of environmental education, individuals should be given the concept of sustainability, which has an important role in the permanent solution of environmental problems, and the relationship between sustainability and environment.

When all these reasons are taken into consideration, it is believed that this topic is important and current study contributes to literature. Education and knowledge about sustainability play an important role in the development of positive attitudes and behavior towards sustainability. Sustainable behavior can be corrected by training. The pre-service teachers who will be the teachers of the future will have positive behaviors on the subject of sustainability. If teachers can show their attitudes towards sustainability in their behaviors, they can be an example to their students. The aim of the study was determined by this.

Purpose of the Study

The purpose of this study is to investigate pre-service science teachers' sustainable environmental education behaviour and the factors affecting them in terms of gender and grade level. For this purpose, the following research problem and the sub-problems were sought.

Sub-Problems of the Research

a. What is the level of the pre-service science teachers' scores of behavior towards sustainable environmental education?

b. Do the pre-service science teachers' scores of behavior towards sustainable environmental education vary significantly depending on gender?

c. Do the pre-service science teachers' scores of behavior towards sustainable environmental education vary significantly depending on grade level?

Methodology

Design of the research

Survey method was used in the study since the purpose of the study is to examine behavior towards sustainable environmental education of the pre-service science teachers' who study in Kırşehir Ahi Evran University in Turkey. Survey models aim to describe a situation as it was in the past or it is at present (Karasar, 2005).

Study Group

The study group of the current research is comprised of 206 pre-service teachers (1st year-4th year) attending the Department of Science Education in Kırşehir Ahi Evran University. Of the participating pre-service teachers, 61.16% are females and 38.84% are males. Of the preservice teachers, 7.76% are first-year students, 33.98% are

second-year students, 28.64% are third-year students and 24.75% are fourth-year students.

Data Collection Tools

In order to collect data, "Sustainable Environment Education Behavior Scale" developed by Demirci Güler and Afacan (2012) was used. The original scale consists of 29 items designed in the form of five-point Likert scale ranging from "Always: 5" to "Newer: 1". The scale used in the study consists of three dimensions. These dimensions are; "Behaving in an Energy-Saving Way", "Following Environmental Publications or Broadcasts and Reacting to People Who Damage the Environment", "Using Environmentally-Friendly and Recyclable Products". In the original study, the cronbach alpha reliability coefficient of the scale was found to be 0.944. The calculated Cronbach alpha value of the scale was found to be α=0.90.

Analyzing Data

The scores obtained from the Sustainable Environment Education Behavior Scale were aggregated and divided into 5 because they were 5-point Likert-type and the lowest score was 29 and the highest score was 145. The ranges of these scores are presented in Table 1.

Table 1.

Ranj values used in ınterpreting calculated average values

Qualification Groups	*Weight Value*	*Range*
Always	5	4,20 - 5,00
Often	4	3,40 - 4,19
Sometimes	3	2,60 - 3,39
Rarely	2	1,80 - 2,59
Never	1	1,00 - 1,79

For the data analysis, SPSS statistical program was used. In order to provide normal distribution of data, test of Kolmogrov-Simirnov was used. According to test of Kolmogrov-Simirnov, data were distributed normally (Z=.493, p>.05). For this reason, t-test and one-way ANOVA was used.

Findings

Data of the research is consisting of drawings and opinions on them. In the research, firstly, results gathered from the drawings shared, then fundamental properties of drawings provided. After, findings from interviews are provided.

In this section, data collected with 206 pre-service teachers with Sustainable Environment Education Behavior Scale and findings are included.

Findings related to sustainable environment education behavior status of pre-service teachersare shown in Table 2.

Table 2.

Descriptive statistics results related to the pre-service science teachers' sustainable environmental education behavior and mean scores

Scale	*N*	*Mean*	*Std. Deviation*	*Min*	*Max*
Sustainable Environment Education Behavior Scale (SEBS)	206	3,67	,45	2,45	5

When Table 2 is examined, the mean score (M= 3.67) of pre-service science teachers' from Sustainable Environment Education Behavior Scaleis among limit values of "often". This value shows that pre-service teachers "often" conduct sustainable behaviors.

Factor names and mean scores (Behaving in an Energy-Saving Way, Following Environmental Publications or Broadcasts and Reacting to People who Damage the Environment, Using Environmentally-Friendly and Recyclable Products) are presented in Table 3.

Table 3.

Descriptive statistics results factors and mean scores

Factors	*The number of items in the factors*	*Mean*	*Std. Deviation*	*Min*	*Max*
Behaving in an Energy-Saving Way (BE-SW)	15	4,05	0,44	2,53	5,00
Following Environmental Publications or Broadcasts and Reacting to People who Damage the Environment (FEPBRPDE)	8	3,26	0,67	1,50	5,00
Environmentally-Friendly and Recyclable Products (E-FRP)	6	3,30	0,72	1,33	5,00

Table 3 is examined that "Behaving in an Energy-Saving Way" factor's mean score is M= 4.05 which is among limit values of "often". This value shows that pre-service teachers "often" intended to the behavior of energy-saving.

"Following Environmental Publications or Broadcasts and Reacting to People who Damage the Environment" factor's mean score is M= 3.26 which is among limit values of "sometimes". This value shows that pre-service teachers "sometimes" followenvironmental publications or broadcasts and react to people who damage the environment.

"Environmentally-Friendly and Recyclable Products" factor's mean score is M= 3.30 which is among limit values of "sometimes". This value shows that pre-service teachers "sometimes" prefer environmental publications or broadcasts and react to people who damage the environment.

The second sub-problem of the study looked at the correlation between the pre-service science teachers' sustainable environmental education behavior scores and the grade level variable. T-test results related to the pre-service science teachers' sustainable environmental education behavior scale and factors' mean scores are given in Table 4.

Table 4.

T-test results related to the pre-service science teachers' sustainable environmental education behavior mean scores

Scale/Sub-Factors	*Gender*	*N*	*Mean*	*Std. Deviation*	*df*	*t*	*Sig*
BE-SW	Female	126	4,04	,44	204	,116	,907
	Male	80	4,05	,45			
FEPBRPDE	Female	126	3,36	,63	204	1,738	,084
	Male	80	3,20	,71			
E-FRP	Female	126	3,31	,68	204	,345	,731
	Male	80	3,27	,78			
SEBS	Female	126	3,70	,45	204	,642	,522
	Male	80	3,66	,46			

As can be seen in Table 4, the female pre-service science teachers' sustainable environmental education behavior mean score (M=3.70) is higher than that of the male pre-service science teachers (M=3.66). There was no significant difference between the mean scores of the pre-service science teachers sustainable environmental education behavior scale and gender variable [$t_{(204)}$ =.642; p>.05].

There was no significant difference in terms of gender variable among the scores of *Behaving in an Energy-Saving Way* factor [$t_{(204)}$ =.116; p>.05], *Following Environmental Publications or Broadcasts and Reacting to People who Damage the Environment* factor [$t_{(204)}$ =1.738; p>.05] and *Environmentally-Friendly and Recyclable Products* factor scores of the scale [$t_{(204)}$ =.345; p>.05].

The third sub-problem of the study looked at the correlation between the pre-service science teachers' sustainable environmental education behavior and factor's scores and the grade level variable.

Table 5.

Descriptive statistics related to the pre-service science teachers' sustainable environmental education behavior scores in relation to grade level

Scale/Sub Factors	*Grade Level*	*N*	*Mean*	*Std. Deviation*
BE-SW	1	16	3,95	,594
	2	70	3,95	,458
	3	69	4,13	,387
	4	51	4,10	,437
FEPBRPDE	1	16	3,24	,879
	2	70	3,25	,742
	3	69	3,21	,517
	4	51	3,35	,688
E-FRP	1	16	3,33	,802
	2	70	3,46	,701
	3	69	3,09	,592
	4	51	3,33	,830
SEBS	1	16	3,63	,587
	2	70	3,66	,515
	3	69	3,67	,350
	4	51	3,74	,472

As can be seen in Table 5, with the pre-service science teachers' increasing grade level, their sustainable environmental education behavior scores also increase respectively (M=3.63, 3.66, 3.67 and 3.74).

Table 6.

Test of homogeneity of variances

Levene Statistic	*df1*	*df2*	*Sig*
5,182	3	202	,002

Levene test conducted to test the homogeneity of the variances belonging to the data revealed that the variances are not homogenous (p<.05) (Table 6). Since the data were not homogeneous, Dunnett C multiple comparison test was performed.

Table 6.

One-way ANOVA results of pre-service science teachers' sustainable environmental education behavior scores in relation to grade level

Scale/Sub Factors	High School	Sum of Squares	df	Mean Square	F	p	Sig. Dif.	η^2
BE-SW	Between Groups	1,407	202	,469	2,392	,070	---	
	Within Groups	39,585		,196				
	Total	40,992						
FEPBRPDE	Between Groups	,600	202	.200	.441	,724	---	
	Within Groups	91,568		.453				
	Total	92,167						
E-FRP	Between Groups	4,817	202	1,606	3,179	**,025***	2-3	0,045
	Within Groups	102,023		,505				
	Total	106,840						
SEBS	Between Groups	,269	202	,090	,421	,738	---	
	Within Groups	43,046		,213				
	Total	43,315						

*p<.05

As can be seen in Table 6, according to the results of Dunnett C multiple comparison test, there is a significant difference between the Environmentally-Friendly and Recyclable Products sub-factors' mean scores of the 2nd, and 3rd grade pre-service science teachers'. This significant difference is in favor of 2nd grade (M=3,46). According to the eta square (η^2) values calculated to test, it is seen that grade level on the environmental behavior scores have a "small" effect (η^2=0.045).

Results and Discusiion

The current study investigated the pre-service science teachers' behavior towards sustainable environmental education in terms of gender and grade level. It was found that the pre-service science teachers' scores of behavior towards sustainable environmental education do not vary significantly by gender. Yet, the female pre-service science teachers' mean behavior score was found to be higher than that of the male pre-service science teachers.

When the relevant literature is reviewed, it is seen that though in general females' behavior towards sustainable environmental education are more positive, there are also some studies reporting conflicting results. Zelezny, Chua and Aldrich (2000), found that females are more concerned about environment than male counterparts. Similar that Roberts' (1996) study showed that consumption behaviors performed by females are more responsible than males. Some studies found that females expressed significantly greater environmental concern than males (Arcury, 1990; Baldassare & Katz, 1992; Blaikie, 1992; Longhi, 2013; Maineri, Barnett, Valdero, Unipan & Oscamp, 1997; Roberts, 1993; Schahn & Holzer, 1990; Uitto, Juuti, Lavonen & Meisalo, 2003).

Socialization theory posits that behavior is predicted by the process of socialization, whereby individuals are shaped by gender expectations within the context of cultural norms. Famales has a stronger "ethics of care" (cited by Zelezny, Chua & Aldrich, 2000). Khan and Trivedi (2015) found that women have a greater tendency towards purchasing products that contribute to the protection of energy and other natural resources. It can be argued that while women are more sensitive about solidarity, protection and responsible behaviors towards environment, men are more tended to controlling nature and exploiting natural resources (Keleş, 2017a). So women are more concerned about social issues than men (Eagly et al. 2004).

In this study no significant difference was found in terms of grade level of Sustainable Environment Education Behavior Scale mean scores. Only there is a significant difference between the Environmentally-Friendly and Recyclable Products sub-factors' mean scores of the 2nd, and 3rd grade pre-service science teachers'. Gordon-Wilson and Modi (2015) found that age does not have a significant effect on the green behaviors of elderly people. This result is similar to this research result. Unlike Keleş (2017a) found that pre-service teachers' scores of attitudes towards sustainable environmental education vary significantly depending on grade level and the highest mean attitude score belongs to the fourth-year students. Some studies have found that older adults tend to exhibit greener behaviors than younger adults (e.g. Lynn & Longhi, 2011)

She stated that probably, environmental education or education for sustainable development can provide positive attitude or pre-service science teachers' consciousness, knowledge, attitude, and behaviors about sustainable life can change during their education (Keles, 2017b). The previous empirical literature (see e.g. Mobley et al. 2010; Longhi, 2013; Lynn & Longhi 2011) suggest that older people, women, and people with higher levels of education score on average higher in the measure of pro-environmental behaviour, although people who are of pensionable age score comparatively lower.

Vermeir and Verbeke (2006) noted that that there was gap between attitude toward sustainable behavior and performing behavior. So attitude may not translate behaviors every time. Current behaviors may predict future sustainable behaviors (Joshi & Rahman, 2017). Borges (2019); in a study by a group of Portuguese university students on the assessment of knowledge, attitudes and behaviors related to various aspects of sustainable development, found that students' area of study for admission to higher education had no effect on sustainability.

In researches about consumers and consumption behaviors, it is determined that consumers can afford to pay more to buy some products due to their environmental characteristics and to buy some even more environmentally sensitive products (Kangun et al. 1991; Chase & Smith, 1992; Carlson et al. 1993; Menon & Menon, 1997; Crane, 2000; Peattie, 2001).

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RESEARCH ARTICLE

Fen Bilgisi Öğretmen Adaylarının Sürdürülebilir Çevre Eğitimine Yönelik Davranışlarının İncelenmesi

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Özet

Bu araştırmanın amacı fen bilgisi öğretmen adaylarının sürdürülebilir çevre eğitimine yönelik davranışlarını ve bunları etkileyen bazı değişkenleri (cinsiyet ve sınıf düzeyi) araştırmaktır. Araştırmanın çalışma grubunu Kırşehir Ahi Evran Üniversitesi Eğitim Fakültesi Fen Bilgisi Eğitimi Anabilim Dalı'nda öğrenim gören 206 öğretmen adayı oluşturmaktadır. Araştırma, nicel araştırma yöntemlerinden tarama yöntemi ile yapılmıştır. Veri toplama aracı olarak Demirci Güler ve Afacan (2012) tarafından geliştirilen "Sürdürülebilir Çevre Eğitimi Davranış Ölçeği" kullanılmıştır. Ölçeğin cronbach alfa güvenirlik katsayısı α=.90 olarak bulunmuştur. Verilerin analizinde SPSS programından yararlanılmıştır. Veriler analiz edilirken, İlişkisiz Örneklemler için t-testi ve One Way ANOVA yapılmıştır. Araştırma sonucunda fen bilgisi öğretmen adaylarının sürdürülebilir çevre eğitimine yönelik davranış puanlarının cinsiyete göre anlamlı bir şekilde değişmediği bulunmuştur. Ayrıca, Ölçeğin Çevre Dostu ve Geri Dönüştürülebilir Ürünler alt faktöründe, 2. ve 3. sınıf fen bilgisi öğretmen adaylarının ortalama puanları arasında 2. sınıf lehine anlamlı bir farklılık tespit edilmiştir.

Anahtar Kelimeler: Sürdürülebilir çevre eğitimi, davranış, fen bilgisi öğretmen adayları, cinsiyet, sınıf düzeyi

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