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Investigation of Pre-Service Science Teachers' Sustainable Consumption Behaviors in Terms of Some Variables

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Abstract
The purpose of the current study is to investigate pre-service science teachers' sustainable consumption behaviors and the factors affecting them in terms of some variables (gender and grade level). The study group of the current research is comprised of 154 pre-service teachers attending the Department of Science Education in the Faculty of Education of Aksaray University. The study employed the descriptive survey method, one of the qualitative research methods. As the data collection tool, "The Sustainable Consumption Behavior Scale" developed by Doğan, Bulut and Çımrın (2015) was used in the study. The Cronbach alpha reliability of the scale was calculated to be α=.77. 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. The analysis results revealed that sustainable consumption behavior frequency of the pre-service teachers is at the medium level. It was also found that the sustainable consumption behavior scores of the pre-service teachers do not vary significantly by gender; yet, they were found to be varying significantly depending on the grade level variable. The findings of the current study may help future researchers determine other factors that affect sustainable purchasing behaviors on larger samples.

Keywords: Sustainable consumer behavior, pre-service science teachers, gender, grade level

1. Introduction

With the development of the notion of sustainable development, studies in the field of change of consumption behavior have led to the idea of "sustainable consumption". Especially in developed countries, the pressure of human beings on natural resources underscores the necessity of questioning the environmental effects of consumption. It is emphasized that individuals' consumption behaviors should be transformed into sustainable consumption behaviors as soon as possible. As stated in the sustainable lifestyle principles, for sustainable development, consumption actions need to be revised and harmonized with sustainable development as a whole.
Individuals are harming the natural environment with their consumption behaviors and product preferences. The notion of sustainable development refers to a movement aiming to minimize these effects. Cultural norms created with the support of advertising and social influences have caused consumers to make incorrect decisions about consumption on the basis of incomplete and biased information. This fallacy has led to a dissatisfaction with consumption beyond meeting basic needs such as food, water (Karalar & Kiracı, 2011).
Sustainable development requires sustainable production and sustainable consumption. In recent years, promoting sustainable production has become a focal point under the

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implicit assumption that green values will lead to an increasing sustainable consumption. However, the actual purchasing behavior has often been found to be deviated from 'green' attitudes. 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).

Consumer behavior is the key to the impact of society on the environment. The actions people take and the choices they make – consuming some products or services more than others or living in some certain styles – exert direct or indirect influences on both environment and personal or collective well-being. For this reason, the topic of 'sustainable consumption' has become a central focus for national and international policies (Jackson, 2015).

Sustainable consumption means meeting individual needs without adversely affecting the present and future generations' life and consumption potential, and is therefore consistent with sustainability principles (Agenda 21, 1992; Mortensen, 2006). The responsible consumer tries to take into account the social aspects of consumption; along the consumption chain, such as ecologic consumption (including animal welfare), equally economical consumption (in terms of personal welfare) and product variety, use and disposal (Terlau & Hirsch, 2015).

While the concept of sustainable consumption is defined, scientists are seen to assign greater priority to different dimensions. While Paavola (2001) describes sustainable consumption as a form of consumption behavior with very little environmental impact, Seyfang (2005) notes that it refers to the consumption of products manufactured more efficiently by green and the application of ecological citizenship.

Scientists have developed two proposals to change the consumption behaviors and to reduce the consumption level for sustainable development (Fuchs & Lorek, 2005; Schaefer & Crane, 2005; Mont & Plepys, 2008). They emphasize that in our consumption models, we need to exhibit sustainable consumption behaviors (consumption of products made from fewer resources, consumption of products during whose production less energy is needed and almost all of which can be recycled etc.). Hansen and Schrader (1997) point out that a sustainable consumption behavior model could be created by consuming ecological products and consuming the least harmful variety of a product for environment. Schaefer and Crane (2005) emphasize that population growth should be prevented and that developed and wealthy countries should reduce their consumption so that the level of consumption can be reduced. Therefore, the concept of sustainable consumption has a different meaning for "developed" and "developing-underdeveloped" countries (Cohen, 2010). For example, the richest quarter of the world realizes 86% of all consumption. Thus, a part of the world consumes all resources indifferently, while another part cannot even meet its basic needs. The concept of sustainable consumption aims to dispel this disparity in the world. Though the outmost importance of the issue of sustainable consumption, scientists and practitioners address consumer behaviors within the context of topics such as environment protection behaviors, purchasing green products, recycling, re-use of products and energy saving (Fowler & Close, 2012; Park & Ha, 2012; Reijonen, 2011).

Sustainable purchasing is important because unplanned purchasing practices can result in

"environmental, social and economic degeneration" (Young et al. 2010). Consumers have the ability to prevent or reduce environmental damage by purchasing sustainable products (Arvolaet et al. 2008). Around the world, many companies have started to produce sustainable products. In addition, over the years, the number of enthusiastic people who advocate sustainable consumption has increased (Tanner &WölfingKast, 2003; Young et al. 2010). Nevertheless, it has been determined that this increased willingness does not translate into true sustainable purchasing activities (Young et al. 2010). Many of the past studies observed a weak relationship between consumers' positive attitude towards sustainable purchasing activities and actual purchasing behaviors (Benson & Hiller Connell, 2014; Tanner & WölfingKast, 2003; Vermeir & Verbeke, 2006). For this reason, it is clear that there is a gap between consumers' thoughts and real actions, and people often overlook the environmental and social effects of their purchases. This inconsistency or gap is called "sustainable purchasing inconsistency" or "sustainable attitude-behavior gap" (Tanner & Wöl fingKast, 2003; Vermeir & Verbeke, 2006).

There are various factors (individual, social and situational factors) that influence the decision making model of sustainable consumption. Individual factors include socio-economic characteristics such as age, gender, education and income, needs and desires, motivation, personal values, norms and habits. Social determinants concern social norms and situational parameters are related to the act of purchasing such as visibility of products in retail shelves, incentives (e.g. political incentives) and consumption options (for example, availability of sustainable products) in the retail sector (Terlau & Hirsch, 2015).

Sheth et al. (1991) concluded that consumption values of grey consumers explain the consumer's option selection behavior (that is, consumers prefer to purchase a specific product or service. These values are added to decision-making criteria. The criteria preserve various consumption values such as functional, emotional, cognitive, social and conditional values. For example, sales techniques and branding criteria are closely related to emotional value (Sheth et al. 1991). Recognizing the fact that green values have weaker influence on decision-making process, while purchasing a product, is of great importance in terms of understanding and changing consumer behaviors.

Research suggests that learning through trial and error, paying attention to how others behave and modeling our behaviors about what we see in our surrounding provide more effective and more promising ways to change behavior than knowledge and awareness campaigns. Like many psychological processes, habit formation has its own rules and dynamics. A vital component to change habits is to "freeze" existing behaviors and to raise behavior from the level of practice to the level of discursive consciousness. It is known that the reinforcer of this process is more effective in a social environment (Jackson, 2005)

When the relevant literature is examined, it is seen that research on consumption focuses on issues such as the incorporation of the subject of sustainable development in out-of-school learning environments into the curriculum (Fröhlicha, Sellmannb., & Bognera, 2013); the effect of age and personality characteristics on elderly people's green behaviors (Gordon-Wilson & Modi, 2015), elder adults and young adults' tendency to exhibit green behaviors (Gilg et al. 2005; Longhi, 2013; Lynn & Longhi, 201); the

characteristics of three sections of consumers having the willingness of taking quality precautions for sustainable development (Janßen & Langen, 2017); the belief that behaviors can determine sustainable behaviors in future and therefore, that various activities and programs should be organized at schools (Joshi & Rahman, 2017); classroom teachers' personal values that can affect sustainable consumption behavior (Karalar & Kiracı, 2010); relationship of consumers' values and living styles with sustainable consumption (Özgül, 2010); the effect of values on women's sustainable consumption behaviors (Şener & Hazer, 2007), academic staff's level of attitudes towards sustainable environmental education (Demirci Güler, 2013); the effect of consumers' level of spirituality and beliefs on sustainable and unsustainable consumer behaviors (Lee et al. 2016).

Many studies have examined the environmental impact of customer purchasing activities in the context of developed countries and have identified various psychological and personal factors that affect the consumer sustainable consumption behavior. Nevertheless, the majority of studies ignored the effect of behavioral variables (such as past sustainable behavior) on consumers' future sustainable consumption behaviors (Lee, 2014). Phipps et al. (2013) argue that besides personal and environmental factors (e.g. socio-cultural factors) past sustainable behaviors can affect consumers' future sustainable behaviors and should be considered as a determinant of this behavior.

Therefore, consumers' past behavior may affect their future intentions and behaviors. Therefore, it is important to examine the effect of consumers' past sustainable behaviors on their future behaviors. A limited number of studies have examined consumer past behaviors as a predictor of future sustainable purchasing behaviors (Lee, 2014). This shows that there is an important gap in the literature that can be filled with studies looking at the effect of past sustainable consumer behaviors on future sustainable behaviors.

It is necessary for individuals to exhibit sustainable consumption behaviors, for organizations to develop strategies and action plants directed to sustainable consumption, for governments to make legal regulations and for non-governmental organizations to enhance their sensitivity and to affect decision-makers. All of these can have great impacts on the behaviors of today's children and adolescents so that future will be brighter. Values and behaviors are among the first things children learn and are taught in educational institutions. Students are influenced by their teachers' values and behaviors. In this process, teachers can affect children by being role models or through various educational methods so that they can be really influential on children's acquiring certain behaviors. Teachers of science, in particular, play a key role in inculcating environmental awareness and sustainable living principles in children. It is not possible to determine how science teachers can impart these behaviors to their students without determining their own sustainable consumption behaviors. Thus, the current study aims to determine pre-service science teachers' sustainable consumption behaviors. To this end, answers to the following questions were sought.

1.1 Sub-problems

a. Do the pre-service science teachers' sustainable consumption behavior scores vary significantly depending on gender?

b. Do the pre-service science teachers' sustainable consumption behavior scores vary significantly depending on grade level?
c. What are the pre-service science teachers' descriptive statistics results obtained from the sustainable consumption behavior scale?

2. Method

The study employed the descriptive survey method.

2.1 Study Group

The study group of the current research is comprised of 154 pre-service science teachers (1st year-4th year) attending the Department of Science Teaching of the Education Faculty in Aksaray University. Of the participating students, 72.5% are females and 27.5% are males. Of the students, 27.3 are first-year students, 22.7% are second-year students, 20.1% are third-year students and 29.9% are fourth-year students.

2.2 Data Collection Tools

In order to collect data, "The Sustainable Consumption Behavior Scale" developed by Doğan, Bulut and Çımrın (2015) was used. The original scale consists of 17 items designed in the form of five-point Likert scale ranging from "Never: 1" to "Always: 5". The scale is made up of four dimensions, which are environmental sensitivity, purchasing though not needed, saving and re-usability. The minimum score to be taken from the scale is 17 and maximum score is 85. The calculated Cronbach alpha value of the scale was found to be α=.77.

2.3 Data Analysis

SPSS program package was used for the statistical analysis of the data. In the analysis of the data, descriptive statistics, for comparisons, Independent Samples t-test and One Way ANOVA were employed.

3. Results

The findings obtained from the analyses conducted to determine the pre-service science teachers' sustainable consumption behaviors in terms of different variables are presented below.

a. Do the pre-service science teachers' sustainable consumption behavior scores vary significantly depending on gender?

As can be seen in Table 1, the male students' sustainable consumption behavior mean score (M=59.69) is higher than that of the female students (M=57.70). The difference between the mean scores (1.99 points) was found to be statistically insignificant ($t_{(151)}$=-1.239; p>.05).

Table 1: t-test Results related to the Pre-service Science Teachers' Sustainable Consumption Behavior Mean Scores

Dependent Variable	Gender	N	Mean	Std. Deviation	df	t	Sig.
Sustainable Consumption Behavior Score	Female	111	57,70	8,967	151	-1,239	,217
	Male	42	59,69	8,543			

b. Do the pre-service science teachers' sustainable consumption behavior scores vary significantly depending on grade level?

As can be understood from Table 2, with increasing level of grade, the students' sustainable consumption behavior scores also increase (M=55.16, 56.51, 57.58 and 62.95, respectively).

Table 2: Descriptive Statistics related to the Pre-service Science Teachers' Sustainable Consumption Behavior Scores in relation to Grade Level

Dependent Variable	Grade Level	N	Mean	Std. Deviation
Sustainable Consumption Behavior Scores	1	42	55,16	6,599
	2	35	56,51	9,233
	3.	31	57,58	8,720
	4	46	62,95	8,803
	Total	154	58,28	8,852

Levene test conducted to test the homogeneity of the variances belonging to the data revealed that the variances are homogenous (p>.05) (Table 3).

Table 3: Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
2,487	3	150	,063

As can be seen in Table 4, the variance analysis showed that the students' sustainable consumption behaviors vary significantly depending on grade level ($F_{(3-150)}$=7.353; p<.001).

Table 4: ANOVA Results related to the Pre-service Science Teachers' Sustainable Consumption Behaviors in relation to Grade Level

Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1537,391	3	512,464	7,353	,000
Within Groups	10454,038	150	69,694		
Total	11991,429	153			

* Sig.<0.001

The multiple comparison test conducted to determine the source of difference showed that the sustainable consumption behavior mean score of the fourth-year students is significantly higher than those of the second-year, third-year and fourth-year students (Table 5).

Table 5: LSD Multiple-comparison Results related to Sustainable Consumption Behavior Scores in terms of Grade Level

(I) Grade level	(J) Grade level	Mean Difference (I-J)	Std. Error	Sig.
Grade level 1	2	-1,34762	1,91066	,482
	3	-2,41398	1,97675	,224
	4	-7,78986*	1,78170	,000
Grade level 2	1	1,34762	1,91066	,482
	3	-1,06636	2,05899	,605
	4	-6,44224*	1,87252	,001
Grade level 3	1	2,41398	1,97675	,224
	2	1,06636	2,05899	,605
	4	-5,37588*	1,93991	,006
Grade level 4	1	7,78986*	1,78170	,000
	2	6,44224*	1,87252	,001
	3	5,37588*	1,93991	,006

*. The mean difference is significant at the 0.05 level.

c. What are the pre-service science teachers' descriptive statistics results obtained from the Sustainable Consumption Behavior Scale?

The pre-service science teachers' descriptive statistics results obtained from the Sustainable Consumption Behavior Scale are presented in Table 6.

Table 6. The Pre-service Science Teachers' Descriptive Statistics Results Obtained from the Sustainable Consumption Behavior Scale

Scale statements	N	Mean	Std. Deviation
1. I buy detergents, shampoos, cleaning products that are less harmful to the environment.	154	3,25	1,121
2. I buy clothes made of natural materials.	154	3,17	,911
3. I buy products from companies that support environmental responsibility.	154	3,28	1,033
4. I buy soluble packaging products in nature.	154	3,35	1,010
5. I persuade my family members and my friends not to buy products that will harm the environment.	154	3,25	1,032
6. Mobile phone etc. technological tools, I replace them with new ones when I do not need technological tools.	154	3,82	1,208
7. I get new clothes even if I do not need it.	154	3,08	1,207
8. I buy products that are not on my list / in my mind while shopping.	154	2,88	1,182
9. I buy a new product, even if it is a similar product.	154	3,51	1,183
10. I also buy food and beverage products that I do not need.	154	3,08	1,197
11. I buy white goods that save energy.	154	3,48	1,168
12. I buy electronic devices that consume less electricity than others.	154	3,55	1,059
13. I pay attention to electricity consumption quantities while buying electronic products.	154	3,61	1,088
14. I use saving bulbs at home.	154	4,00	,957
15. I re-evaluate the packaging of products such as cardboard, tin and glass instead of throwing away.	154	3,29	,994
16. Rent or borrow less used items when I need them (DVD, books, etc.).	154	3,0595	1,146
17. I re-evaluate used papers for work such as taking notes etc.	154	3,9226	1,032

When the pre-service science teachers' descriptive statistics results obtained from the Sustainable Consumption Behavior Scale were examined, it was found that the frequency of their sustainable consumption behavior is at the medium level (Table 6). In Table 6, the most remarkable findings are; the pre-service teachers use energy saving bulbs at home (M=4); use used papers to take notes (M=3.92); the replace technological devices such as mobile phone with new ones when needed (M= 3.82).

4. Conclusions

The concept of sustainable consumption is important for the realization of sustainable living principles. It is important to determine this type of consumer behavior of pre-service teachers as they are the individuals who will educate the next generations and influence their values and behaviors. In this study, the level of sustainable consumption behaviors of pre-service science teacher was determined and their sustainable consumption behavior scores were examined in terms of gender and grade level variables.

It was found that the participating pre-service science teachers' sustainable consumption behavior scores do not vary significantly by gender. Unlike this finding of the current study, similar studies in the literature reported a significant difference in favor of female participants. In these studies it was determined that there is a weak but positive correlation between women's values of universalism and benevolence and sustainable consumption behaviors and that this correlation is stronger when compared to other value types; women attach greater importance to environmental behaviors directly related to the use of money (not starting the washing machine before fully filling it, turning off electrical goods when not used) than behaviors directly related to the protection of environment (separately collecting recyclable waste, paying attention to harm to environment while buying a shampoo) (Şener & Hazer, 2007). An important finding of these studies is that women are more concerned about social issues than men (Eagly et al. 2004) and they are more concerned about environment (Koos 2011, Zelezny et al. 2000). Similarly, Roberts (1996) reported that women's consumption behaviors are more responsible than those of men. It is stated that women are more likely to make actual purchases in line with social and environmental concerns (Vitell, 2003). Demirci Güler (2013) determined the level of behavior of academic staff regarding sustainable environmental education. In terms of gender variable, female and in terms of age variable, 41-50 years old academicians were found to be exhibiting more positive behaviors than the other groups.

The second sub-problem of the study looked into whether the pre-service science teachers' sustainable consumption behaviors vary significantly depending on grade level. It was found that with increasing grade level, the participants' sustainable consumption behavior scores also increase. The grade level-based difference between the mean scores was found to be statistically significant. The multiple comparison test conducted to determine the source of difference showed that the sustainable consumption behavior mean score of the fourth-year students is significantly higher than those of the second-year, third-year and fourth-year students. It is believed that required and elective courses taken by 4th-year students on environmental science and sustainable development

throughout their undergraduate education have a significant effect on the formation of this difference. From the first year towards the 4th year, it is inevitable that students' knowledge, attitude, consciousness and behaviors related to sustainable life will change. In the literature, there are studies focusing on sustainable consumption behaviors and green behaviors of individuals from different age groups.

Gordon-Wilson and Modi (2015); in their study exploring how age and personality characteristics predict green behaviors of elderly people, found that age does not have a significant effect on the green behaviors of elderly people. However, some studies have found that older adults tend to exhibit greener behaviors than younger adults (Gilg et al. 2005; Longhi, 2013; Lynn & Longhi, 201). Findings suggest that personality traits of openness are positively associated with green behavior, and outward personality type is negatively associated with green behavior. Moreover, green behaviors of elderly consumers increased by their age. In the study, it was found that elderly consumers in England are moderately green in general.

The findings related to the third sub-problem of the current study showed that the pre-service science teachers' level of sustainable consumption behavior is medium. Similar results have also been found by Karalar and Kiracı (2010) in their study of classroom teachers' personal values affecting their sustainable consumption behaviors. It was found that the most frequently displayed sustainable consumption behavior by the participating classroom teachers is "preferring energy saving (A, A+ class) white goods. The frequency of behaviors such as using energy-saving bulbs, giving unused old goods (furniture etc.) or clothes to needy people or a charity instead of storing or throwing them away was also found to be quite high. The sustainable behavior with the lowest frequency of demonstration was found to be preferring to rent a car instead of buying one considering natural resources and energy used for the manufacturing of a car. The frequency of displaying second-hand purchasing behavior, solar energy-utilizing behavior, and the use of their own bags, rather than the bags given by stores in the shopping process was also found to be quite low. In a study, Özgül (2010) examined the relationship of consumers' values and lifestyles with sustainable consumption. In general, though it was found that most consumers care about sustainable consumption behaviors, saving-oriented behaviors were found to be seen more important than environmentally-oriented behaviors.

There are also some studies focusing on what can be done for the inculcation of sustainable consumption behaviors in educational environments. Fröhlicha, Sellmannb., & Bognera (2013) have developed a training program in Bavaria for sustainability education in agriculture, food and consumption in the context of extracurricular learning. After participating in this program, 176 fifth-grade students stated that they aim to consume in more a environmentally-friendly manner. No correlation was found between students' intention to consume in an environmentally-friendly manner and their commitment to nature. Joshi & Rahman (2017) noted that current behaviors may predict future sustainable behaviors. They also stated that various programs and events could be organized in the school to make students aware of the steps they could take in order to preserve the environment. Csigéné, Görög, Harazin & Péterné (2015) conducted a study to determine Hungarian university students' knowledge about and attitudes towards sustainable consumption and eco labels and found that though their

knowledge and opinions are deep, they are not environmentally conscious consumers. These studies show that though knowledge and attitudes are imparted in educational institutions, there are some factors affecting their conversion into behaviors.

The findings of the current study may be useful in helping educators better understand the various factors behind the sustainable consumption behaviors of consumers so that training programmers, pre-service teachers and teachers can develop appropriate interventions to promote sustainable consumption behaviors. Achieving the target of sustainable consumption and accomplishing sustainable living goals should be through step-by-step training and accurate communication.

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