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An Examination of Pre-Service Science Teachers' Attitudes Toward Solid Waste and Recycling

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Abstract
There are some changes observed in environment nowadays. Especially the perspective of solid waste and recycling has been in a transformation. The purpose of this study to examine the pre-service science teachers' attitudes toward solid waste and recycling in terms of gender, grade level, family's financial status and the place of residence. The study group was consist of 201 pre-service science teachers. The data collection tools of the research were "Personal Information Form" prepared by researcher and "The scale of pre-service teachers' attitudes towards solid wastes and recycling" developed by Karatekin (2013). The data were analyzed via t-test and ANOVA. It was found that while pre-service science teachers' attitudes toward solid waste and recycling in terms of gender and grade level were significant differences, their family's financial status and the place of residence were not significant differences. Female pre-service science teachers had more positive attitudes toward solid waste and recycling than male pre-service science teachers had. The fourth-grade pre-service science teachers' attitudes toward solid waste and recycling were found to be more positive than the others.
Keywords: environmental education, solid waste, recycling, attitude, pre-service science teacher.

1. Introduction

Since the Industrial Revolution, humankind's damage to the natural environment has gradually increased and humanity has started to face several environmental problems (Çelikler & Aksan, 2015). Primary environmental problems include decreased natural resources, water pollution, air pollution, soil pollution, decreased biodiversity, global warming, ozone depletion, deforestation, erosion, and solid waste (Erökten & Bahtiyar, 2017; Kışlalıoğlu & Berkes, 2010; Mei, Wai, & Ahamad, 2016; Nagra & Kaur, 2014). One of the most important problems due to random waste disposal in the environment by people is a solid waste (Chung, Muda, Omar, & Manaf, 2012; Kışoğlu & Yıldırım, 2015; Moh & Manaf, 2017; Özbay, 2010; Özdemir, 2010).

As rapid population growth, urbanization, industrialization and advancing technology radically change human's consumption habits, amount and types of waste disposed in the nature is rapidly increasing, too (Brown, 2015; Cheung, Chow, & So, 2017; Çalışkan, 2013; Mei, Wai, & Ahamad, 2016; Saeed, Hassan, & Mujeebu, 2009). Solid wastes are produced by humans' social, domestic and industrial activities (Çimen & Yılmaz, 2016; Özbay, 2010). Solid wastes can remain in the nature undegraded, cause environmental pollution and have a negative impact on human health (Çalışkan, 2013; Erökten & Bahtiyar 2017; Kayranlı, Tankut, & Pampal, 2003). Important part of the solid wastes are recyclable products (e.g. Paper, cardboard, metal, glass, plastic, etc.) Recycling these materials diminishes waste materials' negative effects on environment, health and economy and mitigates pollution and the devastation of natural resources (Çimen & Yılmaz, 2012; Özbay, 2010; Suthar & Singh, 2015).

Solid wastes cause primarily soil pollution, water pollution, visual pollution and malodor problems. The best way to get rid of solid wastes today is to reclaim types of materials with economic value within wastes (Bozkurt, 2012; Moh & Manaf, 2017). Considering the bottleneck of raw material and energy in the world today, protection of natural resources, decreased energy consumption and significant drop in environmental pollution are possible through utilization of recyclable materials in the composition of solid wastes following the production and consumption (Akın, 2009; Cheung, Chow, & So, 2017; Esa, 2010; Hasanoğlu, 2012; Karatekin, 2013; Koçer & Işık, 2005).

The most effective method of economic use of natural resources is recycling. Including the wastes which can be reclaimed into production again by turning them into raw material or product with certain processes is called recycling (Çimen & Yılmaz, 2012; Yücel, 1997). Recycling is regarded as an important part of the sustainable future due to allowing for the protection of natural resources and decreased amount of solid waste (Esa, 2010; Hopper & Nielsen, 1991; Oskamp, 1995; Valle, Reis, Menezes, & Rebelo, 2004).

Successful solid waste management and recycling requires realizing the importance of the matter in the first place. Nowadays, many countries start to attach importance to the issues of reducing wastes and recycling to protect their natural resources and deal with environmental problems caused by conventional storage of wastes (Bakar & Aydınlı, 2012; Esa, 2010; Kipperberg, 2007; Latif & Omar, 2012; Latif, Omar, Bidin, & Awang, 2013; Sharifah Norhaidah, 2006).

How a society gains the environmental consciousness and attaches importance to recycling is only possible through education. Individuals to acquire the environmental awareness in family and at school would be more

conscious about and sensitive to the protection of nature and disposal of wastes without harming the environment. Hence, studies should be conducted on positive attitudes of students toward environment as of the beginning of their educations (Bener & Babaoğul, 2008; Çelikler, 2014; Erten, 2004; Fisman, 2005; Karatekin, 2013; Schultz & Oskamp, 1996; Timur, Yılmaz, & Timur, 2013)

The biggest responsibility for construction of a more livable world undoubtedly falls to teachers (Esa, 2010). Given the quality of student which science teachers service, they are the most strategic group of teachers in forming the environmental consciousness (Esa, 2010; Kahyaoğlu & Kaya, 2012). It is important to identify pre-service science teachers' knowledge on and attitudes toward solid waste issue and recycling and to increase efforts to improve the knowledge and attitudes as they are the group of teachers who can influence students the most when bringing the environmental sensitivity and consciousness to them. Science teachers are responsible for being sensitive to environmental problems themselves in the first place and then bringing this sensitivity to their students. Raising students who are responsive to environmental problems depends on how sensitive their science teachers are.

In the literature, Karatekin (2013) examined pre-service teachers' awareness of solid waste and recycling while Kışoğlu and Yıldırım (2015) investigated pre-service teachers' attitudes toward solid waste and recycling. On the other hand, no studies were observed in the literature on pre-service science teachers' attitudes toward solid waste and recycling.

This study made an effort to identify attitudes of the pre-service science teachers, who are attending the first, second, third and fourth grade of the science teaching program, toward solid waste issue which is one of the most stressed-out environmental problems nowadays and recycling which is utilized for eliminating this issue.

This study aims to find out about whether pre-service science teachers' attitudes toward solid waste and recycling differ by gender, grade level, family's financial status, and the place of residence. To this general end, the research sought for answers to the following research question:

Do pre-service science teachers' attitudes toward solid waste and recycling differ by gender, grade level, family's financial status, and the place of residence?

2. Method

2.1 Research model

This study was designed as a causal-comparative research. Fraenkel, Wallen, and Hyun (2012) stated that researchers try to determine the causes or outcomes of the discrepancy among groups in the causal-comparative model.

2.2 Study Group

The research was conducted with the first-grade (n= 52), second-grade (n=55), third-grade (n=46) and fourth-grade (n=48) pre-service science teachers who are attending the Science Teaching Program at Niğde Ömer Halisdemir University Faculty of Education Department of Mathematics and Science Teaching. It was found that 19.9 % of the pre-service science teachers are male (n=40), 80.1 % of them are female (n=161); 69.2 % of them live in a city (n=139), 17.9 % of them in a district (n=36) and 12.9 % of them in a village (n=26). The age of the pre-service science teachers varies between 19 and 21.

2.3 Data Collection

At the process of data collection, the scale of pre-service science teachers' attitudes towards solid wastes and recycling, developed by Karatekin (2013), and the personal information form, developed by the researcher, were used together. The data were gathered in the classrooms after obtaining the necessary permits from the faculty of education. At first, required explanations were made to pre-service science teachers by the researcher, then voluntary pre-service science teachers filled the scales. Filling duration of the scale was between 20 and 25 minutes.

2.4 Data Collection Tools

2.4.1 The scale of pre-service teachers' attitudes towards solid wastes and recycling

It was developed by Karatekin in 2013. It aims to scale pre-service teachers' attitudes towards solid wastes and recycling. The scale has 33 items and 3 factors.

2.4.2 The personal information form

Personal information form was used to describe demographic characteristics of pre-service teachers. This form has 5 questions consist of gender, age, grade level, the place of residence and the financial status of family.

2.5 Data Analysis

At the process of data analysis, before the statistical techniques were used in the data analysis, it was examined whether the data showed normal distribution. Since the data showed normal distribution, parametric tests (t-test

and One Way ANOVA) were used. Independent sample t-test was used to determine whether the pre-service science teachers' attitudes toward solid waste and recycling differed in terms of gender, and one-way analysis of variance (ANOVA) was used in other analyzes. IBM SPSS 24 for Windows software was used for the data analysis. Results were assessed at the significance level of 0.05.

3. Findings and Interpretation

In this section of the study, pre-service science teachers' attitudes toward solid waste and recycling was examined by gender, grade level, family's financial status and the place of residence and the findings achieved are presented.

3.1 Findings on the gender variable

The research looked for the answer to the question "Do pre-service science teachers' attitudes toward solid waste and recycling differ by gender?" Accordingly, t-test for independent groups was used for determining whether there was a difference between pre-service science teachers' genders and their attitude score averages, and the results are given Table 1.

Table 1. Pre-service science teachers' attitudes toward solid waste and recycling in terms of gender

Gender	n	*M*	*SD*	*t*	*p*
Male	40	117.24	14.65	2.22	.03*
Female	161	122.82	14.15		

* $p < .05$

It is seen in Table 1 that there was a significant difference between pre-service science teachers' genders and attitudes toward solid waste and recycling [$t_{(199)}=2.22$, $p<.05$]. The female pre-service science teachers had more positive attitudes toward solid waste and recycling than the male pre-service science teachers did.

3.2 Findings on the grade variable

The research looked for the answer to the question "Do pre-service science teachers' attitudes toward solid waste and recycling differ by grade level?" One-way ANOVA test was used for determining whether there was a difference between pre-service science teachers' grade levels and their attitude score averages, and the results are presented Table 2.

Table 2. Pre-service science teachers' attitudes toward solid waste and recycling in terms of grade

Descriptive Data				ANOVA results				
Grade Level	**n**	***M***	**SD**	**Source of Variance**	**Sum of Squares**	**Mean of Squares**	**F**	***p***	**Discrepancy**
1st Grade	52	106.21	11.74	Intergroup	3515.321	1171.774	5,822	.01*	1-2 1-3
2nd Grade	55	112.79	15.54	Intragroup	39648.60	201.262			1-4 2-3
3rd Grade	46	119.18	17.16	Total	43163.92				2-4 3-4
4th Grade	48	128.37	13.59						

* $p < .05$

It is observed in Table 2 that there was a significant difference between pre-service science teachers' grade levels and their score averages of attitude toward solid waste and recycling ($p < .05$). The fourth-grade pre-service science teachers had more positive attitudes toward solid waste and recycling than the first-grade, second-grade and third-grade pre-service science teachers did. Furthermore, the third-grade pre-service science teachers had more positive attitudes toward solid waste and recycling than the second-grade and first-grade pre-service science teachers did. Lastly, the second-grade pre-service science teachers' attitudes toward solid waste and recycling were more positive than the first-grade and pre-service science teachers' attitudes.

3.3 Findings on the place of residence variable

The research looked for the answer to the question "Do pre-service science teachers' attitudes toward solid waste and recycling differ by the place of residence?" One-way ANOVA test was used for determining whether there was a difference between pre-service science teachers' place of residence and their attitude score averages, and the results are presented Table 3.

Table 3. Pre-service science teachers' attitudes toward solid waste and recycling in terms of place of residence

Descriptive Data				ANOVA results				
Place of Residence	**n**	***M***	**SD**	**Source of Variance**	**Sum of Squares**	**Mean of Squares**	**F**	***p***
City	139	118.73	15.19	Intergroup	418.26	209.129	.97	.38
District	36	115.47	13.77	Intragroup	42745.66	215.887		
Village	26	120.30	13.02	Total	43163.92			

* $p < .05$

In Table 3, it is seen that pre-service science teachers' attitude scores did not differ statistically by place of residence ($p > .05$). In other words, the pre-service science teachers had similar attitudes toward solid waste and recycling no matter where they live.

3.4 Findings on family's financial status

The research looked for the answer to the question "Do pre-service science teachers' attitudes toward solid waste and recycling differ by family's financial status?" One-way ANOVA test was used for determining whether there was a difference between pre-service science teachers' financial statuses and their attitude score averages, and the results are presented Table 4.

Table 4. Pre-service science teachers' attitudes toward solid waste and recycling in terms of family's financial status

Descriptive Data				ANOVA results				
Grade	**n**	***M***	***SD***	**Source of Variance**	**Sum of Squares**	**Mean of Squares**	**F**	***p***
TRY1000 and below	93	117.37	14.73	Intergroup	418.59	209.30	.97	.38
TRY1001-2000	61	117.87	14.71	Intragroup	42745.33	215.89		
2001 and above	47	120.94	14.60	Total	43163.92			
Total	201	118.35	14.69					

* $p < .05$

According to Table 4, pre-service science teachers' attitudes toward solid waste and recycling did not differ by their family's financial status ($p > .05$). In other words, the pre-service science teachers had similar attitudes toward solid waste and recycling no matter what their family's financial status is.

4. Discussion and Conclusion

Considering the research findings, it was found that the female pre-service science teachers had more positive attitudes toward solid waste and recycling. As for the grade level, fourth-grade pre-service science teachers' attitudes toward solid waste and recycling were found to be more positive than the attitudes of other grade levels. On the other hand, the pre-service science teachers had similar attitudes toward solid waste and recycling in terms of family's financial status.

It is seen that the female pre-service science teachers had more positive attitudes toward solid waste and recycling in the research. Comparable results have been achieved in the studies with pre-service teachers in the literature. In the study performed by Kışoğlu and Yıldırım (2015) with science, social studies and classroom pre-service teachers, they found female pre-service teachers' attitudes toward solid waste and recycling to be more positive. Similarly, Cici, Şahin, Şeker, Görgen, & Deniz (2005) concluded in their study with the faculty of education students that the female pre-service teachers had higher awareness of reducing solid wastes. These findings can be considered an indicator that female pre-service teachers who are attending not only the science teaching program but also the faculty of education in general had higher levels of sense of protection toward environment. In the literature, researchers (Arık & Yılmaz, 2017; Çabuk & Karacaoğlu, 2003; Deniş & Genç, 2007; Erol & Gezer, 2006; Gürbüzoğlu-Yalmancı, & Gözüm, 2011; Kahyaoğlu & Özgen, 2012; Karatekin, 2011; Kayalı, 2010; Özsoy, Özsoy, & Kuruyer, 2011; Şama, 2003; Timur, 2011; Timur, Yılmaz, & Timur, 2013) revealed that the female pre-service teachers are more sensitive to environmental problems. The reason for this can be regarded as the fact that female pre-service teachers play roles such as protecting the environment.

It is seen that the fourth-grade pre-service science teachers had more positive attitudes toward solid waste and recycling than the third-grade, second-grade and first-grade pre-service science teachers did. The third-grade pre-service science teachers' attitudes toward solid waste and recycling were found to be more positive than the attitudes of the second-grade and first-grade pre-service science teachers. The second-grade pre-service science teachers' attitudes toward solid waste and recycling had more positive than the attitudes of the first-grade pre-service science teachers. As can be understood, attitudes toward solid waste and recycling become more positive as the grade level increases. This can be explained by the increasing number of field courses as the grade level advances. Another reason may be that the pre-service science teachers have increasing sensitivity to their

program in higher grade levels. It can be said that the environment course provided in the third grade in the science teaching curriculum make a positive contribution to the pre-service science teachers especially in regard to solid waste and recycling. Çabuk and Karacaoğlu (2003) stated that the fourth-grade pre-service teachers had higher environmental sensitivity than the pre-service teachers in lower grade levels. Based on the fact, the grade level can be deemed to be a crucial factor in creating the environmental consciousness.

It is seen that the pre-service science teachers had similar attitudes toward solid waste and recycling in terms of family's financial status. Erol and Gezer (2006) concluded in their study with pre-service teachers that their attitudes toward solid waste and recycling did not differ by the financial status of their families. Similarly, Arık and Yılmaz (2017) showed that pre-service teachers' environmental attitudes did not differ by the income of their families. Sadık (2016) achieved the finding that environmental knowledge and attitudes were similar in regard to family's perceived socioeconomic level. These findings can be accepted as the indicator that family's financial status is not a principal factor in creating environmental sensitivity.

Regarding the place of residence, it is also seen that the pre-service science teachers had similar attitudes toward solid waste and recycling. Kahyaoğlu and Özgen (2012) concluded in their study with pre-service teachers that their environmental attitudes did not differ by the place of residence. Similarly to these findings, in the study conducted by Gürbüzoğlu-Yalmancı and Gözüm (2011), the pre-service teachers had similar environmental attitude in regard to place of residence. The reason why humankind's attitudes toward environment do not differ by the place of residence may be the same value placed on environment no matter where an individual is living. Due to the value on environment, individuals may have similar attitudes toward solid waste and recycling either in cities or countryside.

There are some limitations to this study. The first one is that this research was conducted with the pre-service science teachers who are studying at Niğde Ömer Halisdemir University. Many of these pre-service science teachers attending this university has similar cultures. It is known that there are several cultures in Turkey. Hence, similar studies can be conducted with pre-service science teachers at universities in different regions of Turkey. Another limitation is that this is a cross-sectional research study. There are informing topics about environment within the science teaching program. It is therefore thought that field courses can make significant contributions to the environmental consciousness. It is accordingly recommended that future studies are designed vertically. Despite having some limitations, it can be said that this research has important contributions to the literature. It is observed in the literature that there are limited number of studies on attitudes toward solid waste and recycling.

Moreover, it was seen in the research that attitudes toward solid waste and recycling did not differ by the variables of family's financial status and place of residence. This result can be considered the indicator that education plays a key role in forming the attitudes toward solid waste and recycling.

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