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The Opinions of Elementary Science Teacher Candidates Regarding The Collection, Separation and Recycling of Solid Wastes

Fen Bilgisi Öğretmen Adaylarının Katı Atıkların Toplanması, Ayrılması ve Geri Dönüşümüne Yönelik Düşünceleri

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Öz

Bu araştırmanın amacı, Türkiye'de Fen Bilgisi öğretmenliğinde okuyan öğretmen adaylarının katı atıkların toplanması, ayrılması ve geri dönüşümüne yönelik düşüncelerini belirlemektir. Bu amaca yönelik olarak fen bilgisi öğretmenliğinin birinci, ikinci, üçüncü ve dördüncü sınıfında okuyan toplam 315 öğretmen adayına iki bölümden oluşan bir anket uygulanmıştır. Araştırmanın sonucunda fen bilgisi öğretmen adayları katı atıkların toplanması ve değerlendirilmesi ile ilgili sahip oldukları bilgilerinin kaynağını özellikle okul ve TV olarak belirtmişlerdir. Organik atıklar hariç diğer atıkları geri dönüşüme ve özellikle her atık için eğer varsa ayrı geri dönüşüm konteynerlerine atılmasını belirten öğretmen adaylarının ambalaj üretiminde kullanılan malzemelerin tekrar değerlendirilebilir özelliklerinin farkında oldukları anlaşılmaktadır. Bu farkındalıkla öğretmen adayları hem çevrenin temiz olmasına hem de ekonomik kazanç sağlanmasına katkıda bulunmaktadır. Bu bağlamda sürdürülebilir bir gelecek için katı atıkların geri dönüşümünün önemi ve ekonomiye olan katkısı çevre dersleri ile kavratılmalıdır.

Anahtar Kelimeler

katı atıklar
atık yönetimi
geri dönüşüm
sürdürülebilir çevre
fen bilgisi öğretmen adayı

Abstract

The aim of this study was to determine the opinions of elementary science teacher candidates in Turkey regarding the collection, separation and recycling of solid wastes. To this end, a questionnaire consisting of two sections was administered to a total of 315 first-year, second-year, third-year, and fourth-year university students enrolled in the department of elementary science teacher education. Based on the study results, it was determined that the elementary science teacher candidates acquired their knowledge regarding the collection, separation and recycling of solid wastes mainly from school and television. It was understood that teacher candidates who recycled solid wastes (other than organic wastes) and who used separate recycling containers for each type of solid waste were generally aware that materials used in packages can be recycled and reutilized. Owing to this awareness, these teacher candidates endeavored to create a cleaner environment, and also contributed to the economy through recycling. For this reason, students should participate in courses on the environment to better learn the role of recycling in ensuring a sustainable future, and the economic contributions and significance of recycling solid wastes.

Keywords

solid wastes
waste management
recycling
sustainable environment
elementary science teacher candidates

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1. Introduction

The term "solid waste" refers to all forms of substances and materials that are formed as a result of domestic, commercial, and industrial activities (Igbinomwanhia & Ohwovoriole, 2009), and does not contain any fluids or liquids (TÇSV, 1991; Güler & Çobanoğlu, 1996). Solid wastes are a source of environmental, social, and economic problems. Consequently, solid waste management is one of the most basic services that any healthy society must conduct (El-Hoz, 2007). The main objective of solid waste management is to minimize the environmental effects and economic damages caused by the random and careless disposal of solid wastes (especially of those that present health and environmental hazards) (Okojie, Mokenye, Uzebu, Ufuoma & Ayanta, 2002). Sustainable solid waste management seeks to preserve resources, and to protect the environment and human health (Karagiannidis, Diaz & Kontogianni, 2008). Solid waste management is of considerable importance for public health and the environment; it is also one of the most important environmental problems currently faced by Turkey. Due to the increase in population, advances in technology, and the increasing levels of industrialization and urbanization, both the quantity and variety of solid wastes that are produced is increasing rapidly. For this reason, the detrimental effect of solid wastes has become an important environmental problem (Cici, Şahin, Şeker, Görgen & Deniz, 2005). Failing to sort and collect wastes such as glass, plastic, paper, and metal at their source, in order to reuse and utilize them, leads to pollution, which in turn results in economic losses (Topbaş, Brohi & Karaman, 1998; Yılmaz & Özdil, 1999). It is of utmost importance for public and environmental health that solid wastes are properly collected, gathered, and then transported to treatment facilities, where they will be eliminated in a manner that is not detrimental to the environment (Cici et al, 2005). Solid wastes that are not suitably stored and/or which are randomly and irregularly dumped into landfills create environments that are suitable for pathogenic microorganisms (Ertürk, 1994). Improperly stored solid wastes will lead to visual pollution, malodors, and air, water and soil pollution. Solid wastes can potentially result in methane gas explosions due to the entrapment and compression of methane in landfills. Furthermore, methane and carbon emissions released by solid wastes in landfills and improper storage areas also contribute to the greenhouse effect, and hence to global warming (Çepel, 1992).

Living in a healthy and clean environment is a fundamental human right. Humans represent one of the main components that influence the environment. For this reason, humans have a significant responsibility in protecting and rehabilitating the environment, and also in creating living areas that are clean and healthy. To fulfill this responsibility, it is important for individuals to actively contribute to solving environmental problems, and that they conduct their own share of activities relating to the protection of the environment (DPT, 1994). Thus, protection of the environment is a duty of all individuals (Erten, 2006), the effective participation of the individuals is important for protecting the environment, for preventing pollution, and for rehabilitating the environment wherever necessary (Ünlü, 1995). Individual is a solution key for environmental problems (Erten, 2004). Without the effective and active participation of individuals, it would not be possible to resolve the environmental problems associated with solid wastes (Keleş, Metin & Sancak, 2005). In order to effectively implement solid waste management systems, the consumers – who represent the main source of solid wastes – must also fulfill their share of responsibilities regarding this type of pollutants (Yücel, 1997). Individuals have an important task and responsibility in reducing the amount of solid waste produced, in properly sorting solid waste, and in ensuring that solid waste is recycled. These tasks and responsibilities can only be fulfilled by individuals who are aware and knowledgeable of environmental issues, and of the problems presented by solid waste. Education plays an important role in the raising of individuals who are aware and knowledgeable about environmental issues (Erten, 2006; Karatekin, 2013), and in ensuing that individuals contribute to the sorting solid wastes at their source (Yücel, 1997). Education is an important issue for sustainable environment (Avan, Aydınlı, Bakar & Alboga, 2011). Since they will become the elementary science teachers of the future, elementary science teacher candidates assume an important role in ensuring the provision of education regarding healty people and environment. For the content on this topic can be prepared, needs should be determined. For this reason, it is important to identify the situation. In this context, the aim of this study was to determine the opinions of elementary science teacher candidates in Turkey regarding the collection, separation and recycling of solid wastes. The research questions were expressed as (1) What are the thoughts of teacher candidates regarding the collection of solid wastes?, (2) What are the thoughts of teacher candidates regarding the separation of solid wastes? and (3) What are the thoughts of teacher candidates regarding the recycling of solid wastes?

2. Methods

The study was conducted using the general screening model. The general screening model is a screening approach conducted on populations consisting of a large number of individuals in order to reach a general conclusion regarding the population (Karasar, 2006). It is performed by screening the population as a whole, or a certain group or sample within the population. A sample selection was performed based on the suitability sample, which is defined as the group of individuals who could be reached/contacted for the study (Fraenkel & Wallen, 2003). The study participants included a total 315 elementary science teacher candidates enrolled in the Faculty of Education, Department of Elementary Science Teacher Education at a public university in Turkey. The participating teacher candidates included first-year (N: 87), second-year (N: 58), third-year (N: 80), and fourth-year (N: 90) students. To determine the extent to which the teacher candidates participated in the collection, separation and recycling of solid wastes, a questionnaire was applied. The questionnaire developed by El-Hoz (2009). The study data were analyzed in terms of frequencies (f) and percentages (%).

3. Results

The study results are provided in two sections. The first section provides data regarding the participating teacher candidates' sources of knowledge on solid wastes (Table 1).

The percentage distribution of the teacher candidates' answers to the question, "**What is your main source of knowledge regarding solid wastes?**" is provided in Table 1.

Table 1. The Percentage Distribution of the Teacher Candidates' Sources of Knowledge Regarding Solid Wastes

	First Grade	Second Grade	Third Grade	Fourth Grade
School	58,9	70,7	63,8	49,4
TV	19,7	20,9	23,8	31,6
Family	15,7	6,7	7,2	12,2
Newspaper	5,7	1,7	5,2	7,8

An evaluation of the teacher candidates' sources of knowledge regarding solid wastes revealed that among teacher candidates from all grades/years, the main source of knowledge was school, followed by television. Newspapers, on the other hand, were the least common source of knowledge. It was also observed that family was a common source of knowledge among first-year teacher candidates.

The second section of the study results provides data about the elementary science teacher candidates' answers to the questions concerning their opinion and engagement in the collection, separation and recycling of solid wastes.

The percentage distribution of the teacher candidates' answers to the question, **"Do you sort your solid waste?"** is provided in Table 2.

Table 2. The Percentage Distribution of Teacher Candidates Who Sorted Their Solid Wastes

	First Grade	Second Grade	Third Grade	Fourth Grade
Yes	62,1	31	61,2	75,6
No	37,9	68,9	38,8	24,4

An evaluation of Table 2 reveals that the large majority of second-year teacher candidates (68.9%) did not sort their solid wastes, while the percentage of teacher candidates who sorted their solid wastes was relatively higher among first-, third-, and fourth-year teacher candidates.

The frequency distribution of the reasons why the teacher candidates sorted solid wastes is provided in Table 3.

Table 3. The Frequency Distribution of the Reasons Why Teacher Candidates Sorted Solid Wastes

	First Grade	Second Grade	Third Grade	Fourth Grade
1-Because I see others doing it.	2	-	-	2
2-I know that sorting could be useful.				
2a-For recycling	44	15	42	55
2b-For compost	-	-	-	1
3- I know that sorting will reduce environmental problems.	33	11	30	43
4-I have seen it in the news.				
4a-TV	18	4	10	12
4b-Radio	-	-	-	1
4c-Newspaper	10	1	7	3
5-I see neighbors doing it that is why I do it.	-	-	-	1
6-I don't see any use for sorting my waste.	10	5	17	14

It was observed that the main reasons why the teacher candidates sorted solid wastes were: (1) for recycling, and (2) to reduce environmental problems. These results indicated that all of the teacher candidates (from all classes/years) were sensitive about recycling and environmental issues. It was also determined that visual and printed media such as the television and newspapers were effective in raising awareness concerning the sorting of solid wastes.

The frequency distribution of the reasons provided by the teacher candidates who did not sort solid wastes is provi-

ded in Table 4.

Table 4. The Frequency Distribution of the Reasons Provided By Teacher Candidates Who Did Not Sort Solid Wastes

	First Grade	Second Grade	Third Grade	Fourth Grade
1-I don't know about it.	4	11	7	9
2-I know about it but there is no waste container nearby.	27	28	20	11
3-I know about, there is a container nearby, but I don't have time to sort.	2	-	4	-
4-I don't think it makes a difference to sort.	-	1	-	2

Some of the teacher candidates who did not sort solid wastes reported that although they were aware of the necessity of sorting such wastes, they were not able to do so due to the lack of suitable waste containers in the places in which they lived. However, there were also teacher candidates who were not knowledgeable about the sorting solid wastes, as well as teacher candidates who chose not to spend time sorting waste even though there were waste containers near the places they lived.

The percentage distribution of the teacher candidates' answers to the question, **"Would you be willing to separate compostable materials?"** is provided in Table 5.

Table 5. The Percentage Distribution of Teacher Candidates Who Separated Compostable Materials

	First Grade	Second Grade	Third Grade	Fourth Grade
Yes	11,5	24,1	16,2	14,4
No	88,5	75,9	83,8	85,6

It was observed that most of the teacher candidates were not willing to or interested in separating compostable materials. This might have been due to the teacher candidates' lack of knowledge on what compostable materials are, or to their lack of knowledge about composting.

The frequency distribution of the teacher candidates' answers to the question, **"What should be done to encourage you to start sorting solid waste or to avoid dumping them? Please Explain."** is provided in Table 6.

Table 6. The Frequency Distribution of the Teacher Candidates' Opinions on What Could Be Done to Encourage Sorting

	First Grade	Second Grade	Third Grade	Fourth Grade
Public institutions could organize seminars and panels in order to raise social awareness about sorting	38	39	53	43
Increase the number of containers	21	27	12	13
Provide different containers for organic and solid wastes	18	16	23	22
Perform public service announcements on television and radio regarding the sorting of organic and solid wastes	13	9	14	20
Use rewards in order to encourage the collection and sorting of organic and solid wastes in separate containers	8	3	11	9
To encourage the separate collection of trash and solid wastes by using posters and brochures	3	2	5	10
Ensure the regular collection of waste by municipalities	1	1	3	9
Provide separate trash bags to allow the sorting of different wastes at their source	-	1	2	1
Provide courses in schools regarding the separation of organic and solid wastes	3	1	4	9
Organize school projects regarding the separation of organic and solid wastes	-	-	1	4
Publish public service announcements in newspapers and journals regarding the separation of organic and solid wastes	-	-	-	15
No opinion	10	12	8	6

To ensure that organic wastes are separated/sorted instead of being disposed of directly, teacher candidates from all classes/years have recommended: (1) that public institutions organize seminars and panels to raise social awareness

about sorting; (2) that different containers be used to collect organic and solid wastes; and (3) that the number of such containers should be increased. The teacher candidates have also expressed that separating trash and solid wastes should be encouraged through rewards and public service announcements broadcast on television and radio. Fourth-year teacher candidates in particular emphasized the need to use posters, brochures, and the print media (newspapers and journals) to encourage the separation of trash and solid wastes, and to organize courses and projects relating to this subject in schools. During this study, it was also determined that in all of the classes, a small number of teacher candidates had no opinion on what could be done to encourage the sorting/separation of solid wastes.

The frequency and percentage distribution of the teacher candidates' answers to the question, **"How do you feel about the current situation regarding solid waste disposal, dumping, sorting, etc.? Please Explain."** is provided in Table 7.

Table 7. The Frequency and Percentage Distribution of the Teacher Candidates' Opinions Regarding the Disposal, Dumping, Sorting, etc… of Solid Wastes

	First Grade		Second Grade		Third Grade		Fourth Grade	
I believe that current disposal, dumping and sorting activities are adequate	13	14,9	16	27,6	12	15	10	11,1
I believe that current disposal, dumping and sorting activities are not adequate	40	46	20	34,5	45	56,2	80	88,9
Undecided	34	39,1	22	37,9	23	28,8	-	-
Total	87	100	58	100	80	100	90	100

An evaluation of Table 7 reveals that a large number of teacher candidates did not consider current disposal, dumping, and sorting activities to be adequate. These results indicated that the disposal, dumping, and sorting activities conducted by the relevant institutions were inadequate, and that these practices should be performed more comprehensively and/or become more widespread in order to reach the necessary level of effectiveness.

The percentage distribution of the teacher candidates' answers to the question, **"Are you satisfied with the location, size and numbers of containers in your street?"** is provided in Table 8.

Table 8. The Percentage Distribution of the Teacher Candidates' Level of Satisfaction Regarding the Location, Size and Numbers of Containers Near the Places They Live

	First Grade	Second Grade	Third Grade	Fourth Grade
Satisfied	25,3	15,5	27,5	26,7
Dissatisfied	66,7	82,8	67,5	72,2
Undecided	8	1,7	5	1,1

The majority of the teacher candidates expressed that they were not satisfied with the location, size, and numbers of containers near the places they live. These results indicated that the relevant institutions should conduct additional activities to increase the current level of satisfaction regarding the location, size, and numbers of containers.

The percentage distribution of the teacher candidates' answers to the question, **"What is the distance from your house to the nearest solid waste container?"** is provided in Table 9.

Table 9. The Percentage Distribution of the Teacher Candidates' Answers to the Question Regarding the Distance to the Nearest Solid Waste Container

	First Grade	Second Grade	Third Grade	Fourth Grade
… ≤ 250m (very close)	41,4	36,2	48,8	51,1
250m-500m (close)	17,2	18,9	12,5	14,4
500m-1km (far)	2,3	10,3	11,2	8,9
… ≥ 1km (very far)	8	8,6	-	5,6
Absent	12,6	12,1	5	10
Have no idea	18,4	13,8	22,5	10

As shown in Table 9, most of the teacher candidates had containers within a close range (≤ 250 m) of their house or

place of residence. It was also noted that some of the teacher candidates had no containers near the places they lived. In addition, some of teacher candidates had no knowledge of the approximate distance between their homes/places of residence and the closest containers. This might have been due to the fact that these teacher candidates did not regularly use containers for disposing of solid wastes.

The percentage distribution of the teacher candidates' answers to the question, **"Are you satisfied with waste collection services?"** is provided in Table 10.

Table 10. The Percentage Distribution of the Teacher Candidates' Answers Regarding Their Level of Satisfaction with Waste Collection Services

	First Grade	Second Grade	Third Grade	Fourth Grade
Yes	29,9	25,9	36,2	23,3
No	42,6	62,1	52,5	60
Undecided	27,6	12,1	11,2	16,7

The large majority of the teacher candidates reported that they were not satisfied with waste collection services, while only a small percentage of the teacher candidates expressed they were satisfied with these services.

The frequency distribution of the reasons **why the teacher candidates were satisfied with waste collection services** is provided in Table 11.

Table 11. The Frequency Distribution of the Reasons Why the Teacher Candidates Were Satisfied with Waste Collection Services

	First Grade	Second Grade	Third Grade	Fourth Grade
Because they are performed regularly	15	15	13	11
Because the municipality conducts these services effectively	6	-	3	3
Because they contribute to recycling	5	-	13	7

The results in Table 11 indicated that these teacher candidates were satisfied with the waste collection services mainly because the municipalities conducted these services effectively and regularly, and because these services contributed to recycling activities.

The frequency distribution of the reasons **why the teacher candidates were not satisfied with waste collection services** is provided in Table 12.

Table 12. The Frequency Distribution of the Reasons Why the Teacher Candidates Were Not Satisfied with Waste Collection Services

	First Grade	Second Grade	Third Grade	Fourth Grade
Because they are not performed regularly	11	8	24	17
Because sufficient importance is not accorded to these services	11	12	18	25
Because no recycling containers are made available	3	5	8	13
Because they are performed only in the city center	2	6	4	4

The results in Table 12 indicated that these teacher candidates were not satisfied with the waste collection services mainly because they were not performed regularly, and because they were not accorded sufficient importance. Some of the teacher candidates also drew attention to the lack of sufficient recycling containers, and also to the fact that collection services are only performed in the city centers.

The percentage distribution of the teacher candidates' answers to the question, **"Who do you think is responsible for solid waste management in the city?"** is provided in Table 13.

Table 13. The Percentage Distribution of Teacher Candidates' Opinions Regarding the Parties That are Responsible for Solid Waste Management in the City

	First Grade	Second Grade	Third Grade	Fourth Grade
Municipality	64,4	72,4	72,5	87,8
Have no idea	35,6	27,5	27,4	12,2

An evaluation of the Table 13 indicated that the large majority of the teacher candidates considered municipalities as being responsible for the management of solid wastes in cities. However, it was also noted that a considerable portion of first-year teacher candidates (35.6%) did not have an opinion on this subject. The ratio of teacher candidates with no opinions on the subject decreased as the teacher candidates progressed from their first year in university towards their fourth year.

The percentage distribution of the teacher candidates' answers to the question, **"Would you pay taxes for solid waste services?"** is provided in Table 14.

Table 14. The Percentage Distribution of the Teacher Candidates' Answers on Whether They Would Pay Taxes for Solid Waste Services

	First Grade	Second Grade	Third Grade	Fourth Grade
Yes	48,3	32,8	62,5	56,7
No	9,2	31	11,2	10
Undecided	42,5	36,2	26,2	33,3

An evaluation of Table 14 indicates that most first-, third-, and fourth-year teacher candidates were willing to pay taxes for solid waste services, while the ratio of second-year teacher candidates who were willing to pay, unwilling to pay, or undecided about paying such taxes were fairly similar.

The frequency distribution of the reasons **why the teacher candidates were willing to pay taxes for solid waste collection** is provided in Table 15.

Table 15. The Frequency Distribution of the Reasons Why the Teacher Candidates Were Willing to Pay Taxes for Solid Waste Collection

	First Grade	Second Grade	Third Grade	Fourth Grade
To ensure a cleaner environment	40	13	26	26
To provide payment for the services being rendered by the municipality	10	4	10	16
To ensure healthier life standards	2	-	12	6
To provide payments in case the taxes are reasonable	3	1	-	1
To ensure the better provision of services	1	4	5	6
To prevent the destruction of trees	-	-	5	3
Because they are already paying taxes for many other types of things	2	1	6	5

The teacher candidates reported that they were willing to pay taxes especially to ensure a cleaner environment, and to provide payment for the collection and disposal services being rendered by the municipality. Some of the teacher candidates associated the sorting of solid wastes with healthier life standards. Other teacher candidates associated solid wastes mainly with paper and cardboard-like wastes; for this reason, they stated that they were willing to pay taxes for solid waste collection services in order to prevent the destruction of trees and forests. It was noted that some of the teacher candidates were willing to pay taxes for solid waste collection since they felt that they were already paying taxes for all types of other things, while other teacher candidates were willing to pay taxes on the condition that the taxes be reasonable.

The frequency distribution of the reasons **why the teacher candidates were not willing to pay taxes for solid waste collection** is provided in Table 16.

Table 16. The Frequency Distribution of the Reasons Why the Teacher Candidates Were not Willing to Pay Taxes for Solid Waste Collection

	First Grade	Second Grade	Third Grade	Fourth Grade
Because they are already paying too many taxes	4	2	5	6
Because they considered it mainly as the task and responsibility of municipalities	1	5	2	1
Because they felt that there would be no need for taxes if everyone acted responsibly regarding solid wastes	2	10	6	4
Because they are in a financially difficult position	1	1	1	-
Because they felt that the environment cannot be protected simply by spending more money	-	2	1	-
Because they are not satisfied with the currently provided services	2	1	2	-
Because there are no adequate trash containers near the places they live	2	1	2	-
Because they felt that practices that rely on more money and spending are not effective	3	6	7	3

Some of the teacher candidates reported that they would not pay taxes for the collection of solid wastes because there were already too many other taxes to be paid, or because they were in a financially difficult position at the moment. There were also teacher candidates who expressed that there would be no need for taxes if everyone acted responsibly regarding solid wastes; that the environment cannot be protected just be spending more money; and that the main focus in the management of solid wastes should be on raising environmental awareness. Teacher candidates who did not have trash containers near the places they live, and teacher candidates who believed that solid waste collection is mainly the task and responsibility of municipalities were also unwilling to pay taxes. These teacher candidates argued that municipalities should first endeavor to increase the current activities regarding the collection of such wastes.

4. Conclusions and Recommendations

The study results demonstrated that schools were the main source of information regarding solid wastes for elementary science teacher candidates (Table 1). This result indicated the importance of schools in raising individuals who are environmentally aware, and who would thus contribute to the collection, separation and recycling of solid wastes. In addition, it was also observed in this study that television and the visual media had an important role in informing society regarding solid wastes. Previous study in the literature similarly describe that science students expressed schools and visual media as their main source of information regarding solid waste (Çelikler & Harman, 2015).

It was observed that teacher candidates who recycled solid wastes (other than organic wastes) and who used separate recycling containers for each type of solid waste were generally aware that materials used in packages can be recycled and reutilized. Chemistry teacher candidates expressed that recyclable materials should be used (Yücel & Morgil, 1998). University students (Yılmaz, Morgil, Aktuğ & Göbekli, 2002) and secondary school students (Çelikbaş, Yalçınkaya & Banoğlu, 2013) expressed that they prefer recyclable materials. It was determined that social studies teacher candidates didn't have the sufficient awareness about the solid waste and recycling (Karatekin, 2014). But, it was determined that pre-school children (Can Yaşar, İnal, Kaya & Uyanık, 2012), teacher candidates (Cici et al. 2005) and science teacher candidates (Harman & Çelikler, 2016) had the sufficient awareness concerning the solid waste and recycling. Owing to this awareness, these teacher candidates endeavored to create a cleaner environment, and also contributed to the economy through recycling.

One of the important findings of this study was that teacher candidates were generally aware of the benefits of sorting solid wastes, and also that sorting such wastes would contribute to reducing environmental problems. Environmentally conscious teacher candidates who recycle solid wastes contribute not only to the reduction of wastes that result in environmental pollution, but also to the building of a sustainable future. Teacher candidates who did not engage in sorting solid wastes included teacher candidates who were not knowledgeable about sorting, as well as teacher candidates who, despite being aware/knowledgeable about sorting, did not engage in such activities due to the lack of suitable containers near the places they live. To remedy this situation, the relevant municipalities could assume a more active role in the collection of solid wastes and packaging-related wastes. Primary teacher candidates expressed that local governments should place recycling containers (Kahyaoğlu & Kaya, 2012). 7th and 8th grade students (Mete & Filik İşçen, 2015), primary teacher candidates (Kahyaoğlu & Kaya, 2012) and geography teacher candidates (Kocalar & Balcı, 2013) expressed that recycling containers should be used.

The results of this study indicated that in order to raise awareness among individuals regarding the recycling of solid wastes, and to contribute to the economy by ensuring the preservation of raw materials, it necessary to educate individ-

uals on environmental issues starting from a young age, and to provide courses and projects in schools regarding the environment. The study also indicated that it is necessary to employ approaches such as using visual and printed materials to raise awareness; distributing various informative posters on the sorting of solid wastes; increasing the number of containers for solid wastes; and organizing rewards to promote the proper sorting and disposal of solid wastes. However, it is important to plan the implementation of such approaches correctly. El-Hoz (2009) previously reported that in case practices relating the solid waste management (i.e. collection, utilization, recycling) are not designed by taking into account human behavior and procedural considerations, it will be unlikely for these sorting and recycling practices to become effective.

It was determined that the majority of teacher candidates were not satisfied with the current situation and services regarding the collection, separation and recycling of solid wastes. This dissatisfaction was mainly due to the inadequacy of the number, size, and locations of containers; to the fact that containers are generally concentrated at the city centers; and to the frequent unavailability of recycling bins. This study demonstrated the importance of collecting, sorting, utilizing, and recycling solid wastes, and the necessity of increasing the number of solid waste containers in cities. It also demonstrated that teacher candidates who were environmentally aware were: (1) more willing to pay taxes for municipal services relating to solid waste management, and (2) more interested in contributing to a sustainable future. It was determined that teacher candidates weren't sufficient and sensitive on contributing to recycling (Demircioğlu, Demircioğlu & Yadigaroğlu, 2015), but university students attending to chemistry education paid attention to separate collection of waste (Yılmaz et al. 2002).

According to Fehr (2006), ensuring sustainability is more of an educational issue than a demographic one. Educational programs have a key role in informing individuals about sustainable waste management (Maddox, Doran, Williams & Kus, 2011). Educational materials also represent an effective means for ensuring the proper planning and execution of waste management practices (Pakpour, Zeidi, Emamjomeh, Asefzadeh & Pearson, 2014). A teaching model was designed and implemented, for the fifth grade students were raised awareness on "garbage reduction". It was seen that students' negative attitude towards environment changed positively (Erten, 2003). In fact, Said, Ahmadun, Paim and Masud (2003) reported that identifying and remedying the shortcomings of teachers with regards to their knowledge on waste management (and waste management procedures) is important for ensuring that younger generations develop a lifestyle based on sustainability. Based on these considerations, it is necessary for elementary science teacher candidates, who will become the teachers of future generations, to be informed about the collection, sorting, and utilization of solid wastes, and to be well-versed in sustainable solid waste management. For this reason, elementary science teacher candidates should be informed and their participation should be ensured to collection, separation and recycling of solid wastes through: (1) environment-related courses based on student-centered methods, techniques, and materials; and (2) the use of visual and printed materials. Transforming information into behavior is very important. Aydinli and Avan (2015) also expressed that information must be transformed into behavior and action. But it was expressed that possibility of transforming information into behavior is weak (Erten, 2002) and inconsistencies were found between environmental information and behavior (Erten, 2005). In addition, it is also necessary for municipalities to raise awareness regarding the collection of solid wastes and their utilization, and to conduct activities to remedy any shortcomings regarding the proper and effective collection of solid wastes.

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