

The Views of Pre-Service Science Teachers on Recycling

Ibrahim Yukselⁱ
Gazi University

Abstract

This study aims to determine the views of pre-service science teachers on recycling. The current study was carried out with semi-structured interview questions applied to 130 pre-service teachers studying in the Department of Mathematics and Science Education at a state university in the spring term of the 2018-2019 academic year. Due to the time and application limitations, the purposeful sample was chosen. Since this group will teach secondary school students in the future and recycling will be an important issue in the future as well as today, it is necessary to work specifically with this group so that teachers can teach this subject to their students. By taking their opinions, the deficiencies or negativities in the university education will be determined, thus an opportunity will be obtained to take steps towards overcoming these deficiencies. In the study, the case study method, a qualitative research design, was preferred and Recycling Interview Questions that was developed by the researcher was used as a data collection tool, and a content analysis was made. In the case study, a holistic single-case design was used. There are seven codes regarding the theme of “Separating the Wastes” in the 1st question about recycling for the pre-service science teachers. The highest frequency was given for “Reducing Environmental Pollution”. There are six codes for the theme of the contribution of recycling to the country in the 2nd question. The highest frequency was given for “It makes a contribution to the country”. In the 3rd question, there are six codes regarding the themes of recycling at universities. “Adequate education is not given” had the highest frequency. There are six codes for the theme of recycling at secondary schools in the 4th question. The highest frequency was given for “Only theoretical information is given”. There are seven codes for the theme of the zero waste project in the 5th question. “It is an efficient work” had the highest frequency. The pre-service teachers studying in the Department of Science Education are given practical education regarding recycling, separation of wastes and Zero Waste Project.

Keywords: Recycling, Separating the Wastes, Zero Waste Project, Pre-service Science Teachers

DOI: 10.29329/ijpe.2021.366.27

ⁱ **Ibrahim Yüksel**, Lecturer Dr., Science Education, Gazi University, ORCID: 0000-0001-5686-9344

Email: ibrahimyuksel7@hotmail.com

INTRODUCTION

Protection of natural resources, biodiversity and protection of endangered species, reduction of carbon dioxide concentration in the atmosphere as a result of the use of non-renewable energy sources and motor vehicles, widespread use of renewable energy sources, reproduction of green areas, prevention of environmental pollution (water, soil and air pollution), ensuring the reuse of wastes by recycling and reducing the use of raw materials, preventing the climate change which is the most significant impact of global warming by taking serious measures, supporting environmental-oriented activities by increasing the number of environmental organizations are all regarded as some practices necessary to prevent environmental destruction and to ensure the continuity of the environment (Dinc, 2015; UNESCO, 2006).

The fact that water, soil and air pollution has reached harmful levels poses a handicap for environmental sustainability. These sources, which are polluted for many reasons such as wastes and industrial companies, also threaten the health of living beings. Recycling policies should be implemented in order to end the environmental pollution caused by wastes. Regaining wastes with recycling will not only reduce resource use for raw materials but will also prevent many problems caused by environmental pollution (Korkmaz, 2015).

The concept of “ecological footprint” considers the relation between nature and man through a different perspective and determines the quantity of the pressure upon natural resources and from which factors its results. Ecological footprint determines the fertile surface on the earth where the sources needed by individuals having a life quality and consumption habits and the wastes are turned out to be harmless (Wackernagel & Rees, 1996) and to produce energy by reabsorbing carbon dioxide (Wilson & Anielski, 2005). Making wastes harmless is of importance for sustainable development for indirect recycling and zero waste processes and for ecological footprint. Recycling is an effort of a human being with his own wastes. It slows down the consumption speed of our natural resources and protects nature. Separation of our wastes to regain them needs collecting the same types in the same place. What is regarded as a waste when thrown together becomes a raw material out of which we can reproduce something when collected by separation. What kind of things should we pay attention to? Even though recycling increases reusing things and prevents sending reusable materials to nature once again, one of the most significant things is actually the fact that individuals pay attention to a lifestyle that does not require recycling as much as possible. Such that, the cost required for the recycling of waste materials could sometimes exceed the cost needed for the production of that material. Natural resources are not our belongings. We make a contribution to the ecological footprint by using them carefully and handing them down to the next generations. The ecological footprint is indicated to be an effective educational tool as it is used by students to understand its environmental effects scientifically by using their problem solving and critical thinking skills (Abellera, 2005).

Separating the materials that are suitable for recycling out of the ungrouped wastes is thought to be one of the biggest problems in the recycling of wastes. In the developed and environmentally conscious countries, awareness-raising activities are carried out for citizens depending on this idea to group solid wastes and gain them for recycling more rapidly. In this sense, in many countries, multi-bin trash cans and garbage containers are used for grouping garbage, which will contribute to the separation of the garbage from the houses, schools, workplaces, neighbourhoods, etc., without sending it to solid waste disposal facilities. The wastes to be recycled should be clean, which is very important for the recycling process. Therefore, the disposal and preparation of the garbage in the place where it was first formed for recycling makes it more convenient for the subsequent transformation processes (Curran & Williams, 2012).

One of the most important principles of Turkey’s waste management strategy is the “recycling of wastes”. In all the legal regulations, especially in the Environment Law, the reuse of wastes, regaining of them as a material and energy has been handled as one of the priority management principles, recycling activities have been encouraged, criteria for improving the technical and

administrative qualifications of the recycling facilities have been established and the facilities having these criteria have been licensed to contribute to both the economy and the environment (Bek, 2019). It refers to the collection, transportation, regaining, disposal, maintenance of disposal sites, supervision, inspection and monitoring of such activities (Karaca, 2008; T. C. Resmi Gazete [Turkish Official Gazette], 2015). Accordingly, the waste management hierarchy is shown in Figure 1.

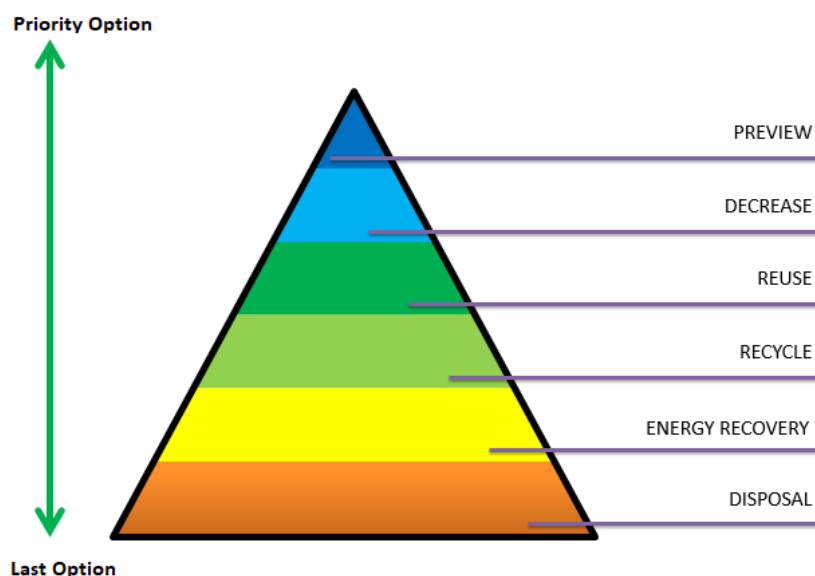


Figure 1. Waste management hierarchy (Karaca, 2008)

Rapid economic growth, urbanization, increase in population and rising of the welfare level in Turkey, the increase in the waste types and quantities revealed the requirements of an integrated approach comprising all the wastes rather than setting up a separate management system for each type of waste (Cremiato, Mastellone, Tagliaferri, Zaccariello & Lettieri, 2018). When the recycling and waste management practices in Turkey are analyzed, it is likely to see that there is a transition to Zero Waste Project. It is aimed to prevent wastes, revise the reasons for waste formation, and prevent and/or reduce waste formation with this project (Zero Waste Regulation Draft, 2018).

Waste management is described as the prevention of waste formation, reduction in the source, reuse, separation according to the quality and type, accumulation, collection, temporary storage, transportation, intermediate storage, recycling, regaining including the regaining of the energy, disposal, observation after the disposal, control and supervision of the activities. Zero Waste, on the other hand, is defined as the aim of preventing wastes, reviewing the causes of waste generation and preventing and/or decreasing waste generation, preferring more sustainable products, ensuring efficient use of resources, and collecting and recovering the waste separately in their sources when there are wastes. Zero Waste Information System is defined as the online registration system prepared by the Ministry in order to record the places implementing the zero waste management system, to provide the observation of the wastes collected in this scope and to give a zero waste certificate to the places that establish the zero waste management system (Zero Waste Regulation Draft, 2018).

The consciousness of sustainable development was given a place in the general objectives of the Science curriculum prepared by T. R. the Ministry of National Education (MoNE, 2018). In the related text, it is emphasized that one of the aims of the Science course is to educate individuals who have a sense of sustainable development with the expressions of “to recognize the interaction between individual, environment and society, to have a sustainable development consciousness belonging to society, economy and natural resources.” With the philosophy of the curriculum, it is likely to see that it is aimed to raise individuals with a responsibility, respectful to the rights and freedom of the person, helpful, having ethical values and who are beneficial to the society and the planet where they live. Upon the detailed examination of the program, it is likely to see those achievements related to many

subjects such as preservation of the natural environment in all grade levels where the Science course is taught, saving resource use, the importance and encouragement of recycling, the importance of biodiversity, energy sources, delivery to the people in need with reuse of the goods that can be used, the fact that the ozone layer gets thinner, global warming, environmental problems and sustainable living have all been determined. It is clearly seen that it is aimed to educate individuals who have exhibited behaviours in accordance with the principles of sustainable development as a way of life through the acquisition of these gains in the curriculum (MoNE, 2018). In addition, it is aimed that students comprehend the importance of the sustainable and efficient use of natural resources in the curriculum of the course “Environmental Education”, which is one of the elective courses at secondary education (MoNE, 2015).

The current study was carried out to determine the view of teachers on recycling in order that raw material sources could be used by future generations as it is thought that each individual has responsibilities in the process of recycling waste. It is important to determine the current opinions of pre-service teachers on recycling in terms of understanding their competencies in recycling and organizing educational activities in this context. As a matter of fact, pre-service science teachers, who are the future teachers, have a role as role models in ensuring environmental sustainability by raising students who are aware of reduce, reuse and recycle, known as 3R principles. It should be taken into consideration that students also transfer the concept of recycling and practices learned from their teachers to their own environment and families and has an important role in creating a widespread effect.

The purpose of this study is to determine the views of the pre-service science teachers over recycling. The general problem statement of this study can be expressed as “What are the opinions of the pre-service science teachers about the subject of recycling?” The problem situation was determined by paying attention to the general and specific criteria that should be taken into consideration in the selection of the problem. It is considered that it is important as it is useful for pre-service teachers to determine their views over the issue of recycling. In line with this general objective, the following questions were tried to be answered:

1. Why is it so important to separate wastes?
2. What is the contribution of efficient recycling to the country (economy, etc.)?
3. Is there adequate recycling education at universities in our country?
4. Do you think there is adequate information about recycling in the Science curriculum taught at secondary schools?
5. Do you think that studies such as the Zero Waste Project carried out in our country have a waste prevention approach that includes adequate recycling of waste?

METHOD

Research Model

In this study, a case study method was used at a qualitative dimension. The case study in qualitative research is related to the intensive study of an event (Glesne, 2011). The case study is a method that investigates social phenomena by conducting a detailed analysis of a single case and associating a single event with various phenomena. In addition, it allows examining information in depth that other methods can overlook (Punch, 2014). Holistic single case study design: There is only one unit of analysis (an individual, an institution, a program, a school, etc.) in a single case study design (Yildirim & Simsek, 2013).

In this study, the opinions of pre-service science teachers over the subject of recycling were analyzed in detail. The interview form developed by the researcher was used as a data collection tool and content analysis was performed. The questions were developed by the researcher upon the literature review. In the study, the answers obtained from the interview form were added and interpretations were made based on the results.

Participants

The research was carried out with a total of 130 pre-service teachers who take the course of Environmental Education course, studying in the Department of Mathematics and Science Education at a faculty of education at a public university in the spring term of 2018-2019 academic year. Homogeneous sampling means that the research consists of an analogous sub-group or situation present in the universe depending on the problem and the purpose of the study and that the study is carried out here (Buyukozturk, Kilic Cakmak, Akgun, Karadeniz, & Demirel, 2018). In the current study, homogeneous sampling was used because the study comprised of pre-service teachers who were chosen from the population, attending to the same practice school and having similar characteristics. Pre-service teachers were coded as PT₁, PT₂, PT₃ ... PT₁₃₀. In addition, demographic data regarding the gender of pre-service teachers are given in Table 1.

Table 1. Demographic characteristics in terms of gender

Gender	f	%
Female	113	86.9
Male	17	13.1

Depending on the numbers of the pre-service teachers registered at the central system student affairs office at a state university, Faculty of Education for the academic year of 2019-2020, it is likely to say that the rate of the pre-service science teachers is females at the rate of almost 87%.

Data Collection Tool

In the case study, the interview questions developed by the researchers were used as the main data collection tool. Recycling Interview Questions (RIQ) was prepared by the researcher by examining the related studies about the issue in Turkey after a comprehensive review of the literature (Cremiato, et al, 2018; Bek, 2019), and by depending on the opinions of 4 field experts. In order to reach the goals determined in this research, the interview questions developed for the pre-service teachers by the researcher were used as data collection tools. Interview questions are often asked in an interview or in writing. The interview is the conversation conducted to reveal the experiences, thoughts and beliefs of individuals about the searched subject and to reveal the important reasons underlying them (Yildirim & Simsek, 2013). When the interview technique is compared with other data collection methods, it is stated that the pre-service teachers' response rate is almost complete since he/she personally participates in the data collection process. It is because the researcher can ask additional questions for more in-depth answers, repeat the question in case of misunderstanding, or ask the question in a different way in this process (White & Gunstone, 1992). The questions in the interview form were developed in line with the opinion of 4 experts in the field and the scope validity was ensured. Each interview or meeting lasted for 10-20 minutes. During the interviews, the opinions of the pre-service teachers were written on the interview form paper with their permission.

Data Analysis

Content analysis was performed in data analysis. Content analysis is usually a method used in the analysis of written and visual data. In the content analysis, the researcher first develops categories related to the research topic. The words, sentences or visuals that fall into these categories are counted. In the development stage of the category, it is necessary to pay attention to develop appropriate categories for other researchers who are planning to do similar research on the same text so that they

can get the same results (Ozdemir, 2010). The main purpose of content analysis is to reach the concepts and relations that can explain the collected data. In this sense, it is necessary to conceptualize the collected data firstly and to organize these concepts in a logical manner and define the themes that explain the data accordingly. Thus, it is aimed to determine the data obtained by content analysis and to highlight the realities hidden in the data (Yildirim & Simsek, 2013). The themes and codes obtained from the data are included in the findings.

According to Miles and Huberman (1994), definitions become sharper if two researchers encode using the same data set. In this way, it is possible to reach a common vision about what coding means and which piece of data belongs to which code. The main point of this technique is whether encoders use similar codes for the same pieces of data. Disagreements indicate that definitions need to be expanded or corrected. By dividing the number of compromised codes by the total number of compromised and non-compromised codes, the reliability ratio between the encoders can be calculated. It is recommended that this ratio should be close to 80% and even more than 90% depending on the size of the data.

The interview questions obtained in the data were turned into writing without making any changes by the two experts. Later on, the writings were examined separately and it was paid attention to in order not to have any inconsistency. Depending on the expressions of the participants, some codes were formed in line with the purpose of the study. Sub-questions were given themes and coded. In order to provide intercoder reliability, 32 codes were made at common vision. There became a disagreement in 3 codings. With the division of the number of the codes agreed by the total agreed and disagreed code number, the intercoder reliability rate was calculated. Intercoder reliability was found as 91%. It is recommended that this number should be over 90% (Miles & Huberman, 1994).

RESULTS

At the end of the semi-structured interviews, the answers of the pre-service teachers over recycling replied to the interview form and the frequency values of these answers were given in this section. The first question of “The recycle bin appears everywhere. Why is it so important to separate waste? Please explain.” asked the pre-service teachers was processed with the theme of “Separating Wastes”. The answers of the pre-service teachers to this question are given in Table 2.

Table 2. Opinions of pre-service teachers about separating wastes and the frequencies

Theme	Codes	f
Separating the Wastes	Reducing Environmental Pollution	46
	Resource Saving	29
	Economic Contribution	22
	Provides Business Easiness	18
	Ecological Balance	7
	Efficient Recycling	3
	Reducing Soil Pollution	2

As given in Table 2, there are seven different opinions by the pre-service teachers for the 1st question. The most important topics that pre-service teachers focus on regarding “Separating Wastes” are “Reducing Environmental Pollution” in the first place and secondly “Resource Saving”. Besides that, they were followed by “Economic contribution” by twenty-two pre-service teachers, “It provides easiness at business” by eighteen pre-service teachers, “Ecological Balance” by seven pre-service teachers, “Efficient Recycling” by three pre-service teachers and “Reducing Soil Pollution” by two students, respectively. Some of the statements written by the pre-service teachers in the interview form regarding the 1st question are as follows:

PT₁: Provides great convenience in the recycling of wastes. Reduces labor.

PT₇: Recycling is provided by separating the wastes. If we separate the paper, cutting trees is reduced. We will prevent soil contamination.

PT₃₁: It is important to reduce environmental pollution.

PT₉₉: It is important to separate the wastes in order to prevent wastes from giving harm to our environment and reuse them by recycling.

PT₁₂₀: This method helps to minimize the use of raw materials (resources).

The second question of “What is the contribution of efficient recycling to the country (economy, etc.)? Please, explain.” asked the pre-service teachers was themed as “Contribution to the Country”. The answers of the pre-service teachers to this question are in Table 3.

Table 3. Opinions of the pre-service teachers about the contributions of recycling to the country and frequencies

Theme	Codes	f
Contribution to the Country	Contributes to the economy	87
	Saves money	33
	Reduced raw material requirement	30
	Protects natural resources	18
	Reduced damage to the environment	17
	It advances development	4

As given in Table 3, there are six different opinions by the pre-service teachers for the 2nd question about recycling. The most important ones that the pre-service teachers focus on regarding “Contribution to the Country” are firstly “Contributes to the economy” and secondly “Save money”. Also, they were followed by “Reduced raw material requirement” by thirty pre-service teachers, “It protects natural resources” by eighteen pre-service teachers, “Reduced damage to the environment” by seventeen pre-service teachers and “It advances development” by four pre-service teachers, respectively. Some of the statements written by the pre-service teachers on the interview form regarding the 2nd question are as follows:

PT₃₈: For example, recycling paper is very important for our trees. The cost of paper is reduced. Our natural resources are protected.

PT₆₄: Provides resource-saving in the economy. It prevents environmental pollution by preventing the disposal of harmful wastes to the soil by recycling.

PT₈₀: Provides resource-saving in the economy. We don't use resources unnecessarily.

PT₁₁₆: Fewer trees are cut (natural resources are preserved). The country's forest resources are consumed less. The raw material and energy consumed for the production of a glass bottle is reduced to a minimum.

PT₁₂₀: The decrease in raw material use affects the economy positively. Recycling reduces the amount of wastes.

The third question of “Is there an adequate level of recycling education in universities in Turkey? Please explain.” asked the pre-service teachers were processed with the theme of “Recycling in universities”. The answers of the pre-service teachers to this question are given in Table 4.

Table 4. Opinions of pre-service teachers about recycling at universities and frequencies

Theme	Codes	f
Recycling at Universities	Inadequate education	106
	Adequate education	11
	There should be practical education	9
	There should be education to create awareness	8
	Adequate education is given in the Environmental Science course	6
	There could be better education	5

As given in Table 4, the pre-service teachers answered the 3rd question about recycling in six different opinions. The most important topics that the pre-service teachers focus on regarding “Recycling at Universities” are firstly “Inadequate education” and secondly “Adequate education”. In addition, these answers were followed respectively by “There should be a practical education” by nine pre-service teachers, “There should be an education to create awareness” by eight pre-service teachers, “An adequate education is given in the course of Environmental Science” by six pre-service teachers and “There could be better education” by five pre-service teachers. Some of the statements written by the pre-service teachers on the interview form regarding the 3rd question are as follows:

PT₃₈: Adequate training about recycling is not provided. Moreover, there aren't even recycling bins at many universities. Each university should have recycling bins.

PT₅₀: I don't think there is adequate education about recycling. Information is given but we are not provided areas that are applicable and recycling areas.

PT₅₆: Since we are studying in the Department of Science Teaching, enough importance is given to recycling in our lessons.

PT₁₁₃: I don't think there is adequate education about recycling. I think it should be given as a lesson in every department and all pre-service teachers should be informed.

PT₁₂₁: Communities related to recycling are established at universities. The number of participants is small, but the participants are able to receive education and perform some activities.

The fourth question of “Do you think there is adequate information about recycling in the Science curriculum taught in secondary schools? Please explain.” asked the pre-service teachers was processed with the theme of “Recycling at secondary schools”. The answers of the pre-service teachers to this question are given in Table 5.

Table 5. Opinions of pre-service teachers about recycling at secondary schools

Theme	Codes	f
Recycling at Secondary Schools	Theoretical knowledge is given	52
	Adequate education is not given	28
	The level of implementation was inadequate	25
	Adequate education is given	20
	Teacher education is effective	11
	Projects should be done.	3

As given in Table 5, the 4th question about recycling was answered by the pre-service teachers in six different opinions. The most important issues that pre-service teachers emphasize about “Recycling at Secondary Schools” are firstly “Theoretical knowledge is given” and secondly “Adequate education is not given”. In addition, they were followed by “The level of implementation was inadequate” by twenty-five pre-service teachers, “Adequate education is given” by twenty pre-service teachers, “Teacher education is effective” by eleven pre-service teachers and “Some projects should be made” by three pre-service teachers, respectively. Some of the statements written by the pre-service teachers on the interview form regarding the 4th question are as follows:

PT₃₄: Adequate education about recycling is not provided. These issues should be mentioned much more and environmental awareness studies should be carried out.

PT₃₈: I don't think that enough importance is given to recycling. In my opinion, recycling bins should be given to classes and weekly competitions should be organized in the classroom or at the school.

PT₃₉: Textbooks include recycling. But I don't think people are very focused on this subject. The consciousness of recycling should be given at a young age.

PT₅₀: I think there is an adequate level of education for recycling at the secondary level.

PT₁₂₀: Although there is an adequate level of theoretical education for recycling, it lacks applications and projects.

The fifth question of “Do you think that studies such as the Zero Waste Project carried out in our country have a waste prevention approach that includes adequate recycling of waste? Please explain.” asked pre-service teachers was processed with the theme of “Zero Waste Project”. The answers of the pre-service teachers to this question are given in Table 6.

Table 6. Opinions of pre-service teachers about zero waste project and the frequencies

Theme	Codes	f
Zero Waste Project	Efficient study	50
	It isn't adequate	29
	Adequate information isn't given	6
	People are insensitive	5
	It was effective at the beginning	4
	A theoretical project	4
	It's student-centered	3

As given in Table 6, there are seven different opinions which include the opinions of the pre-service teachers about the 5th question about recycling. The most important issues that the pre-service

teachers focus on the “Zero Waste Project” are firstly “Efficient study” and the second is “It isn’t adequate”. In addition, six pre-service teachers said “Adequate information isn’t given”, five pre-service teachers think “People are insensitive”, four pre-service teachers said “It was effective at the beginning”, four of them said, “A theoretical project” and three pre-service teachers said, “It’s student-centered”. Some of the statements written by the pre-service teachers on the interview form regarding the 5th question are as follows.

PT₃₈: I think that the Zero Waste Project covers adequate recycling of waste. In order to minimize waste, maximum importance is given to recycling in this project.

PT₃₉: If Zero Waste Project can be taken into consideration and the project can be continued, sufficient recycling can be done in the future.

PT₄₉: I don’t think it’s enough. Because we do not divide the wastes into certain waste bags at our houses.

PT₅₇: The Zero Waste Project is an applicable project with a more sensitive and conscious approach to people.

PT₉₆: Thanks to the Zero Waste Project, I saw people in the community becoming conscious.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

As a result of the research conducted in order to determine the opinions of pre-service science teachers about recycling, it was determined that the pre-service teachers expressed the following concepts.

- Separating wastes; reducing environmental pollution, resource-saving, economic contribution, it provides easiness at business, ecological balance, efficient recycling, reducing soil pollution,
- Contribution to the country; contributes to the economy, save money, reduced raw material requirement, it protects natural resources, reduced damage to the environment, it advances development,
- Recycling at universities; inadequate education, adequate education, there should be a practical education, there should be an education to create awareness, an adequate education is given in the course of environmental science, there could be better education,
- Recycling at secondary schools; theoretical knowledge is given, adequate education is not given, the level of implementation was inadequate, adequate education is given, teacher education is effective, some projects should be made, and
- Zero waste project; efficient study, it isn’t adequate, adequate information isn’t given, people are insensitive, it was effective at the beginning, a theoretical project, it’s student-centered.

Grouping recycling wastes is very important for the recycling process. In this respect, the disposal and preparation of the garbage in the place where it was first created makes it more suitable for the subsequent transformation processes (Curran & Williams, 2012). The system has been set up with zero waste principle for the purpose of placing the current system on a more regular, systematic and practical basis, in order to prevent wastes, to make more efficient use of natural resources, to

prevent or to minimize waste generation by reviewing the reasons and to recycle the waste in its source in the case of waste generation. Zero Waste Project will be implemented gradually in the framework of the Zero Waste Management Action Plan, which includes the period of 2018-2023. It is aimed that Zero Waste Project will gradually be put into practice in public institutions, educational institutions (universities, schools, etc.), terminals (airport, bus station, railway station, etc.), in hospitals, in big workplaces in 2018 and throughout Turkey in 2023 (Çevre ve Şehircilik Bakanlığı [Republic of Turkey Ministry of Environment and Urbanisation], 2017). As it is known, waste is the main source of urbanization and environmental problems. In order to achieve this goal, firstly, information infrastructure should be established and all segments of the society should be made aware of this issue. The most effective way to do this is through training. The implications for research and implementation were discussed and it was concluded that pre-service teachers should be provided with practical training on the recycling of wastes and training should be provided to make the Zero Waste Project more widespread.

Lecturers should pay attention to the importance of beliefs of pre-service Science teachers over recycling. Pre-service teachers should be given an opportunity to offer a rich educational environment and to carry them beyond in order to realize them. The participants who are future science teachers should be given opportunities to work with their friends together and to develop projects regarding recycling and zero waste. Oskamp et al. (1991) pointed out that the presence of friends and other important ones would be an effective factor for individuals in the realization of recycling. In line with it, Kelly et al. (2006) maintained that teachers need the support of their colleagues in their daily tasks and it also increases their motivation. In this sense, Giusti (2009) pointed out that teachers mostly learn from their colleagues. Juceviciene and Lepaite (2003) indicated that in-service training would give important chances to teachers and make them attain such new skills as developing oneself and exhibiting oneself and strengthens their current knowledge. In this respect, similar to in-service training, recycling and zero waste training and workshops could be arranged for pre-service teachers and they could be integrated into their training. In order that these teachers understand its importance more at school, they could be trained about sustainable development education (Davis & Gibson, 2006; Wells & Lekies, 2006). Having a sustainable future, the clues of recycling, the experiences obtained could change their beliefs and perspectives and help them attain a different perspective (Emanuel & Adams, 2011). The pre-service teachers could be aware of the practicability and usability of recycling performance. In addition, they could be aware of the fact that recycling is not only an environmental problem but also it is a hopeful solution for social and economic affairs and that active citizen involvement, particularly their involvement as the ones raising the future generations is of importance in order to cope with these problems.

Natural resources are not our personal property. Using them carefully, we should transfer them to the next generations in the same amount and cleanness (Gercek, 2007). In this context, recycling is the effort of humanity with his own wastes. Recycling slows down the consumption speed of our natural resources and protects nature. Separation of our wastes to regain them needs collecting the same types in the same place. What is regarded as a waste when thrown together becomes a raw material out of which we can reproduce something when collected by separation. Such that, the cost required for the recycling of waste materials could sometimes exceed the cost needed for the production of that material. Natural resources are not our belongings. We make a contribution to the ecological footprint by using them carefully and handing them down to the next generations with the same cleanness and quantity (Gercek, 2007).

In line with the results obtained from the research, the following recommendations were made.

1. Although the major task in education for recycling falls on educators, a concept with such broad and important goals cannot be burdened by educators alone. Therefore, in the future, it is likely to think to reach other faculties (engineering, architecture, law, medical faculty, etc.) in addition to the education faculties of higher education as decision-makers.

2. Studies can be carried out into the knowledge, attitudes, behaviours and practices of faculty members who have an important share in the opinions of university students on recycling.
3. In order to better understand the importance of recycling in higher education institutions, appropriate content should be placed in the curriculum.
4. Symposiums, congresses, interviews, wide participation events and encouraging competitions, projects, and education related to recycling can be raised to increase the awareness of the targets.-making and implementing positions in the name of education for recycling.
5. Some studies are carried out by the Ministry of Environment through a program called Water Detective at primary and secondary school levels and with the school visits, the policy of using water actively are told to children practically. It is possible to carry out a common study by the Ministry of Environment and pre-service science teachers for the sake of increasing the consciousness level of children over recycling.
6. Deactivating wastes, indirect recycling and zero waste processes are of importance for sustainable development and ecological footprint. Thus, we should give necessary importance to these studies.

REFERENCES

- Abellera, D. (2005). *Ecological Footprint Teacher's Manual Workshop*. Oakland: Redefining Progress.
- Bek, Y. (2019). *Türkiye'de geri dönüşüm uygulamaları (3R)[Recycling in Turkey applications (3R)]* (Yayımlanmamış yüksek lisans tezi). Ondokuz Mayıs Üniversitesi Fen Bilimleri Enstitüsü, Samsun.
- Buyukozturk, Ş., Kilic Cakmak, E., Akgun, Ö. E., Karadeniz, Ş. & Demirel, F. (2018). *Bilimsel araştırma yöntemleri*. Ankara: Pegem Akademi.
- Cremiato, R., Mastellone, M. L., Tagliaferri, C., Zaccariello, L., & Lettieri, P. (2018). Environmental impact of municipal solid waste management using Life Cycle Assessment: The effect of anaerobic digestion, materials recovery and secondary fuels production. *Renewable Energy*, 124, 180-188.
- Curran, T., & Williams, I. D. (2012). A zero waste vision for industrial networks in Europe. *Journal of Hazardous Materials*, 207-208, 3-7. <https://doi.org/10.1016/j.jhazmat.2011.07.122>
- Çevre ve Şehircilik Bakanlığı [Republic of Turkey Ministry of Environment and Urbanisation] (2017). Sıfır Atık. Retrieved from: https://webdosya.csb.gov.tr/db/bartın/menu/sifiratikuygulamarehberi_20180424090214.pdf
- Davis, J. M., & Gibson, M. (2006). Embracing complexity: creating cultural change through education for sustainability. *International Journal of Knowledge, Culture and Change Management*, 6(2), 93-102.
- Dinc, A. (2015). *Bir sürdürülebilir kalkınma göstergesi olarak ekoloji ayak izi ve Türkiye. [Ecological footprint as an indicator of sustainable development and Turkey]* (Yayımlanmamış yüksek lisans tezi). Anadolu Üniversitesi Sosyal Bilimler Enstitüsü, Eskişehir.

- Emanuel, R., & Adams, J. N. (2011). College students' perceptions of campus sustainability. *International Journal of Sustainability in Higher Education*, 12, 79-92. doi:10.1108/14676371111098320
- Gercek, Ö. (2017). İnsanlığın kendi atığıyla mücadelesi. *Doğa ve yaşam*, 1, 9-14.
- Giusti, L. (2009). A review of waste management practices and their impact on human health. *Waste Management*, 29(8), 2227-2239.
- Glesne, C. (2011). *Becoming qualitative researchers: An introduction* (4th ed.). Boston, MA: Pearson.
- Juceviciene, P., & Lepaite, D. (2003). Evaluator as feed-back driver: European competences and contemporary training problems. Competence as derived from activity: The problem of their level. *Socialiniai Mokslai [Social Sciences]*, 4(36), 57-63.
- Karaca, Y. (2008). Atık yönetimi konusundaki mevcut-yeni yönetmelikler ve uygulamaları eğitim programı. Retrieved from: <http://www.authorstream.com/Presentation/mslan-1254341-at-ky-netimi-karaca/>
- Kelly, T. C., Mason, I. G., Leiss, M. W., & Ganesh, S. (2006). University community responses to on-campus resource recycling. *Resources, Conservation, and Recycling*, 47, 42-55.
- Korkmaz, M. K. (2015). *Yeşil Tedarik Zinciri Yöntemi ve sürdürülebilir uygulamalar*. Gümüşhane Üniversitesi İktisadi ve İdari Bilimler Fakültesi IV. Ulusal Lojistik ve Tedarik Zinciri Kongresi Bildiriler Kitabı, 21-23 Mayıs. Gümüşhane: 1-13.
- Miles, M. B., & Huberman, A. M. (1994). *An expanded sourcebook: Qualitative data analysis* (Second edition). Thousand Oaks, CA: Sage.
- Ministry of National Education [MoNE] (2015). Ortaokul Çevre Eğitimi dersi öğretim programı, Ankara: MoNE.
- Ministry of National Education [MoNE] (2018). Science Education program, Ankara: MoNE. Retrieved from <http://mufredat.meb.gov.tr/ProgramDetay.aspx?PID=325>
- Oskamp, S., Harrington, M. J., Edwards, T. C., Sherwood, D. L., Okuda, S. M., & Swanson, D. B. (1991). Factors influencing household recycling behavior. *Environment and Behavior*, 23(4), 494-519.
- Ozdemir, M. (2010). Nitel veri analizi: Sosyal bilimlerde yöntem bilim sorunsalı üzerine bir çalışma [Qualitative data analysis: A study on methodology problem in social sciences]. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi*, 11(1), 323-343.
- Punch, K. F. (2014). *Introduction to social research: Quantitative & qualitative approaches* (3th ed.). London: Sage.
- T. C. Resmi Gazete [Turkish Official Gazette] (2015, Nisan). 29314 sayılı Atık Yönetimi Yönetmeliği. Retrieved from: <http://www.resmigazete.gov.tr/eskiler/2015/04/20150402-2.htm>
- UNESCO (2006). United Nations Decade of Education for Sustainable Development 2005-2014, UNESCO: International Implementation Scheme, Paris.
- Wackernagel, M. & Rees, W. (1996). *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publishers.

Wells, N. & Lekies, K. (2006). Nature and Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism. *Children, Youth and Environments*, 16(1), 1-25.

Wilson, J., & Anielski, M. (2005). *Ecological Footprints of Canadian Municipalities and Regions. Ecological Footprinting*. Netherlands: Kluwer Academic Publishers.

White, R. T. & Gunstone, R. F. (1992). *Probing understanding*. London: The Falmer.

Yildirim, A. & Şimsek H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri*. Ankara: Seçkin.

Zero Waste Regulation Draft (2018). Retrieved from: <http://zerowaste.gov.tr/en/zero-waste/regulations>