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E-waste Awareness Among Young Generation

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Environmental pollution is becoming a high-priority concern, as it threatens the natural resources of many countries. In this context, electronic waste (e-waste) pollution is expected to play an important role in the ecosystem. E-waste is an emerging type of pollutant, defined as the various forms of electrical and electronic material that have stopped being of value to their users or no longer satisfy their original purpose. In our study, the aim was to measure the awareness of young generations regarding the e-waste concept and to analyze how much young people are familiar with the regaining activities. To achieve the goal of this study, an e-waste survey of 9 multiple choice questions was formed in an online survey platform. This paper provides a panorama of the awareness, actual motives for change and disposal method, attitudes and other factors potentially explaining the intention to recycle, and deterrents to recycling.

Keywords: *e-waste, recycling, mobile phone, environment, statistics*

Introduction

With the rapid development of technology, a newer model of electrical and electronic devices is released at every moment and new models are marketed to the consumer as "better". This situation causes consumers to buy new devices before the end of the device's lifespan. However, due to reasons such as the high cost of repair when the device in use fails, and the preference for a new one instead of repairing, the service life of electronic devices is getting shorter day by day. All electrical and electronic devices such as refrigerators, televisions, small household appliances, lighting equipment, mobile phones, computers, tablets, cameras, food vending machines, which have lost their technological or functional feature and completed their useful life, are considered electronic waste (e-waste). Along with the shortening of the service life of the specified electronic devices, there is also a significant increase in the amount of e-waste generated. The substances contained in the resulting e-waste can harm both the environment and human health. Therefore, proper management of e-waste and planning of recycling activities are important. With the recycling of e-waste, precious metals such as copper, gold,

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silver, glass and plastic are obtained, thus both environmental impacts are minimized and raw material needs are provided.

The e-waste concept and regaining activities examined in this research has been the subject of many previous studies. In one of these studies, Shahabuddin et al. (2022) reviewed the concept of electronic waste and discussed the regaining activities starting from collection to pre-treatment and recycling. The study also investigated the recent developments, statistics and operational challenges. According to the study (Shahabuddin et al. 2022), Europe has the highest collection rates of e-waste, while Asia, America, Oceania, and Africa have lower rates, respectively. In addition, Shahabuddin et al. (2022) stated that the e-waste materials produced are worth $ 57 billion, and only $10.0 billion worth of e-waste is recycled and recovered sustainably, where the remaining materials cause high CO_2 emission. These statistics and previous researches indicated that it is important to understand the e-waste concept and raise awareness for sustainability activities.

The aim of this study is to measure the level of awareness of individuals aged 18-25 in Turkey about electronic waste and e-waste sustainability studies. In the study, first of all, the concept of e-waste, the content of e-waste and waste recovery methods are explained; e-waste recycling regulations in various world countries and Turkey are included. In the following parts of the study, the methods, findings, and results of the survey study conducted to measure the awareness of individuals aged 18-25 on e-waste and waste recycling studies are included. At the end of our study, discussion and suggestions were shared.

Literature Review

Today, the rapid progress of technology has led consumers to prefer the product with the newest technology to the product they have. With the shorter life of new devices, the frequency of electronic device replacement has increased. Therefore, there has been an increase in the amount of electronic waste generated. According to the Global E-waste Monitor (Forti et al. 2020), which was created by examining the data for 2019 within the scope of the United Nations University (UNU) Sustainability Program, 44.4 million tons of e-waste worldwide in 2014 has occurred. In 2019, the amount of waste increased to 53.6 million tons. The report, prepared with the contributions of the World Health Organization (WHO), shows that while the amount of e-waste per capita was 6.4 kg in 2014, it increased to 7.3 kg in 2019. According to this increase in the amount of electronic waste in five years, it is predicted that the total amount of waste will be 74.7 million tons and the amount per person will be 9 kg in 2030 (Forti et al. 2020). The increase in the amount of electronic waste causes an increase in the damage to both the environment and the health of living things due to the elements and chemical materials contained in the device. However, the production of electronic devices requires a very high human resource and raw material usage. It is known that 239 kg of fossil fuel, 22 kg of chemicals and 1.5 tons of water are used even when producing only one computer (National Conference of State Legislatures 2018).

Due to the rapid development of technology, with the increase in the circulation of electronic devices day by day, the problem of electronic waste has become a problem that is evaluated on a global scale. Especially in countries where the production and use of electronic devices is high, there is a significant increase in the amount of e-waste generated within a year. The Global E-waste Statistics Partnership was established by the International Telecommunication Union (ITU) and the United Nations University (UNU) in order to monitor the annual amount of e-waste. The e-waste generation map per capita for 2019, published in cooperation with ITU and UNU was created. It is found that the highest production with 17-21 kg of waste is in the USA, Canada, Switzerland, European Union countries and Australia. With the increasing amount of e-waste, many countries, including Turkey, have started sustainability studies in this area in order to control the increasing amount of waste and gain economic benefits from recycling activities. Countries that have enacted recycling regulations can be found also on the Global E-waste Statistics Partnership (GESP 2020).

Kumar (2019) suggests that it is important to better understand young generation's behavior in EEE consumption. In China and India, young adults represent "the new generation" that contributes significantly to the EEE consumption growth. Thus, it becomes imperative that this new generation understands the importance of responsible and sustainable e-waste management and becomes an instrument of social and behavioural change in future.

European Union

When the e-waste production in European countries is evaluated, it was seen that the total waste amount of all European countries at the end of 2019 was 12 million tons. According to the study, it has been determined that among the countries included in the European Union, the countries with the highest annual e-waste production are Poland in Eastern Europe, Sweden in Northern Europe, Italy in Southern Europe and Germany and France in Western Europe (Forti et al. 2020). Two directives, the Waste from Electrical and Electronic Equipment Directive (WEEE) and the Restriction of the Use of Certain Hazardous Substances (RoHS), have been created by the European Union in order to record the e-waste production and recovery activities of the member countries and to ensure e-waste control. It is stipulated that all electrical and electronic products to be produced and sold in the member states of the European Union comply with these directives.

EU directives classify e-waste into 10 categories (Gill 2010). Waste electrical and electronic equipment (WEEE) is defined as a mixture of materials and components that originated from mobile phones, computers and many more types of electronic equipment (Zhang 2011). The first WEEE Directive (Directive 2002/96/EC) entered into force on February 13, 2003 (European Commission 2003), but the European Commission later proposed revising the Directive in order to tackle the fast-increasing waste stream. WEEE Directive 2012/19/EU entered into force on August 13, 2012 and has been considered operative since February 2014 (European Commission 2012).

China

With a total of 10.1 million tons of e-waste generated in 2019, China represents 74% of the total amount of e-waste generated in the East Asian region and is the country with the highest e-waste production in the world with this ratio (Forti et al. 2020). The reasons why China is the country with the highest global e-waste production can be considered as the country's strong position in the production of electrical and electronic devices, being one of the countries with the densest population in the world, and the high demand for electronic devices in the country. However, it is seen that electronic waste in the country generally consists of households, municipalities and institutions that have completed their useful life, defective electronic devices produced by manufacturers and waste devices imported from other countries (SEPA 2006). It should also be noted that China had established different types of policy, starting in 2000, as preliminary steps before the Chinese WEEE Directive came into force in January 2011 (China State Council 2011).

E-waste Management in Turkey

Turkey is one of the countries that have established national legislation for the inclusion of e-waste in recycling studies. It is seen that the concept of e-waste was officially included in the 2002 addition to the Solid Waste Control Regulation for the first time (Salihoğlu and Kahraman 2016). The first study on the management process of e-waste in Turkey was carried out in 2004 within the scope of the Martha Project in cooperation with the Dutch Government (Atasever 2015). After this project, the Ministry of Environment and Urbanization started to work for the management of electrical and electronic wastes by a national standard compatible with health and the environment. A draft regulation was created by the Ministry by harmonizing the WEEE and RoHS Directives of the European Union with the national legislation. The final version of the draft was published in the Official Gazette No. 28300 on May 22, 2012 under the name of the Waste Electrical and Electronic Equipment Control Regulation (TÜSİAD 2015).

According to the analysis made by the Global E-waste Statistics Partnership (GESP),[1] the total amount of electrical and electronic devices put on the market in Turkey in 2019 was 1273 thousand tons, and the total amount of e-waste consisting of these devices was 847 thousand tons. While 18% (152 thousand tons) of the generated e-waste is collected and included in the recovery process, 125 kilo-tonnes of these wastes have been registered and included in the process.

Methodology

The concept of electronic waste is impacting our lives negatively in many ways. The components of this kind of waste materials are harmful for both the environment and human health. Since the e-waste statistics are increasing every

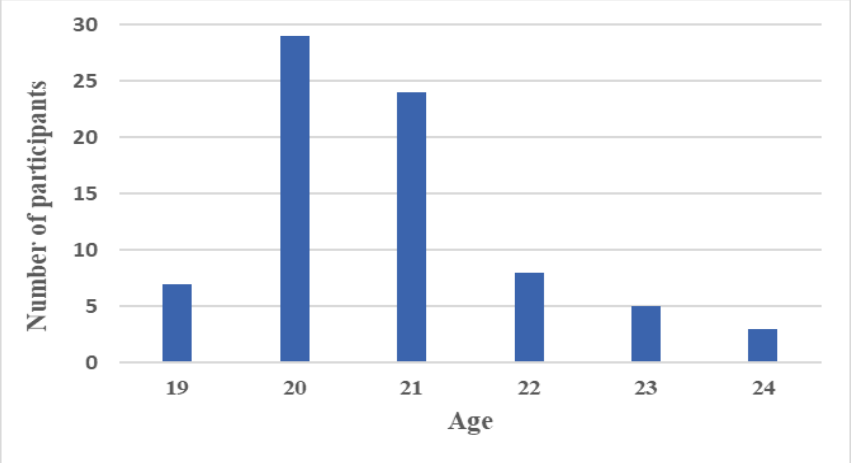
[1]GESP (2020): https://globalewaste.org/.

year, understanding the e- waste concept and regaining these waste materials are becoming significantly important. In this study, the aim was to measure the awareness of young generations regarding the e-waste concept, and to analyze how much young people are familiar with the regaining activities. To achieve the goal of this study, an e-waste survey of 9 multiple choice questions was formed in an online survey platform. The survey was among volunteers aged between 18-25 in two cities of Turkey, Istanbul and Ankara. Ankara is the capital city and Istanbul is the most crowded city of Turkey. Both cities are examples of the most developed cities, having a high number of young educated people. Therefore, they were chosen to reach more suitable participants for the survey. The survey was conducted online via a survey link, which was directed to 120 people through their mobile phones as text messages. 87 participants out of 120 people answered questions, creating a 72% response rate. While creating the survey, it was based on measuring the level of knowledge of individuals about e-waste and their attitude towards recycling activities; the questions were prepared on the basis of previous studies in the literature. At the beginning of the questionnaire, the aim of the study was mentioned by giving written information about the study to the participants. At the end of the survey, the results were collected on the online survey platform as graphics and numerical tables, which were then used in the final analysis. The data collected by survey instrument helped us to make some descriptive statistics. Validity of this instrument can be found also in many works as well as the study of Sadik et al. (2017) that we mention in the literature review. They also focus on the student's awareness about e-waste in Bangladesh.

Results

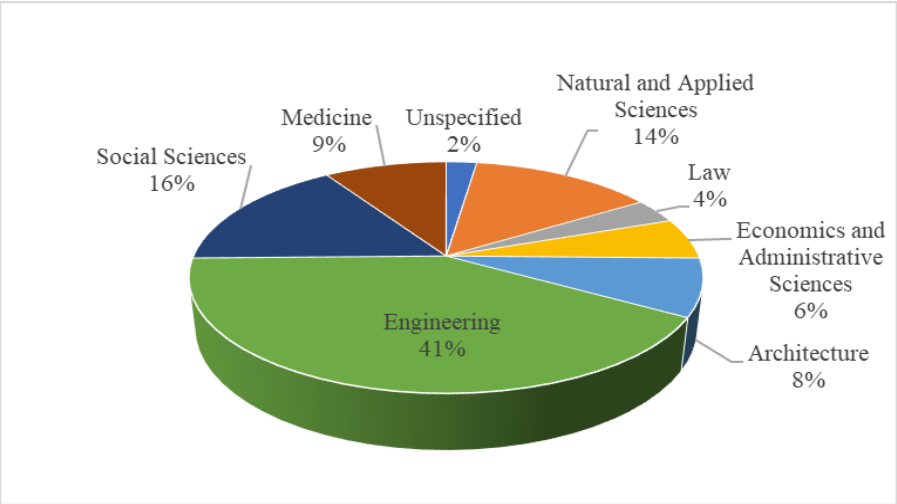
Participants' distribution in age and area of study are shown in Figure 1 and Figure 2. The majority of the survey participants are 20 years old with 33%; It consists of individuals in the age group of 21 with 28% and in the 18-age group with 13%. A total of 87 people participated in the survey and it is seen that 24-year-old individuals have the lowest rate of participation.

Figure 1. *Age Distribution of Participants*



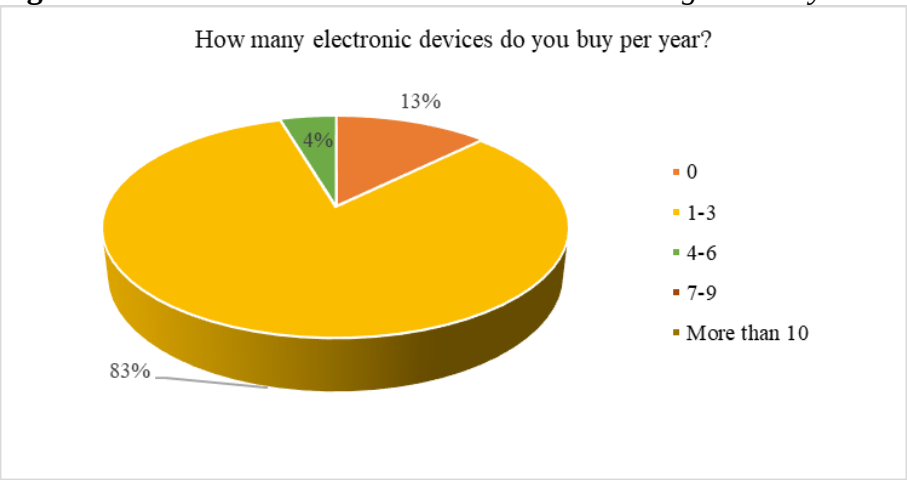
When the education/occupational distribution of the participants is examined, it is seen that the individuals with an engineering background have the highest participation with a rate of 41%. According to the analysis, the participants include people working in the fields of social sciences, natural sciences, medicine, architecture, economics/administrative sciences, and law.

Figure 2. *Area of Study of Participants*



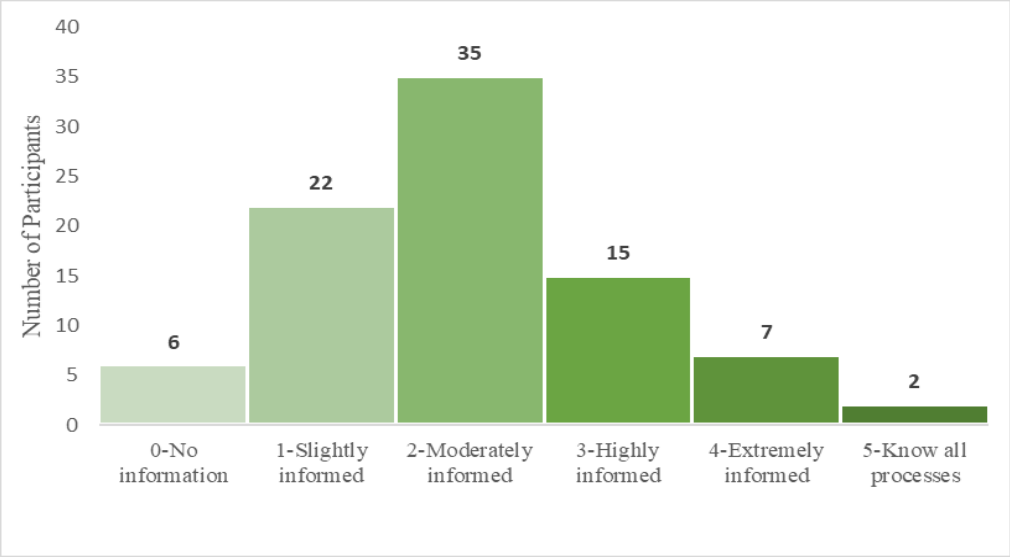
In the survey study, it was first aimed to analyze the electronic device purchasing behavior of consumers. The participants were asked how many electrical/electronic devices they buy in a year and the answers are shown in Figure 3. While 83% of the participants stated that they buy 1-3 electrical/ electronic devices per year, 4% of them purchase 4-6 devices per year; 13% stated that they have not purchased any device for a year. 7-9 and more than 10 device purchase options presented among the question options were not marked by any participant. Considering that the people participating in the study are individuals between the ages of 18-25, it is seen in Figure 3 that despite their tendency to follow technology, they only buy a few devices per year.

Figure 3. *Annual Electric/Electronic Device Purchasing Tendency*



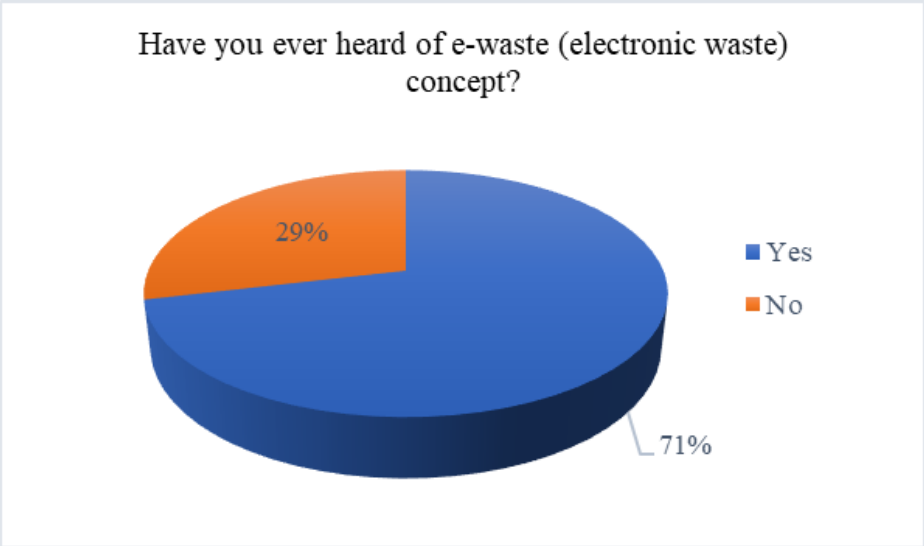
In the second question of the study, the level of knowledge of the materials in the electrical and electronic devices purchased by the consumers was measured with a scale in the range of 0-5. The answers to the question answered by all participants are shared in Figure 4. The majority, which constitutes 40% of the participants, stated that they have some knowledge of the materials found on the devices; the following 25% marked the option "1- I don't know much". The sum of the people who stated that they had above average and quite knowledge about the materials contained in the electronic device constitutes 25% of the participants. While 7% of the participants marked the answer "0- I have no knowledge", 2% of them marked the highest scale and stated that they had knowledge about all stages. When the answers of all the participants are evaluated, it is seen that 59 participants, who make up the majority of 68%, have knowledge about the materials used in electronic devices. This high rate can be explained by the high number of people with technical professions, especially considering the education/occupational groups of the participants.

Figure 4. *Knowledge Levels of Participants Regarding Electronic Device Components*



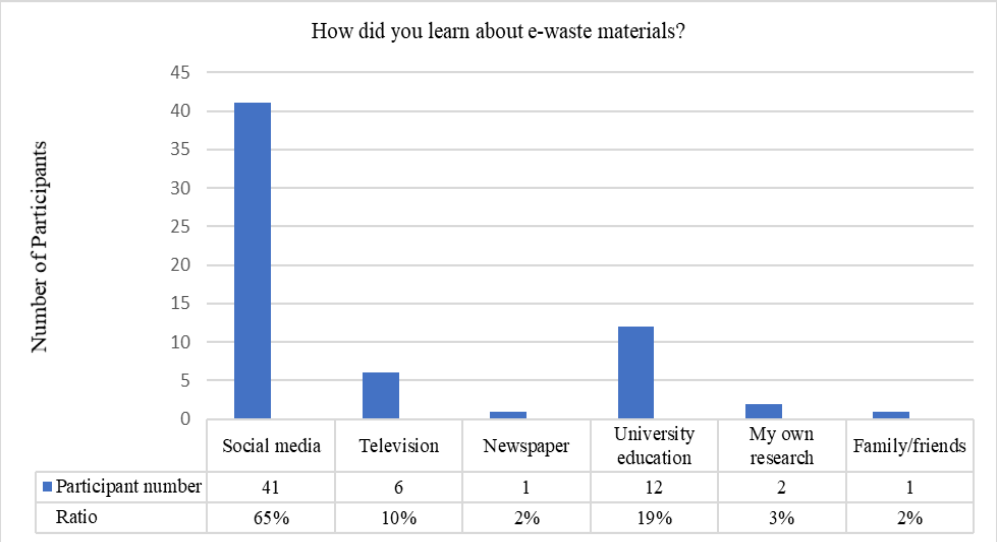
In the third question of the survey study, the participants were asked questions about the concept of electronic waste and the harmful effects of these wastes. While a majority of the 87 participants, 71%, stated that they had heard of the concept of e-waste before, 29% answered that they had not heard of such a concept before (Figure 5).

Figure 5. *Awareness of E-waste Concept*



Participants who answered yes to the question were asked the question through which channel they learned the concept of e-waste. Social media, television, newspaper, university education/lecture and "other" options were presented to the participants. Of the 63 people who answered the question, 61% chose the concept of social media, 19% chose university education/course, and 10% chose television. It is seen that only one participant selected the newspaper option. A free response was requested from the participants who marked the "Other" option; 3% stated that they learned about e-waste through their own research, while 2% stated that they learned from their family/environment. When the answers are evaluated, it is seen that traditional channels are ineffective in announcing the e-waste issue to people between the ages of 18-25, and social media has a very important role. The distribution of the answers is shared in Figure 6.

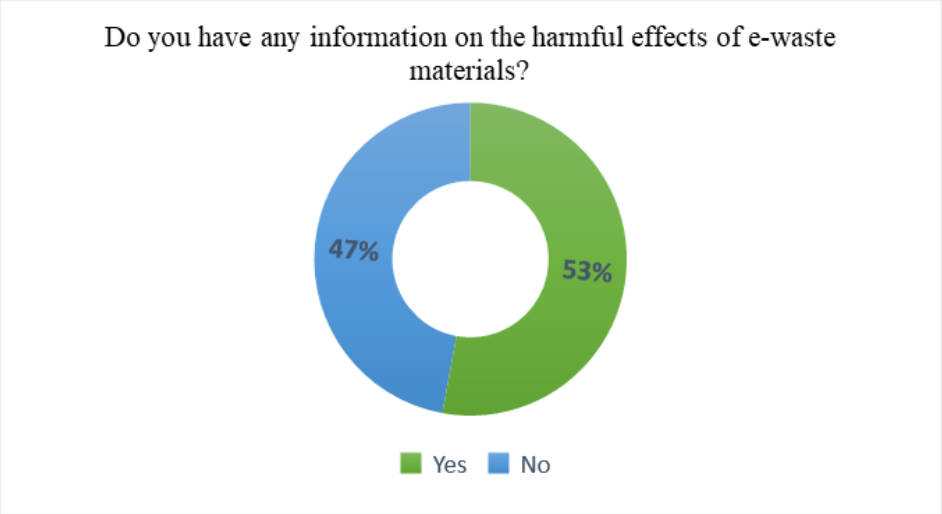
Figure 6. *Distribution of Sources in Learning E-waste*



	Social media	Television	Newspaper	University education	My own research	Family/friends
Participant number	41	6	1	12	2	1
Ratio	65%	10%	2%	19%	3%	2%

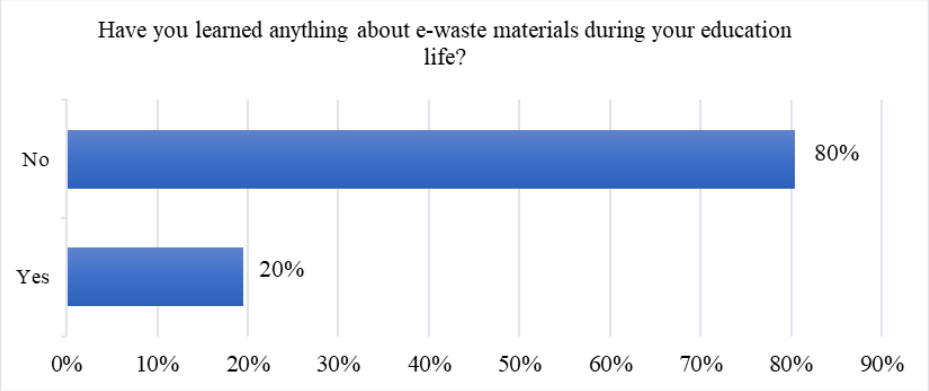
In the fourth question of the study, the participants were asked whether they had knowledge about the subject in order to measure their awareness of the harmful effects of e-waste. While 53% of the participants stated that they were aware of the harmful effects, 47% stated that they did not know about the subject (Figure 7). The answer rate of "Yes" given to the question was "Have you heard of the concept of e-waste before?" The fact that it is lower than the positive answer given to the question shows that everyone who has heard of the concept of electronic waste is not actually aware of the harmful effects of this waste. This situation indicates that while explaining the concept of e-waste to consumers, it is also necessary to mention the negative effects of waste on health and the environment.

Figure 7. *Awareness of the Harmful Effects of E-waste*



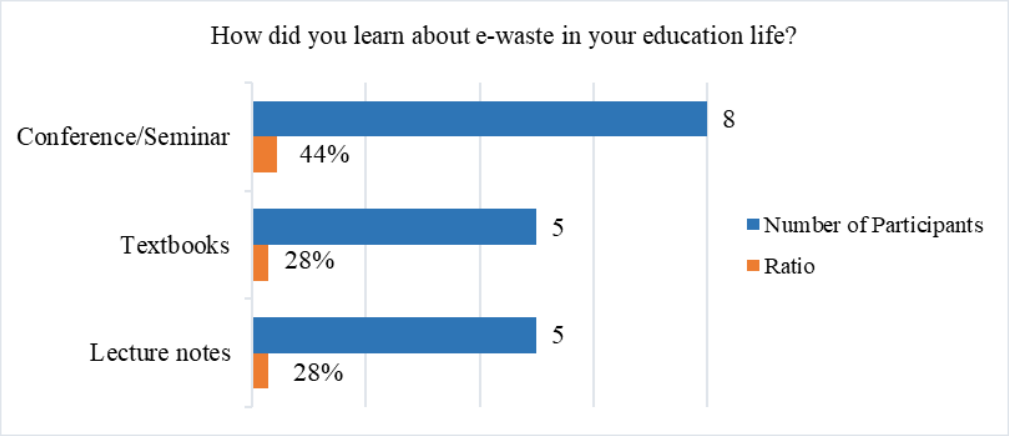
In the fifth question, in order to analyze whether the participants from different education/professional groups received any training on e-waste during their education, the participants were asked whether they learned a subject related to this concept during their education. While 20% of the participants answered "Yes" to the question, a large majority of 80% stated that they did not receive information about this issue in their education life (Figure 8).

Figure 8. *E-waste Awareness Formed During Education Life*



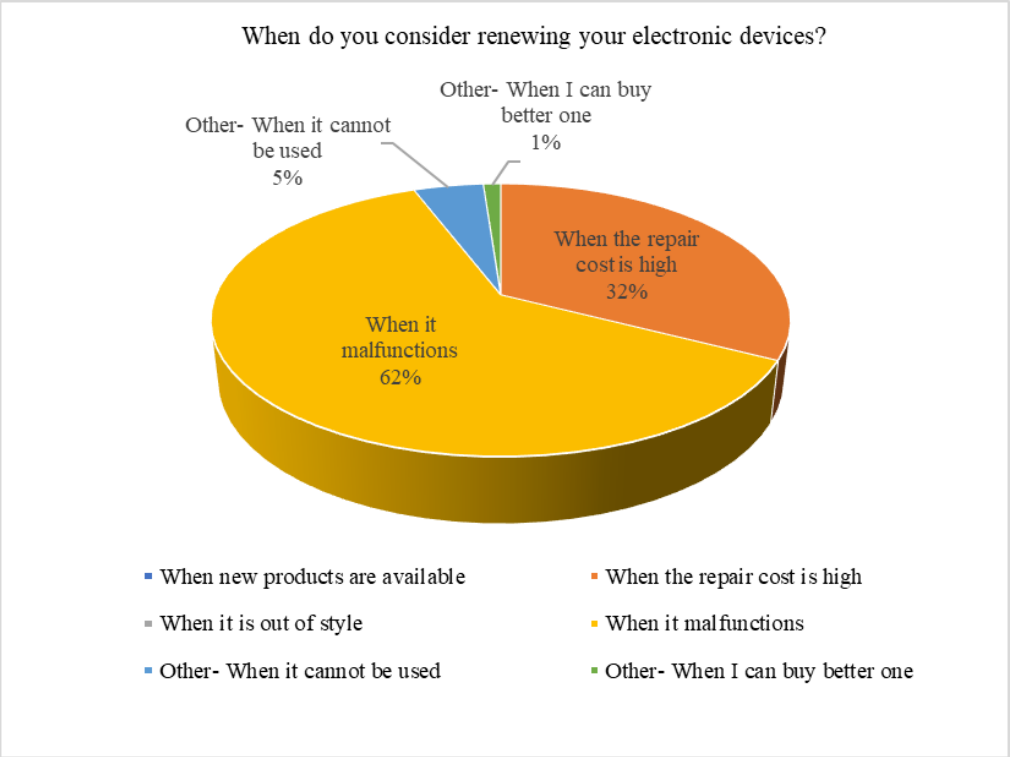
Those who answered the question positively were asked the question on which educational material they learned about e-waste. While 44% of the participants answered that they learned through face-to-face events such as conferences and seminars; Half of the remaining 56% of the participants stated that they received information from lecture notes and the other half from textbooks (Figure 9). It is seen that the common material in the process of teaching e-waste-related subjects in education life is organizations based on face-to-face and mutual communication.

Figure 9. *The Sources Where Participants Learn About E-waste Materials in Education Life*



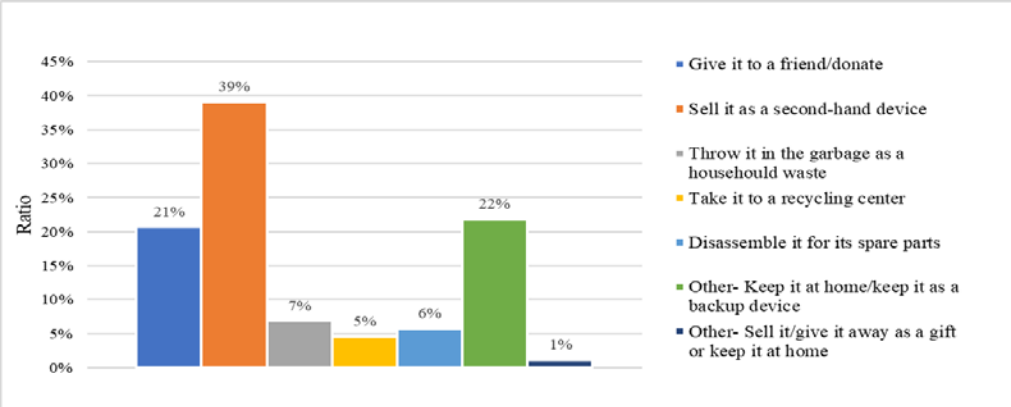
In the continuation of the study, the habits of the participants to change electronic devices and how they behaved when the devices became waste were examined. In the sixth question, participants were asked when they changed their devices in order to analyze the reasons for changing their electronic devices. “When new models are available for sale”, “When the repair cost is high”, “When outdated”, “When it breaks down while using” and “Other” options are presented in the question options; Those who marked the answer “other” were asked to explain. In the question answered by 86 participants, 62% of the respondents said that they would replace their electronic device when it malfunctioned; A portion of 32% stated that they would replace it if the repair cost was high in case of malfunction. When the answers are examined, it is seen that none of the participants changed their device when it became obsolete or when new models were put on sale. In this case, it is deduced that the participants do not change their devices only with the concern of following the technology. While the people who marked the other option make up 6%; Among the answers given were “When it becomes unavailable” and “When I can get a better quality” options. The percentage distributions of the response are shared in Figure 10.

Figure 10. *Reasons to Renew Electronic Devices*



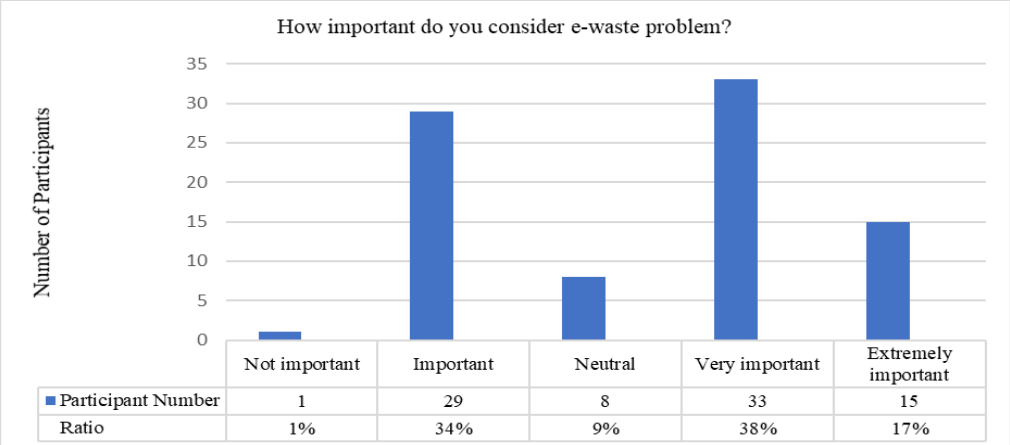
In the seventh and eighth questions of the study, how the participants manage their electronic device waste and their attitudes towards the recycling process were examined. In the seventh question, the participants were asked how they, as a consumer, changed their electrical and electronic devices. In the multiple-choice question consisting of six options, the participants who chose the "Other" option were asked to specify details. The answer to the question answered by all participants was "I sell it as a secondhand device" at a rate of 39%. When the distribution of the answers is examined, it is seen that 29% of the participants did not include the devices in any acquisition process. 22% of these participants answered the question as "Other-I keep it at home/I keep it as a spare device", while 7% stated that they consider electronic device waste as a household waste and throw it away. 21% of all participants answered the question as to give or donate the device to their friend. When the other answer options of the question were examined, it was seen that the participants who took their waste device to the recycling center made up only 4% of the total. Response distributions are shared in Figure 11.

Figure 11. *The Ways Participants Handle Their Used Devices*



In the eighth question, it was investigated whether the participants saw the harmful effects of e-waste as a problem and their attitudes. The participants were presented with five answer options and asked to mark the option that came closest to them, and their response distribution is shown in Figure 12. 90% of the 86 respondents to the question rated the e-waste problem in the "important" to "extremely important" range. However, a segment representing 9% stated that they saw the problem as "neither important nor unimportant", while the remaining 1% interpreted it as "not important". The rate of people who describe e-waste as an important problem is higher than the rate of people who state that they know about the harmful effects of e-waste. In this case, it can be interpreted that consumers are aware of the problem created by electronic waste, even if they do not fully know the harmful effects of e-waste on human health and the environment. However, when evaluated together with the behavior of consumers after changing their electronic devices, it is seen that the vast majority know the harmful effects of e-waste and consider the problem of e-waste as important, but still do not include their devices in the recycling process. It is deduced that consumers should be encouraged more about recycling and disposal activities in order to spread the sustainability studies supported by the Waste Electrical and Electronic Equipment Control Regulation and the Zero Waste project in the society.

Figure 12. *Consumer Evaluation Regarding the E-waste Problem*



At the last stage of the study, the participants were asked whether they knew about Earthday. While 63% of the participants stated that they had heard of Earth Day before, the remaining participants stated that they did not know about the subject.

Discussion

When examining the situations in which the individuals participating in the study change their electronic devices, it is seen that 62% of the participants change their device when it fails, and 32% when the repair cost is high after the breakdown. It is seen that only a fraction representing 1% change their device when newer models are released. When e-waste studies in the world literature are examined, it is seen that similar studies have been carried out in England and Bangladesh. In a study conducted by Ongondo and Williams (2011) at 5 universities in England, the behaviors and attitudes of university students towards mobile phone waste recycling were examined. The survey question, which analyzes the reasons for students to change their mobile phones, was answered by 2,287 participants, and 58% of the people stated that they changed their phone when it malfunctioned, and 41% stated that they changed it due to the update request of the operators. According to the research (Ongondo and Williams 2011), people who make changes to keep up with the latest technology make up 16% of the total. When the study by Ongondo and Williams (2011) is compared with the e-waste awareness research, it is seen that the rate of consumers who change when the device fails is close to each other and consumer concerns are generally common. Zheng et al. (2021) examined the factors affecting the behavior of people in the evaluation of electronic waste. In this regard, a literature review and first findings were presented.

Sadik et al. (2017), in a study conducted with 1055 people in three cities of Bangladesh with different demographic characteristics, the question of when they changed their electronic devices was asked to people aged 16-22. According to the results, the majority of respondents replace their electronic device in case of malfunction or if the cost of having it repaired is too high. In this case, it was seen that the results of the research conducted in Ankara and Istanbul were compatible with the results of the study conducted in England (Ongondo and Williams 2011) and Bangladesh (Sadik et al. 2017). The similarity of the results can be explained by the fact that the age groups of the people participating in all three studies are close and they exhibit similar purchasing behavior.

When the level of knowledge of the people participating in the e-waste awareness survey about the materials used in electrical/electronic devices was analyzed, it was seen that the majority of 68% had some or more knowledge. While 40% of the participants stated that they had some knowledge about the subject, a segment representing 25% stated that they did not know much; a portion of 7% said that they had no information.

When the awareness level of the people participating in the study on the issue of electronic waste was examined, it was determined that 71% of the participants

knew the concept before. When the study in Turkey is compared with the study conducted in Bangladesh with participants in the similar age group (Sadik et al. 2017), it is seen that the e-waste awareness analysis in both studies reveals similar results. Sadik et al. (2017), it was seen that approximately 60% of 1055 participants had an opinion about e-waste. Although the majority of the participants in both studies stated that they knew the concept of e-waste, the percentage of people who were not familiar with the concept was still considered to be quite high. Therefore, the results of both studies were found to be compatible with each other.

In the second stage of the e-waste awareness analysis, it was examined from which channels the participants learned about e-waste. When the results were evaluated, it was determined that the majority of 65% learned the concept of e-waste through social media. Some of the remaining participants stated that they learned the concept from university education and courses, and some of them learned from television. The number of people who learn about the subject through the newspaper, social environment or their own research is quite low. This shows that social networks are the most efficient tool to reach young people between the ages of 18-25. According to the results, it is commented that traditional mass media such as television and newspapers do not have sufficient effect on transferring important issues such as electronic waste to future generations. When the level of awareness about the harmful effects of e-waste is measured, it is seen that 53% of the participants in Turkey know about the harmful effects, while this rate was determined as 63% in the participants in Bangladesh (Sadik et al. 2017). When all the results of e-waste awareness are evaluated together, e-waste awareness in Turkey is relatively high compared to Bangladesh, while the rate of people who know about the harmful effects of these wastes on human health and the environment is lower. This situation makes us think that the e-waste issue in Turkey is not adequately transferred to the younger generations and there is a problem in accessing the right information. Considering that people in this age group access information mostly through social media, authorized institutions and organizations should take action to transfer sufficient and accurate information; it is recommended to address future generations through reliable sources.

In a part of the study, the role of education channels in informing the young population in Turkey about e-waste was examined. The rate of people who stated that they learned about e-waste in their education life was only 20%. This rate, Sadik et al. (2017) in Bangladesh, it is seen that approximately 40% of the youth between the ages of 16-22 living in Bangladesh received information about e-waste during their education life. It is thought that studies on e-waste in Turkey are not as common as plastic, paper, glass and similar waste projects, since people who do not receive training on e-waste have a higher rate than those in Bangladesh. However, it is commented that the education curriculum and resources created on electronic waste in Turkey are rarer than the subject of environmental pollution, and therefore fewer young people are able to access them.

In the next stage of the study, people who stated that they learned about e-waste in their education life were asked which resources they used, while the most common response in Turkey is recorded as conferences and seminars with a rate

of 44%; the majority of respondents in Bangladesh (Sadik et al. 2017), 57%, answered textbooks. While 30% of the participants in Bangladesh stated that they learned e-waste in lessons based on participation, 13% stated that they learned by practicing in the lessons. When these results were analyzed, it was seen that the study in Turkey was not compatible with the previous study. While the main source of information on the subject for the participants between the ages of 18-25 in Turkey is extracurricular interactive activities; it is seen that written sources such as textbooks and lecture notes have a lower rate. Accordingly, organizations based on mutual interaction are in a more effective position to inform young people living in Turkey; however, it is seen that these organizations should be supported with written sources by creating course materials related to the subject. However, it is thought that only theoretical training will not be sufficient to inform young people about e-waste. In order for future generations to adopt and take action on the e-waste problem, it is recommended to implement practical training practices, as in Bangladesh.

When the opinions of the participants on the e-waste problem were examined, it was determined that 90% of the majority saw e-waste as an important problem, while a segment representing 10% did not find the problem important. While 17% of the participants described e-waste as "Extremely important", 38% as "Very important" and 34% as "Important". According to the results, the majority of young people between the ages of 18-25 see the problem as an issue that needs to be intervened. When a question about Earth Day was asked in order to measure the environmental awareness of the participants, it was seen that 63% of the participants had knowledge about the subject. When the results are evaluated together, it is understood that most of the participants are aware of environmental issues and are aware of the importance of e-waste on the environment.

The results found are in Bai et al. (2018) compared with the research conducted in China. In the research, consumers' attitudes towards mobile phone use and disposal of waste phones were examined. The research was conducted in a total of 71 cities from different classes; a sample was formed with a total of 820 participants from different education levels, gender, age and income groups. In the study, in order to measure the level of awareness towards environmental and resource conservation activities, the participants were asked whether this would cause environmental pollution if mobile phones were not included in the recycling. According to the results of the research, it was seen that the participants did not show a high awareness of environmental protection activities, and consumers needed more information about the recycling of mobile phone waste. Bai et al. (2018), it was seen that people in the 20-25 age group had the highest participation rate and all participants predominantly had a university degree; however, the results were found to be different from the research in Turkey. When the results are compared, it is deduced that consumers between the ages of 18-25 in Turkey have a higher level of awareness about environmental activities.

In the e-waste awareness research, the attitudes and behaviors of the participants towards e-waste recycling processes were examined. Respondents were asked how they handled their old device waste when they replaced their electronic devices. As a result of the examination, it was seen that only 4% of the

participants took the waste device to the recycling center. However, the majority constituting 39% stated that they sold the device as second hand, 22% of them kept the waste device at home, and a portion representing 7% stated that they disposed of the device as any household waste. This shows that the participants, who have a high level of knowledge about electronic wastes and the harms of waste, do not have enough information about the recycling processes or do not take action on recycling.

When e-waste evaluation habits in other countries are examined, according to the study conducted by Ongondo and Williams (2011) on mobile phone waste management in England, approximately 56% of the students keep the waste phone at home, 19% give it to someone they know, 9% It is seen that the rest donated for recycling. According to the study, while the majority of people who keep the waste device at home keep the device as a spare, about 30% of them do not know what to do about the waste device. Bai et al. (2018), on the other hand, according to the study on mobile phones in China, it was seen that 79% of the participants store their unused phone at home, 36% give it to their acquaintances as a gift, and about 15% sell it as a second-hand device through different channels. When the attitudes of consumers in China towards recycling are examined, it has been determined that only 5% of the consumers send the device back to the manufacturer and the majority have a negative attitude towards recycling activities. Finally, Sadik et al. (2017) with students in Bangladesh, it was seen that 47% of the students hid their waste electronic device, 34% repaired and donated it, and 20% threw it away as any waste. According to the study, the rate of people who do not properly dispose of the waste electronic device was calculated as 80% (Sadik et al. 2017).

When compared to the studies in the literature, it is seen that the majority of consumers both in Turkey and in other countries do not dispose of their electronic waste in accordance with the standards, and the rate of people who are actively involved in the recycling process has a very low rate. For this reason, it was determined that the study conducted in Ankara and Istanbul gave results in line with the studies in the literature. It is thought that the majority of the people participating in the study prefer to sell unused electronic devices for economic income, therefore they are more selective about throwing them away or storing them at home. However, due to the low recycling rates as a result of the research, young people between the ages of 18-25 should be made more aware of the recycling of e-waste and should be encouraged for recycling. According to the study conducted by Ongondo and Williams (2011) in England, it was seen that each incentive application has a different effect on students' inclusion of mobile phones in the recycling process. According to the analysis, the most effective incentive is cash payment, followed by the application of coupons, an easy-to-apply recycling service and the establishment of suitable recycling points. In Turkey, starting similar incentive practices that appeal to the young population, taking into account the research in the literature, will motivate future generations for recycling practices.

Suggestions

In this survey, the awareness levels of young people on e-waste concept and regaining activities were studied. Considering the results of this survey and previous literature studies, it was inferred that although most young people were aware of the effects and consequences of not regaining e-waste materials, there are still some applications need to be implemented by authorities to increase this level of awareness. Here are some improvement points and suggestions emphasized:

- In order to prevent the increasing number of e-waste materials, consumers should be informed properly about the content of the electronic products they buy.
- Authorized institutions should include topics on e-waste materials, their harmful effects and regaining procedures in the school and university curricula.
- The media sources mostly used by young people, specifically social media platforms, television and magazines should be used more effectively to inform a large number of young consumers. The content and accuracy of information should be inspected by authorized institutions.
- Consumers should be informed about the Turkish Regulation on Control of Waste Electrical and Electronic Equipments and responsibilities of all parties should be clarified.
- Authorities should collaborate with non-governmental organisations and educational institutions. E-waste bins should be placed and waste collection centers should be built to places such as dormitories, schools and campuses, where young people have easy access.
- Manufacturers and authorized institutions should start incentive programs to encourage young people to actively contribute to regaining activities. Consumers should be encouraged by financial support, especially by highlighting applications such as cash payments, bonuses, discounts and/or coupons.

Conclusions

Today, with the acceleration of technological activities, electrical and electronic devices are frequently renewed and both functional and technological lifetimes of devices are shortened. As consumers prefer to buy new devices instead of having them repaired, the number of electronic devices that have completed their useful life and become waste is increasing day by day. The density of the substances contained in the waste devices poses a threat to the environment and human health. In addition, when the materials in the waste devices are recycled, the raw material needs of the countries are met economically. For this reason, many countries, including Turkey, are working to reduce the production of e-waste, to properly recover the produced waste and to dispose of non-recoverable waste in a standard way. Consumers play an active role in the recycling process of

e-waste. It is especially important for future generations to correctly understand the risks of e-waste on both the environment and human health, and to take precautions in advance for the coming years.

In the survey conducted on the basis of volunteerism, it was seen that despite the legal regulations and social responsibility projects implemented in Turkey, the awareness level of individuals between the ages of 18-25 on electronic waste and e-waste sustainability studies should be increased. Consumers in the relevant age group are theoretically aware of the risks posed by e-waste, but the majority of them do not actively contribute to recycling studies. It is of great importance that future generations reach a higher level of awareness about e-waste, in order to create permanent values for health, the environment and the country. For this purpose, joint studies should be carried out by authorized institutions, non-governmental organizations and educational institutions; more information should be provided and incentives should be implemented so that individuals in the relevant age group manage their waste appropriately.

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