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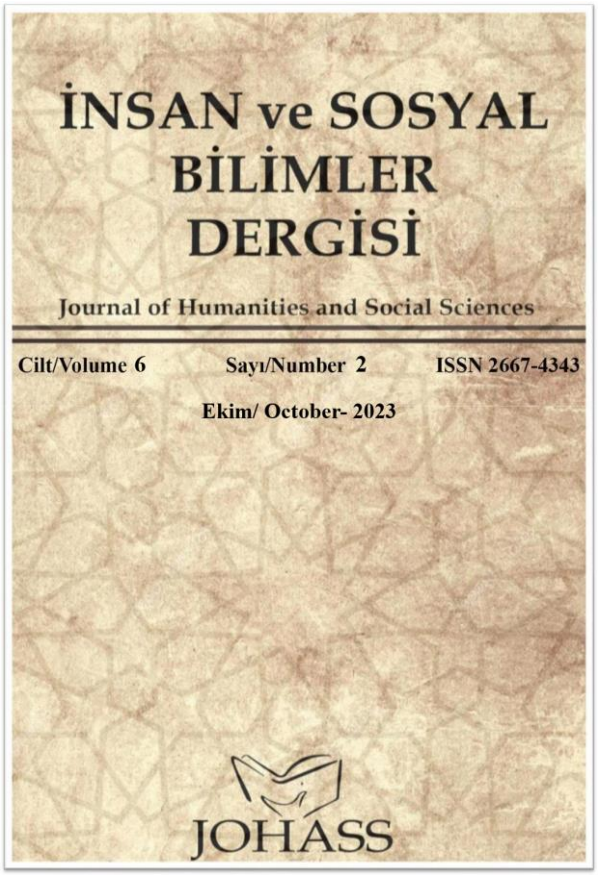

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Investigation of Preschool Teacher Candidates' Views on Zero Waste

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Abstract

Individuals' perspectives and views on zero waste are important in terms of minimizing the damage to the environment and a sustainable world. At this point, especially the level of educators' understanding of sustainability and zero waste will directly affect the worldview of students, who are the individuals of the future. The aim of this study is to determine and examine the views of pre-service preschool teachers on the concept of zero waste. Within the scope of the study, the views of 83 pre-service preschool teachers on zero waste were examined in depth using an interview form, and the data were analyzed by creating codes and categories. Phenomenology, one of the qualitative research methods, was used in the process. As a result of the study, it was determined that pre-service preschool teachers have limited knowledge about zero waste and sustainability. In addition, the fact that most pre-service teachers defined zero waste as recyclable waste indicates that there is an incomplete learning. It was determined that pre-service preschool teachers have limited knowledge and experience about reduce and reuse, which are recommended for a sustainable environment, and which take place before recycling in the zero waste hierarchy. Another important result was that pre-service preschool teachers prioritized especially plastic wastes in terms of recycling. In line with these results, it is recommended that these issues should be included in the education programmed for pre-service teachers.

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Introduction

People pollute the environments that they live in with the wastes that they leave to the environment. Although this pollution seems to be limited to that area where the individual lives, it actually directly affects the world. In the world where the carbon footprint is an average of 7 tonnes per year, it shows that the increasing human population creates a great pollution (Tezel & Yıldız, 2020). The result of atmospheric and marina pollution due to emission of various wastes in the world, various disasters related to global warming such as floods and droughts are encountered. These problems are among the main causes of climate change, which is called "red alert" for humanity in the United Nations Circular (Intergovernmental Panel on Climate Change [IPCC], 2021; Onuoha, Ngobiri, Ochekwub & Onuoha, 2022). Numerous ways to contribute to the solution of the climate crisis are put forward by researchers, policy makers and non-governmental organizations (Schouten, 2021; Geden, 2018). Although countries make some commitments from their upper legislative bodies, the public's opinion and opinion on this issue directly affects environmental change and can create solutions for problems. There are some ways to produce personal solutions to these problems around the world. Among these, there are suggestions such as reducing the use of fossil fuels, reducing meat and milk consumption, reducing the use of aircraft, using public transport in transportation, reducing energy consumption, respecting green areas, reducing consumption and waste (Bhoyar et al., 2014). In order to promote these solutions, countries carry out some studies in certain periods. At the beginning of these, studies on energy saving and then increasing green areas come first. In order to reduce waste and consumption by increasing energy saving and green areas, the issue of "Zero Waste" comes to the agenda. Zero waste is a project that includes ensuring efficient use of resources, preventing waste, minimizing waste generation processes by addressing them, and ensuring the recovery of the waste generated by separating them (Bagui, & Arellano, 2021; Song, Li & Zeng, 2015). The concept of zero waste includes the stages of reduce, reuse and recycle known as the "3R rule" to create a sustainable living space. These stages aim to create waste management awareness in the society and to produce solutions to global environmental problems in the distant goal (Yu, Zhang, Li, Montenegro-Marin & Kumar, 2021). Zero waste was implemented for the first time in Türkiye in 2017 and in this sense, steps were taken to prevent waste and use resources efficiently. Zero waste project started to be implemented for the first time according

to the Zero Waste Regulation published in the Official Gazette in 2019 and the project started to be implemented all over Türkiye in 2023 (Gül & Yaman, 2021).

Social acceptance is important for environmental initiative activities to be effective in solving environmental problems. These initiative activities become possible with the education of individuals. At this point, preservice preschool teachers who will educate future individuals who have the power to change societies and the world should have environmentalist goals and learning areas for a sustainable society (Atasoy & Ertürk, 2008; Gülersoy, Dülger, Dursun, Ay & Duyal, 2020). There is a compulsory course called "Early Childhood Environmental Education" in the undergraduate program for preschool teachers in Türkiye. In preschool teaching undergraduate programs and other teacher training undergraduate programs, course materials, outcomes and subject contents should be related to the environment and zero waste (Kowasch, 2022; Özel & Erdaş Kartal, 2022). At this point, the thoughts, opinions and prior knowledge of teachers, who are the primary practitioners in the teaching of learning outcomes, are very important. In the literature, studies on this subject have come to the forefront in recent years and studies have been conducted especially for science and social studies teachers and prospective teachers. In these studies, awareness levels towards basic concepts were generally examined (Altınok, 2021; Dal & Okur Akçay, 2021; Harman & Yenikalaycı, 2020; Önal, Kaya & Çalışkan, 2019). In addition, in the international literature, it is seen that the concept of zero waste is addressed at the point of reducing environmental problems (Álvarez-García, Sureda-Negre & Comas-Forgas, 2015; Kowasch, 2022; Mónus, 2022; Murley, Gandy & Huss, 2017). Although these studies mostly include field-based evaluations, they do not contain sufficient information about lower age groups and their teachers. In the current study, it was aimed to determine the views of pre-service preschool teachers on the concept of zero waste.

Method

The research aims to determine the views of preservice preschool teachers on zero waste. In this context, analyses of common experiences and experiences towards a phenomenon or phenomenon (zero waste) were discussed. In this process, the opinions of individuals were revealed with the phenomenological design, one of the qualitative research methods. In this design, the aim is to understand a particular phenomenon in depth based on the experiences of individuals. At this point, it is expected to reveal the cognitive structures of

each pre-service teacher by looking closely at their experiences and comments on the zero waste issue that they perceive and focus on in their own world with the primary data collection method (Christensen, Johnson & Turner, 2015; Creswell & Poth, 2016). In this study, in accordance with the nature of the phenomenological research design, questions were asked about the perception/experience of pre-service preschool teachers on zero waste, answers were received and analyses were made on the subject or phenomenon of zero waste.

Working Group

Convenient sampling technique was used to determine the study group of the research. Convenient sampling technique is frequently used in qualitative sampling because it provides advantages to the researcher in terms of economic, practical and easy accessibility. Here, convenient sampling occurs when individuals are invited to the study. Convenient sampling also provides speed to the researcher for the realization of the study. The disadvantage of convenience sampling is that the universe cannot be represented because the sample is small or limited to a certain area. Here, generalization to a larger population remains limited (Creswell & Poth, 2016; Yıldırım & Şimşek, 2013). In this study, 63 undergraduate students studying at Kastamonu University, Faculty of Education, Department of Preschool Education were included in the study group. The participants were given codes as K1 , K2 , ...K63 .

Data Collection

The data were collected in spring semester of 2023. The interview form developed by the researchers was used as a data collection tool. Participants were asked 12 open-ended questions and answers were received. The questions in the interview form are as follows: “What is waste? Explain.”, “Can you list five wastes that come to mind?”, “How many types of waste do you think there are? Explain.”, “What is zero waste? Explain.”, “What is your opinion on the feasibility of zero waste? Please explain.”, “Which practices can be done in our faculty for zero waste? Explain.”, “What do you think about the relationship between zero waste and recycling? Explain.”, “How do blue caps and similar campaigns affect the use of plastic and pet bottles? Explain.”, “Where would you like recycling bins to be placed in our faculty?”, “Is the mask medical waste? Explain.”, “Should waste mask bins be placed in a different area from recycling bins?” and “What do you think about epidemic and waste management? Explain.”. The validity and reliability of the data collection tool were ensured by taking expert who worked on preschool opinion while creating the data collection tool.

Analyzing the Data

In the study, data were collected by researchers. The interview form was distributed to the preservice teachers and then the preservice teachers were asked to answer and fill the interview forms without any time limit. The forms were collected from the pre-service teachers who completed the interview form. In the study, it was also paid attention that the participants were volunteers. Content analysis and descriptive analysis were used to analyses the data. The data were analyzed according to predetermined codes and themes and the analyses were interpreted. Direct quotations were also used to increase reliability in the study. The reliability in data analysis was calculated using Miles and Huberman's (1994) formula of consensus/ (consensus + disagreement) x 100 and 92.92% was found. This reliability coefficient should be at least 80%. The reliability coefficient of 92.92% in the study shows that the analyses are reliable (Miles & Huberman, 1994; Patton, 2002).

Compliance with Ethical Standard

Ethical rules were complied with at all stages of this study, and effective approval of the study was received as a result of the decision of Izmir Bakırçay University Ethics Committee dated 24.08.2023 and numbered 1142.

Findings

In the research, preschool teachers were asked questions in the interview form prepared in line with the purpose of the research and their answers were received. In this direction, the findings were presented according to the sub-problem situations in the research. Pre-service preschool teachers were asked the question "What is waste?" and the data obtained were analyzed and presented in Table 1.

Table 1

Analysis of Pre-Service Preschool Teachers' Views on The Definition of Waste

Themes	f	%	Examples
Material discarded after use.	21	33.3	It is any kind of material that has been used and generally cannot fulfill the same function again in the same way (P5).
A substance that has lost its function.	21	33.3	Dysfunctional substances remaining after the use of a functional substance (P11).
A substance that is harmful to the	14	22.2	All materials that are used and left to the

environment.			environment and are harmful for the environment are called waste (K60).
Any kind of used material.	3	4.8	Used materials are called waste (P34)
Any recyclable used material.	3	4.8	All products that are no longer used but can be recycled are waste. Glass, packaging, fabric, etc. (P31).
Non-recyclable material.	1	1.6	Non-recyclable materials (K13)

The analysis of Table 1 has shown that pre-service preschool teachers mostly answered the question of "what is waste?" as a substance that is discarded after use (33.3%), has lost its function (33.3%) and is harmful for the environment (22.2%). 4.8% of the pre-service teachers defined waste as any kind of used material and recyclable material. Only one of the teachers defined waste as a non-recyclable substance.

Pre-service preschool teachers were asked the question "Can you list five wastes that come to your mind?". Pre-service preschool teachers suggested 320 words related to waste. The keywords suggested by pre-service preschool teachers with waste types and the themes covering those keywords are presented in Table 2. While creating the themes, zero waste *"https://sifiratik.gov.tr/"* address was used.

The analysis of Table 2 has shown that the theme covering the most suggested keywords by pre-service preschool teachers was plastic waste (25.3%). After plastic waste, paper waste (18.4%), glass waste (16.3%), waste battery (9.4%) and metal waste (7.2%) are among the themes covering the most suggested and most prominent keywords. The themes covering other suggested waste words remain below 5 per cent of the total words.

Table 2

Analysis of Pre-Service Preschool Teachers' Views on Keywords about Waste

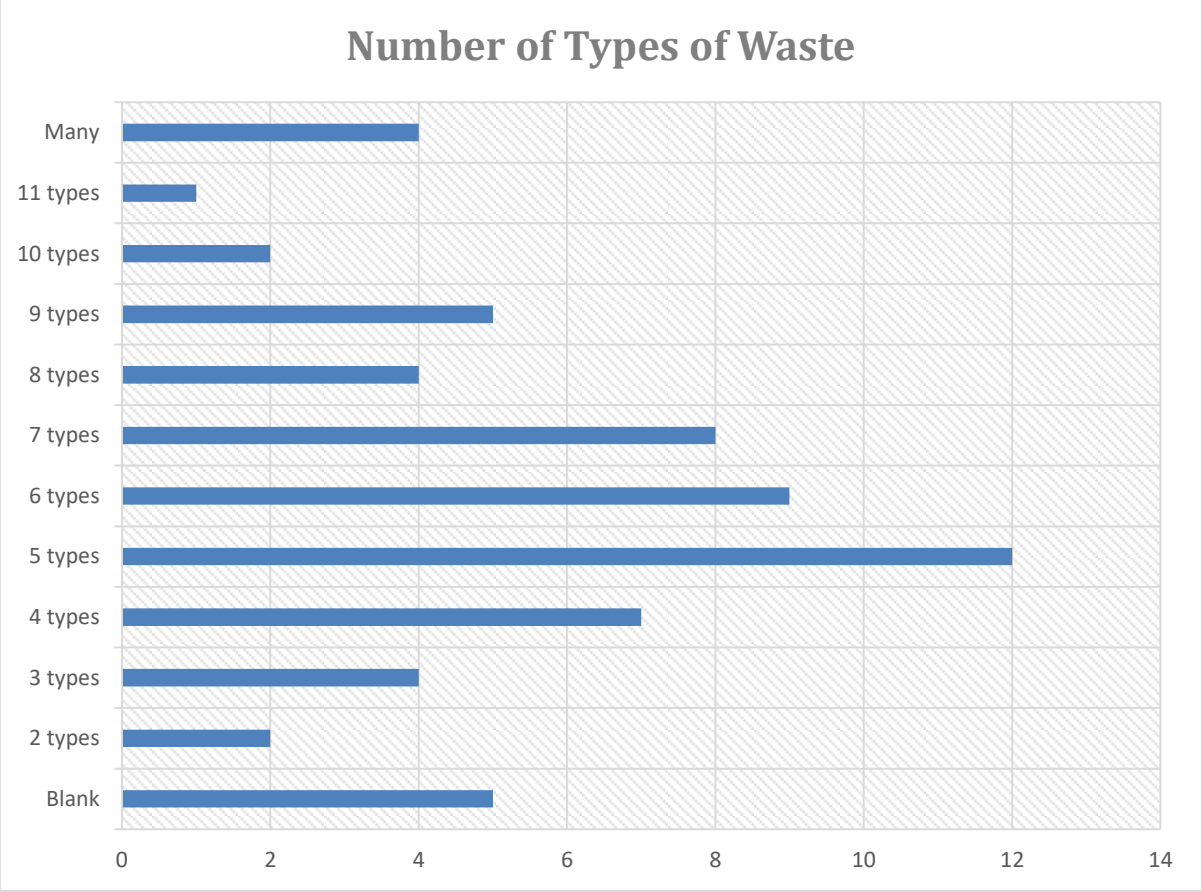
Themes	**f**	**%**	**Codes**
Plastic waste	81	25,3	Plastic (41), bags (15), plastic bottles (12), packaging (7), nylon (4), bottle caps (2).
Paper waste	59	18,4	Paper (41), cardboard parcel (8), toilet paper and roll (8), notebook (1), newspaper (1).
Glass waste	52	16,3	Glass (30), beverage bottle (17), glass jar (3), glass (1), perfume bottle (1).
Waste Battery	30	9,4	Battery (28), waste battery (2).
Metal waste	23	7,2	Metal (12), tin (4), tin cans (3), iron (2), oil drums (2).
Organic waste	15	4,7	Fruit and vegetable waste (9), organic waste (3), vegetable waste (2), composite (1).
Vegetable waste oil	10	3,1	Waste oil (10).
Textile Waste	9	2,8	Fabric (6), clothes/garments (3).
Medical Waste	9	2,8	Medical waste (6), mask (1), syringe (1), gloves (1).
Electronic waste	5	1,6	Electronics (2), light bulb (1), charger (1), technological waste (1).
Composite waste	2	0,6	Juice and milk packaging (2).

Wood waste	2	0,6	Toothpick (1), board (1).
Other	23	7,2	Food and catering waste (6), chemical waste (3), garbage (3), industrial and industrial waste (3), butts (1), faeces (1), agricultural waste (1), waste motor oil (1), construction (1), broken objects (1), polluted water (1), chewing gum (1).

Preschool teachers were asked the question "How many types of waste do you think there are?" and answers were received. The number of waste types is presented in Figure 1.

Figure 1

Analysis of Pre-Service Preschool Teachers' Views on the Number of Waste Species



The analysis of Figure 1 has shown that pre-service preschool teachers stated that there are five, six, seven and four types of waste respectively. In addition, it was also determined that there were pre-service teachers who left this question blank and said that there were many types of waste.

Preservice preschool teachers' codes and themes that include codes and codes related to the type of waste type are presented in Table 3.

Table 3

Analysis of Pre-Service Preschool Teachers' Views on the Type of Waste

Waste Type	f	%
Plastic waste	38	60.3
Glass waste	33	52.4
Paper waste	32	50.8
Metal waste	29	46.0
Organic waste	21	33.3
Waste Battery	19	30.2
Medical Waste	14	22.2
Vegetable waste oil	14	22.2
Wood waste	11	17.5
Composite waste	9	14.3
Electronic waste	7	11.1
Textile Waste	3	4.8

The answers to the type of waste is analysed; 60,3% of the pre-service preschool teachers stated that plastic, 52,4% glass, 50,8% paper, 46% metal, 33,3% organic, 30,2% waste battery, 22,2% medical and vegetable waste oil, 17,5% wood, 14,3% composite, 11,1% electronic and 6,3% textile waste types. In addition, 10 of the pre-service preschool teachers evaluated domestic waste, seven of them evaluated chemical, four of them evaluated food and catering, construction, radioactive, industrial, and industrial waste, two of them evaluated hazardous, liquid and recyclable and non-recyclable waste, one of them evaluated environmental, mixed with nature and not mixed with nature, solid, gas, agricultural, zero, non-harmful waste, garbage and oil as waste types.

Pre-service preschool teachers were asked the question "What is zero waste?" and the answers were analyzed. The results of the analysis are presented in Table 4.

The analysis of Table 4 has shown that 46% of pre-service preschool teachers defined zero waste as recycling. 27% of the pre-service teachers defined zero waste as minimizing waste by reusing it, 15.9% defined it as efficient use of resources by preventing waste, and 3.2% defined it as materials that are thrown away without being used. One teacher stated that he had no information on the subject.

Table 4

Analysis of Pre-Service Preschool Teachers' Views on Their Definitions of Zero Waste

Themes	f	%	Examples
Recycling of waste	29	46.0	Zero waste is to utilise leftover materials and prevent them from being rubbish. It is to transform (P35). Preventing

			waste generation and recycling (P14). Efforts are made to minimise waste by preventing waste generation and ensuring their recycling (P62).
Minimising waste through reuse.	19	30.1	The idea of preventing or minimising waste generation (P53). Minimising the level of waste in order not to harm the nature (P4).
Efficient use of resources by preventing waste	10	15.9	Making wastes suitable for reuse and not wasting them (P58). Preventing waste and using resources more efficiently (P29).
Materials thrown away without being used	2	3.2	Materials thrown away without being used (P48).
No information	1	1.6	I have no knowledge (P57).

Pre-service preschool teachers were asked the question "What is your opinion on the applicability of zero waste?" and the answers were analyzed. The results of the analysis are presented in Table 5.

Table 5

Analysis of Pre-Service Preschool Teachers' Views on the Applicability of Zero Waste

Themes	**f**	**%**	**Examples**
Can be implemented by raising awareness of individuals	20	31.7	I think that the applicability of zero waste can be implemented on a wider scale by raising people's awareness (P5).
Applicable to waste reuse and recycling	11	17.5	It can be done if recycling practices are increased (P52).
Zero waste can be implemented.	10	15.9	It is definitely feasible and very useful and is essential to reduce the consumption of the world's resources and increase renewability (P17).
It can be implemented if people are responsible and sensitive about zero waste.	7	11.1	If our society can be very sensitive about waste, I think zero waste can be implemented (P60).
Zero waste is difficult to implement.	6	9.5	Although it seems a little difficult in today's conditions, it is not impossible. It is necessary to create awareness and raise awareness on this issue (P41).
Minimalist living is important	2	3.2	Individuals should learn and adopt the minimalist life philosophy (P56)
No information	2	3.2	I have no knowledge (P57)
Other (Importance, public service announcements, municipalities should be active)	3	4,8	Not enough importance is given. More importance should be given, public service announcements should be made, It is a very important target and project (P26)

31,7% of pre-service preschool teachers stated that individuals should be aware of the implementation of zero waste, 17,5% stated that zero waste can only be realized through reuse and recycling, 11,1% stated that it can only be implemented if people are sensitive and responsible. While 15.9% of pre-school teacher candidates stated that zero waste can be implemented, 9.5% stated that it is difficult to implement. In addition, two teachers

emphasized the importance of minimalist life in the implementation of zero waste and two other teachers stated that they had no knowledge on this subject.

Pre-service preschool teachers were asked the question " Which practices can be done in our faculty for zero waste?" and the answers were analyzed. The results of the analysis are presented in Table 6. Since the answers given by pre-service teachers in this question were included in more than one theme, the number of units given by pre-service teachers was taken into consideration in the analyses, not the number of pre-service teachers.

Table 6

Analysis of Pre-Service Preschool Teachers' Views on the Implementation of Zero Waste in Faculties

Themes	f	%	Examples
Brochures, posters, and animations can be prepared, events such as seminars, conferences and theatre can be organized.	31	49.2	Due to the geographical location and demographic characteristics of our faculty, I think more than one project can be implemented, I think the important thing is the desire and intention (P26). Conferences can be organized to raise people's awareness, and cooperation can be made with the municipality (P23).
Can be implemented by recycling.	22	34.9	Recycling bins for plastic bottles, paper, batteries and glass waste can be placed in various places (P46).
Recycling bins can be increased and made widespread.	13	20.6	Recycling bins should be diversified and widespread throughout the faculty, posters indicating color scales should be hung, informative banners and posters about recycling should be placed in our faculty (P29).
Waste can be exchanged for money or other reinforcement.	3	4.7	If the person who brings the waste is paid a very small amount of money, if there is a machine for this purpose, if there is a machine that gives money in return when plastic bottles are thrown there, such a vending machine provides a large amount of recycling of plastic waste (P11). Vending machines that give certain things in return for recycling, as some municipalities do (P15).
I don't know	3	4.7	I have no knowledge (P57).

Regarding the implementation of zero waste in their faculties, 49.2% of pre-service preschool teachers stated that brochures, posters, and animations can be prepared, seminars, conferences and theatre can be organized, 34.9% stated that recycling bins can be placed in various parts of the faculty, 20.6% stated that recycling bins can be made widespread, 4.7% stated that money or other reinforcement should be given in return for waste. 4.7% of pre-school teacher candidates stated that they did not have any knowledge.

Pre-service preschool teachers were asked the question "What do you think about the relationship between zero waste and recycling?" and the answers were analyzed. The results of the analysis are presented in Table 7.

Table 7

Analysis of Pre-Service Preschool Teachers' Views on The Relationship Between Zero Waste and Recycling

Themes	f	%	Examples
Zero waste can be achieved through recycling.	27	42.9	Zero waste means that no waste is thrown away and we can achieve this by recycling (P3). To achieve zero waste, waste must be recycled (P11).
There is a positive relationship between zero waste and recycling.	16	25.4	It enables the reuse of zero material wastes with one material recycling. So, I think there is a positive relationship (P23). There is a positive correlation (P50).
The two are almost identical concepts.	6	9.5	I know that they are both similar and almost the same concepts (P37).
They're both useful.	2	3.2	Zero waste; to prevent waste is to prevent it. Waste that cannot be prevented can be collected for recycling. Both are very useful projects (P4).

The examination of Table 7 has supplied that almost half of the pre-service preschool teachers stated that they could reach zero waste through recycling. In addition, 25.4% of the pre-service teachers stated that there is a positive correlation between zero waste and recycling, 9.5% stated that the two concepts are the same and 3.2% stated that both are useful.

Pre-service preschool teachers were asked the question "How do blue caps and similar campaigns affect the use of plastic and pet bottles?" and the answers were analyzed. The results of the analysis are presented in Table 8.

Table 8

Analysis of Pre-Service Preschool Teachers' Opinions on the Effect of Blue Caps and Similar Campaigns on the Use of Plastic and Pet Bottles

Codes	f	%
It has not changed.	27	42.9
Increased.	20	31.7
Reduced.	15	23.8
Leaving Empty	1	1.6

The analysis of Table 8 has shown that 42.9% of pre-service preschool teachers stated that such campaigns did not change the use of plastic and pet bottles and 31.7% stated that

they increased it. Considering the total rate in these two answers (75%), pre-service teachers stated that these campaigns either did not work or increased the use of plastic and pet bottles. On the other hand, only 23.8% of the pre-service teachers stated that these campaigns reduced the use of plastic bottles and plastics.

Pre-service preschool teachers were asked the question "Where would you like recycling bins to be placed in our faculty?" and the answers were analyzed. The results of the analysis are presented in Table 9.

Table 9

Analysis of Pre-Service Preschool Teachers' Opinions on the Location of Recycling Bins in the Faculty

Themes	**f**	**%**
It should be placed at entrances and exits.	34	54
It should be placed in the canteen.	26	41.3
It should be placed in the garden.	11	17.5
It should be placed wherever students can see it.	8	12.7
It should be placed in school corridors.	7	11.1
They should be placed in classrooms.	5	7.9
Must be placed on each floor	5	7.9
It should be placed in areas where students spend time collectively.	3	4.8
It should be placed next to the security booth.	3	4.8
They should be placed in places accessible to everyone.	3	4.8
It should be placed next to the rubbish.	2	3.2

The analysis of Table 9 has revealed that more than half of the pre-service preschool teachers stated that recycling bins should be placed at entrances and exits. In addition, 41.3% of the pre-service teachers stated that recycling bins should be placed in the canteen, 17.5% in the garden, 12.7% in places where students can see, 11.1% in the corridors and 7.9% in the classroom and on each floor, There is one teacher indicating that they should be placed at the transition points between blocks, near the seating areas, in the administrative department, in social activity centres, outside the classroom and school, next to the pool, everywhere, in the sports hall, in each block, on the edge of the cafeteria hall and in common areas.

Pre-service preschool teachers were asked the question "Is a mask medical waste?" and the answers were analyzed. The results of the analysis are presented in Table 10.

Table 10

Analysis of Pre-School Teacher Candidates' Opinions on Whether the Mask is Medical Waste or Not

Themes	f	%
Yes	57	90.5
No.	4	6.3
Leaving Empty	2	3.2

While 90.5% of the pre-school teacher candidates stated that the mask was medical waste, 6.3% stated that the mask was not medical waste.

Pre-service preschool teachers were asked the question " Should the waste mask bins be placed in a different area from the recycling bins?" and the answers were analyzed. The results of the analysis are presented in Table 11.

Table 11

Analysis of Pre-School Teacher Candidates' Opinions on The Locations of Waste Masks and Recycling Bins

Themes	f	%
Yes	48	76.2
No.	9	14.3
Doesn't matter	5	7.9
Leaving Empty	1	1.6

While 76.2% of pre-service preschool teachers stated that waste mask bins should be placed separately from recycling bins, 14.3% of them disagreed with this view. Five of the pre-service preschool teachers stated that they did not notice.

Pre-service preschool teachers were asked the question "What are your opinions about epidemic and waste management?" and the answers were analyzed. The results of the analysis are presented in Table 12.

Table 12

Analysis of Pre-Service Preschool Teachers' Views on Epidemic and Waste Management

Themes	f	%	Examples
As consumption increased with the pandemic, the amount of	15	23.8	With the pandemic, people's consumption needs have also increased, so the number of waste materials has increased

waste increased.			(P5)
People should be made aware of the pandemic and waste management.	13	20.6	People should be made aware of this issue and information seminars should be organised and everyone should do their part and set an example (P52).
If waste management is done well, a clean environment is ensured, and outbreaks can be prevented.	8	12.7	When waste management is provided, environmental cleanliness is also ensured. This leads to a decrease in epidemics and a clean environment (P43).
With the pandemic, the number of harmful items such as masks and gloves increased.	8	12.7	With the pandemic, masks and gloves that we ruthlessly throw around us were also added (P40).
I don't have an opinion.	3	4.8	I do not know (P14).
There is no work on this issue.	3	4.8	I think it is something done to prevent waste production (P58).
Increasing the amount of waste may increase the spread of the epidemic.	3	4.8	Waste materials may increase the epidemic rate and cause new outbreaks (P46).
Studies on waste management should be carried out.	2	3.2	Waste management should take a more active role in this issue and serious work should be done to prevent the epidemic. The pandemic has already negatively affected human health and the environment, and the inclusion of waste will worsen the situation (P55).
The pandemic was beneficial for the environment. There has been progress in waste management.	2	3.2	I think that the amount of waste has decreased due to the pandemic and that it is a beneficial process for the environment. I think that certain steps have been taken in waste management stages (P41).

Regarding the epidemic and waste management, 23.8% of pre-service preschool teachers stated that there was an increase in the amount of waste with the epidemic, 20.6% stated that people should be aware of waste and epidemic management, 12.7% stated that if waste management is done well, a clean environment is provided and epidemics can be prevented, and that there was an increase in the number of harmful items such as masks and gloves with the epidemic. In addition, there are also pre-service teachers who stated that they have no opinion, that the increase in the amount of waste increases the epidemic, that studies should be carried out with waste management and that the epidemic is positive for the environment.

Discussion and Results

Sustainability is one of the important issues necessary to provide a livable world for future generations. It directly affects people such as social norms, cultural diversity and economic activity areas. The teaching of concepts related to sustainability terms in the education system will accelerate the change of individuals and society. Especially, the education given at young ages will be more permanent in the individual. Providing this education in the sensible and wise perspevtive is another important issue. Examining the

knowledge, skills and opinions of preschool teachers and pre-service teachers on these issues in order to support their individual competencies contributes positively to the process. Within the framework of the findings obtained, it was seen that pre-service teachers did not have sufficient knowledge about the concept of waste and zero waste. In addition, the fact that the majority of pre-service teachers defined zero waste as recyclable waste shows that an incomplete learning has occurred. At this point, it was determined that pre-service preschool teachers do not have sufficient knowledge and experience about reduce and reuse, which are recommended to be done before recycling (recycle) for a sustainable environment. In addition to these, it is another important result that pre-service preschool teachers prioritize especially plastic wastes.

Pre-service preschool teachers defined waste as a substance that is discarded after use, has lost its function and is harmful to the environment. In addition, some of the teachers defined waste as all kinds of used materials and recyclable materials. Here, while the pre-service teachers defined waste as a substance that is discarded after use, i.e. a disposable substance of a product, some of the pre-service teachers defined waste as a substance that has lost its function. These two situations show that pre-service teachers have different knowledge levels and habits in terms of sustainability and zero waste. The fact that a product has lost its function means that it is used until the last stage for its purpose. This situation supports both the dimension of reuse and reducing use. However, these situations are not valid for those who express disposable use. In the literature, it was found that pre-service science teachers mostly aim to reduce use and reuse (Harman & Yenikalaycı, 2020; Keleş & Aydoğdu, 2010). The study conducted by Sivrikaya (2018) on pre-service science and Turkish language teachers, the ecological footprints of the candidates were evaluated in different dimensions and it was determined that there was a significant difference in favor of pre-service science teachers in the management of waste and especially in the reduction dimension. This result shows that especially pre-service teachers studying in social fields do not have sufficient knowledge in this field. This situation is similar to the result of this study. Günşen (2023) stated that environmental trainings that will create awareness in pre-service preschool teachers affect the process positively. In addition, pre-service teachers stated that disposable wastes were related to the epidemic in the past.

Pre-service teachers listed the keywords plastic, paper, glass, battery and metal waste the most. Pre-service teachers mostly gave five, six and seven answers as waste types. In addition, there were also candidates who left the waste type blank or stated that there were

many waste types. Apart from those who left it blank, pre-service teachers who indicated the number of waste types stated that there were mostly plastic, glass, paper, metal, organic, battery, medical and herbal, wood, oil and composite waste types. This situation shows that pre-service teachers associate waste with the materials they encounter in daily life. The study conducted by Erdaş Kartal and Ada (2019) with pre-service preschool teachers supports this result. In addition, this situation is also valid for pre-service science teachers (Harman & Çeliker, 2016). Almost all of the pre-service preschool teachers stated that the mask was medical waste. The vast majority of pre-service teachers (76.2%) stated that waste mask boxes should be placed separately from recycling boxes. Regarding the epidemic and waste management, pre-service preschool teachers stated that there was an increase in the amount of waste with the epidemic, people should be aware of waste and epidemic management, if waste management is done well, a clean environment is provided and epidemics can be prevented, and there was an increase in the number of harmful substances such as masks and gloves with the epidemic.

Approximately half of the pre-service preschool teachers defined zero waste as recycling. After that, they defined it as minimizing waste by reusing it, using resources efficiently by preventing it, and materials that are thrown away without being used. In addition, one teacher stated that he had no knowledge on this subject. When the literature is examined, it is seen that there are parallel results to this situation (Dal & Okur Akçay, 2021; Harman & Yenikalaycı, 2020). From this, it can be inferred that pre-service teachers' thoughts on the definition of zero waste are limited. This may be due to the novelty of the concept of zero waste. At the point of implementation of zero waste, pre-service teachers stated that individuals should be raised awareness, zero waste can only be implemented through reuse and recycling, individuals being sensitive and responsible, and the importance given to minimalist life. In addition, it was determined that there were two teachers who stated that they had no knowledge on the subject. The prospective teachers stated that brochures, posters and animations can be prepared, ethical events such as seminars, conferences and theatre can be organized, recycling bins can be placed in various parts of the faculty, recycling bins can be made widespread, money or other reinforcement can be given in return for waste. On the other hand, there were also pre-service teachers who stated that they had no knowledge on the subject. Regarding the applicability of the concept of zero waste, preservice preschool teachers stated that media and animations should be used to raise awareness from near to far. There is a similar situation in the literature regarding this result. Altınok (2021) stated that

social studies teachers stated that the content related to zero waste is insufficient. This situation is similar not only at the university level but also at the basic education level. Studies have stated that these issues are not sufficiently covered in textbooks, which are the basic teaching resource tools at this level (Erten & Köseoğlu, 2022; Önal, Kaya & Çalışkan, 2019). In addition, it was also stated by pre-service teachers that recycling bins should be in areas where people create waste. It is thought that this will contribute to both awareness and active processing of the process.

The almost half of pre-service preschool teachers assumes that zero waste can be achieved through recycling. Some of the candidates stated that there is a positive relationship between zero waste and recycling and that the two concepts are the same and useful. The majority of the prospective teachers stated that blue caps and similar campaigns did not change or increase the use of plastic bottles. Regarding the placement of recycling bins in the faculty, more than half of the candidates stated that bins should be placed at the entrance and exit of the faculty. In addition, they stated that the boxes should be placed in the canteen, garden, places where students can see, corridors, classrooms and floors respectively.

In line with the results of the research, courses on zero waste and sustainability can be added to the preschool teaching program and activities can be prepared for this purpose.

Compliance with Ethical Standard

Ethical rules were complied with at all stages of this study, and effective approval of the study was received as a result of the decision of Izmir Bakırçay University Ethics Committee dated 24.08.2023 and numbered 1142.

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