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RESEARCH ARTICLE

Preschool Children's Awareness of Recycling: A Case Study

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What is already known on this topic?

- *Environmental education in early childhood plays a critical role in shaping environmental awareness and sustainable behaviors.*
- *Preschool children are capable of recognizing the concept and symbol of recycling as well as identifying basic recyclable materials such as paper, glass, and plastic.*
- *International studies show that play-based and experiential learning activities significantly enhance children's environmental awareness and promote positive recycling habits.*

What this study adds on this topic?

- *This study, conducted with 48–60-month-old children in Türkiye, demonstrates that preschoolers not only recognize recycling as a concept and symbol but also connect it with their daily practices.*
- *Children's drawings prominently feature recycling bins, environmental pollution, and nature, indicating that their conceptual understanding of recycling is reinforced by behavioral expressions.*
- *Findings reveal that although children have a high level of recycling awareness, real-life practices, particularly at home, remain limited, highlighting the need for stronger collaboration between schools and families.*

Abstract

This study examines the recycling awareness among children aged 48–60 months attending preschool education. The research employs a qualitative methodology, utilizing a case study design. The study was conducted with 36 children selected through purposive sampling. Data were collected using a semi-structured interview form and a drawing form developed by the researchers. The collected data, including children's drawings and interview responses, were analyzed using content analysis with the support of MAXQDA Analytics Pro 2022 (VERBI Software, Berlin, Germany), which is licensed to the Fatih Sultan Mehmet Vakıf University Center for Excellence in Education Research (EMAM). he collected data, including children's drawings and interview responses, were analyzed using content analysis with the support of MAXQDA Analytics Pro 2022 (VERBI Software, Berlin, Germany), which is licensed to the Fatih Sultan Mehmet Vakıf University Center for Excellence in Education Research (EMAM).

According to the findings, children define recycling as reusing materials and creating new objects. They identify paper, glass, and plastic as recyclable materials and express that recycled materials can be transformed into new paper and items. Regarding the benefits of recycling, children associate it with maintaining a clean and aesthetically pleasing environment and consider it essential for a livable world. Additionally, an analysis of the children's drawings reveals that themes related to environmental pollution, recycling, and nature are prominently featured, indicating their conceptual understanding and awareness of these issues.

These findings suggest that preschool children have a firm grasp of the concept of recycling, recognize its environmental benefits, and actively engage in recycling behaviors. However, despite their high awareness levels, their responses indicate that real-life applications may vary, particularly in home environments. Based on these results, it is recommended that collaboration between schools and families be strengthened to foster consistent recycling habits among young children.

Keywords: Early childhood education, environmental education, recycling, recycling awareness, sustainable environment

Introduction

Environmental education has gained significant importance in an era where population growth, technological advancements, industrialization, and rapidly increasing consumption pose serious environmental and human health threats (Erdaş Kartal & Ada, 2020). In this process, factors such as the expansion of marketing activities, unconscious and intense use of natural resources, and increased waste quantity have created adverse effects on the environment. This situation has led to various environmental problems, including the depletion of natural resources, increased energy use, increased waste quantity, and rising environmental pollution (Onur et al., 2016). To mitigate or eliminate these effects, adopting environmentally friendly behaviors at societal, institutional, and individual levels is necessary. Establishing lifestyles centered on a sustainable future and widespread adoption of recycling is of utmost importance (Kızılkaya & Beşoluk, 2017).

In recent years, international research on developing recycling awareness and environmental consciousness in early childhood has gained momentum. Tan & Güler (2024) conducted an action research study in Türkiye, demonstrating that hands-on recycling activities significantly enhanced children's environmental awareness. Similarly, Mohamad et al. (2024) in Malaysia investigated the impact of an interactive play-based activity, the "Recycling Traffic Mini Park," on preschool children's understanding and habits related to recycling. Their findings indicated notable improvements in children's recycling knowledge and behavioral engagement.

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Research conducted in Europe further supports these trends. Sihvonen et al. (2024) examined a project in Finnish kindergartens, emphasizing the critical role of cultural context in shaping children's recycling awareness. Their study underscored that free play in natural settings and close collaboration between parents and teachers were pivotal in fostering sustainable behaviors in young children.

Environmental sustainability is an approach that aims to increase efficiency in the production activities and planning of institutions and organizations and promote the long-term use of environmental resources (Domka, 2004; Umut et al., 2015). In today's world, environmental issues are gaining increasing importance and urgency. Factors like climate change, depletion of natural resources, and environmental pollution threaten the sustainability of the planet. In this context, environmental education becomes crucial in helping children develop environmental consciousness early, adopt strategies for conserving natural resources, and acquire environmentally compatible behaviors (Ministry of Environment and Urbanization of the Republic of Türkiye, 2004). The preschool period is a phase where children naturally explore and are curious about their environment. The concept of environmental education during the preschool period was introduced by Jaus in 1982 (Russo, 2001). In this period, developing positive attitudes and behaviors toward the environment helps children acquire sustainable habits in their later lives (Yaşar et al., 2012). During this period, children curiously investigate the natural world and form a fundamental environmental consciousness (Çimen & Yılmaz, 2012). Therefore, providing environmental education to instill positive attitudes toward the environment is crucial. Teachers engage in activities that foster sustainable behaviors and recycling habits within environmental education. Starting environmental education at an early age contributes to children becoming conscious and environmentally sensitive citizens in the future (Gülay & Öznacar, 2010). One of the key components of environmental education, recycling, plays a critical role in conserving and effectively using natural resources (Şallı et al., 2013). Recycling means transforming reusable waste into raw materials and reintegrating them into production (Büyüksaatçı et al., 2008). Globally, recycling is highly significant for conserving and efficiently utilizing natural resources (Soğancılar, 2018). Recycling is a process that occurs in three stages: the first stage involves collecting and processing recyclable materials, the second stage includes using these processed materials in the production of new products, and the final stage is the purchase and use of these new products (Environmental Protection Agency, 2013). One of the primary objectives of recycling is to reduce the amount of solid waste while enabling the reuse of valuable waste materials (UNESCO, 1992). By saving energy, recycling typically requires less energy during the production process of the recycled material, reduces the use of fossil fuels, and lowers greenhouse gas emissions (Worrell & Reuter, 2013). In the contemporary era, as global environmental challenges continue to escalate, the significance of sustainability education has become increasingly evident. Enhancing environmental awareness during early childhood can empower future generations to address these challenges more effectively. Numerous international studies have demonstrated that environmental education initiated in early childhood facilitates the adoption of sustainable behavioral patterns among children. For instance, a study conducted by Tan and Güler (2024) in Türkiye revealed that hands-on recycling activities significantly enhanced children's environmental awareness. Similarly, research by Apriliana et al. (2024) in Indonesia highlighted the effectiveness of learning activities using recycled materials in fostering young children's environmental awareness and creativity. Their study demonstrated that integrating recycled materials into kindergarten activities not only promoted sustainability but also enhanced fine motor skills and problem-solving abilities. However, the majority of these studies are limited to specific geographical

regions, and there is a lack of research examining the effects of recycling education across diverse cultural contexts. Understanding how recycling awareness develops among preschool children in different cultural environments is essential for addressing this gap and enabling the adaptation of environmental education strategies on a global scale. This study aims to contribute to international research by evaluating the effectiveness of strategies designed to enhance recycling awareness among preschool children in Türkiye, thereby offering valuable insights into optimizing environmental education across various cultural contexts. This approach not only addresses the need for further research highlighted by previous studies but also underscores the importance of expanding the body of knowledge to incorporate diverse cultural perspectives. By doing so, this study not only fills a critical gap in the existing literature but also highlights the universal relevance of early childhood environmental education and its potential to influence sustainable practices on a global scale. There is a need for more detailed research on preschool children's understanding and behavior toward recycling. This research aims to comprehensively examine the knowledge and behaviors of preschool children regarding recycling. The sub-objectives of the research are as follows:

1. How do preschool children define and interpret the concept and symbol of recycling?
2. How do they identify and classify recyclable materials?
3. What criteria do they consider when evaluating the recyclability of different materials?
4. What are their views on the environmental benefits of recycling?
5. How do their drawings depict a sustainable environment and recycling process?

Methods

This study was conducted using a case study design, one of the qualitative research methods. Qualitative research aims to explore and deeply analyze individuals' or groups' perceptions, experiences, and interpretations regarding a specific topic (Merriam, 2009; Yıldırım & Şimşek, 2016). Case study research allows for an in-depth examination of a phenomenon or event within its natural context (Yin, 2018).

Given that the study focuses on understanding preschool children's awareness of recycling, a qualitative research approach was adopted. This method was chosen as it enables the most compelling exploration of children's thoughts and perceptions regarding recycling. Case studies are particularly suitable for observing how individuals or groups behave in a given context and analyzing their thoughts and emotions (Stake, 1995).

Study Group

In this study, purposive sampling was employed to select participants. The sampling criteria required that all participating children be 48–60 months old and have no more than one year of prior preschool education. Purposive sampling is a method in which participants are deliberately selected best to answer the research questions (Patton, 2015). In this approach, individuals meeting specific research objectives are chosen to enhance the efficiency of the data collection process (Creswell, 2013).

The study group consisted of 36 preschool children enrolled in the 2022–2023 academic year in two schools in the Ümraniye district of İstanbul province in northwestern Türkiye. These schools were selected to represent different socioeconomic levels. Socioeconomic status was determined based on various factors, including parental income, education level, occupational status, and the economic infrastructure of the residential area.

Data Collection Tools

This study collected data using a semi-structured interview form and a drawing form.

Semi-Structured Interview Form

A semi-structured interview form was used to assess the recycling awareness of preschool children. The development process of the interview form involved several stages. Initially, existing research on recycling and environmental education was reviewed, and measurement tools used in similar studies were evaluated. Subsequently, the form was examined by three field experts for content validity, clarity, and age appropriateness, and modifications were made based on their feedback. To ensure its applicability, the form was pilot-tested with a small sample group, and the comprehension levels of the children, as well as the diversity of their responses, were assessed. Based on the findings from the pilot study, some questions were revised, and the final version of the interview form was prepared for implementation.

Drawing Form

The drawing form was employed to allow children to express their perceptions of recycling visually. The analysis of the drawings was conducted according to specific criteria. First, the themes depicted in the drawings were identified and categorized under key topics such as recycling, environmental pollution, and interactions with nature. The symbols and metaphors used by the children, including recycling bins, trash bins, and other recycling-related elements, were also examined. Furthermore, the role of color usage in reflecting children's emotions and perceptions was analyzed. In addition, the level of detail and creativity in the drawings was assessed to evaluate children's knowledge and their ability to express their understanding of the concept of recycling visually. Through this analysis, insights into the children's recycling awareness were obtained.

Data Collection

Prior to data collection, ethical approval was obtained from the Ethics Committee of Fatih Sultan Mehmet Vakıf University (Date: 02/08/2024; Number: 32/25). Subsequently, the parents of the children were informed about the content of the study, and written informed consent was obtained from them. Following the completion of the ethical procedures, information regarding the participants was gathered. During the data collection process, the children's teachers conducted one-on-one interviews to ensure that they could express themselves comfortably in a natural environment. Following the interviews, the children were asked to draw a picture related to recycling. Throughout the process, ethical principles were strictly observed, and the privacy of the children was protected.

During the interviews, teachers posed age-appropriate and cognitively suitable questions, prompting children to elaborate on their responses when necessary. The children's responses were noted verbatim by their teachers, transcribed, and directly transferred into the interview forms. After completing their drawings, teachers asked children to explain the meaning of their drawings, and their verbal descriptions were documented accordingly.

Teachers ensured the process was conducted without direct guidance, allowing children to express their thoughts freely. Additionally, they adhered to ethical research principles, ensuring the voluntary participation of children and maintaining the confidentiality of their identities.

Data Analysis

Data were analyzed using the content analysis method. Before the analysis began, the children were assigned identification numbers ranging from C1 to C36 (e.g., C1, C2, C3...C36). The responses given by the children were coded using the open coding technique and grouped under seven themes, resulting in 367 different codes. These codes were further categorized into sub-themes and main themes.

The children's drawings were also analyzed. Their depictions of sustainable environment and recycling in the pictures were examined and the figures used and themes addressed in the children's drawings were identified. Out of the 36 pictures drawn by the children, 30 were included in the coding. Six were excluded due to being unclear or blurred. Themes of recycling, environmental pollution, and children and nature emerged in the pictures. Each of the included pictures was uploaded into the MAXQDA Analytics Pro 2022 program and coded using the open coding technique by four researchers. Data were analyzed using MAXQDA Analytics Pro 2022 (VERBI Software, Berlin, Germany), licensed to the Fatih Sultan Mehmet Vakıf University Center of Excellence in Education Research (EMAM). One hundred codes were obtained, and themes and sub-themes were derived from these codes.

The interviews with the children and their drawings were coded by four researchers. The codes were reviewed mutually for consistency among coders. Reliability was calculated using Miles and Huberman's (1994) formula: "Reliability = (agreement) : (agreement + disagreement) × 100." The calculation showed that there was a 93% agreement in the data. Considering the minimum 90% reliability level suggested by Miles and Huberman (1994), the data can be considered reliable for the study.

Results

In this section of the study, the findings obtained are presented in line with the aim of the study.

How do Preschool Children Define and Interpret the Concept and Symbol of Recycling?

As depicted in Figure 1, the children's responses to this inquiry encompass nine distinct themes. It has been noted that "recycling" is the most commonly cited term among the children, accounting for 46% of the responses. The responses that appeared with the least frequency include saving our lives (3%), healthy nature (3%), a factor that alters time (3%), and discarding waste (3%).

Several children demonstrated their understanding of recycling through their statements:

Recycling means using things again instead of throwing them away (C17).

It is when we put bottles, papers, and cans into different bins so they do not go into the garbage (C22).

My teacher says we should recycle so the Earth stays clean (C7).

Figure 2 illustrates that all the children were familiar with the recycling symbol presented to them. It was observed that all the children affirmed their recognition when asked, "Do you recognize this shape?"

When asked to describe the symbol, some children responded:

It means recycling and shows arrows going in a circle (C35).

This means you should put your trash in the right place (C11).

Children were shown the image of the recycling symbol and asked, "What is this symbol?" As seen in Figure 3, nearly all of the children (97%) responded with 'recycling.'

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Some children's responses included:

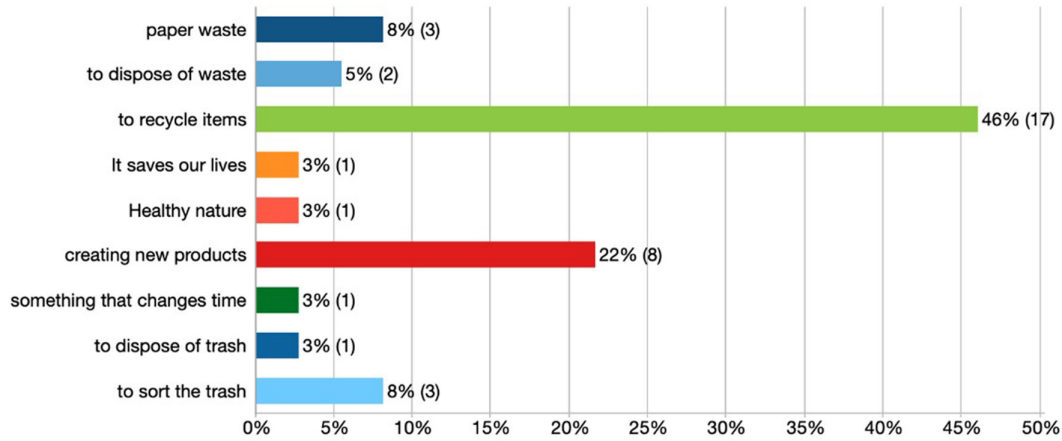


Figure 1.
Information of Preschool Children Regarding the Concept of Recycling.

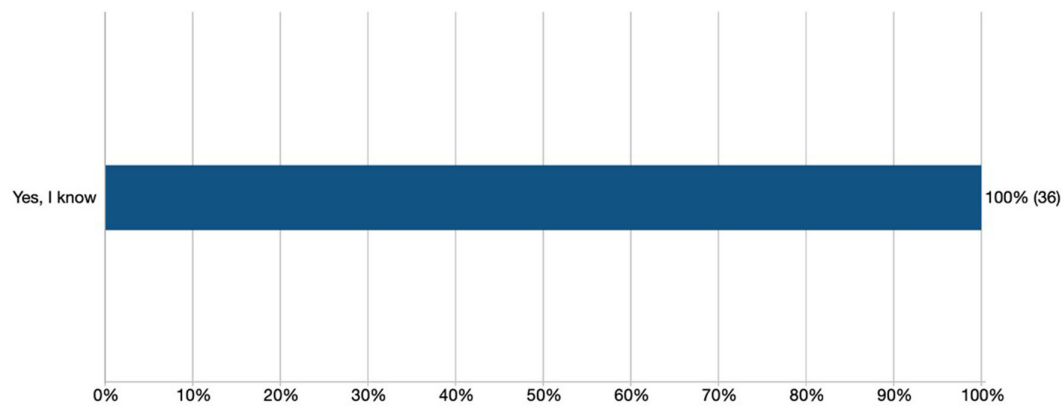


Figure 2.
Graph of Definitions of the Recycling Symbol.

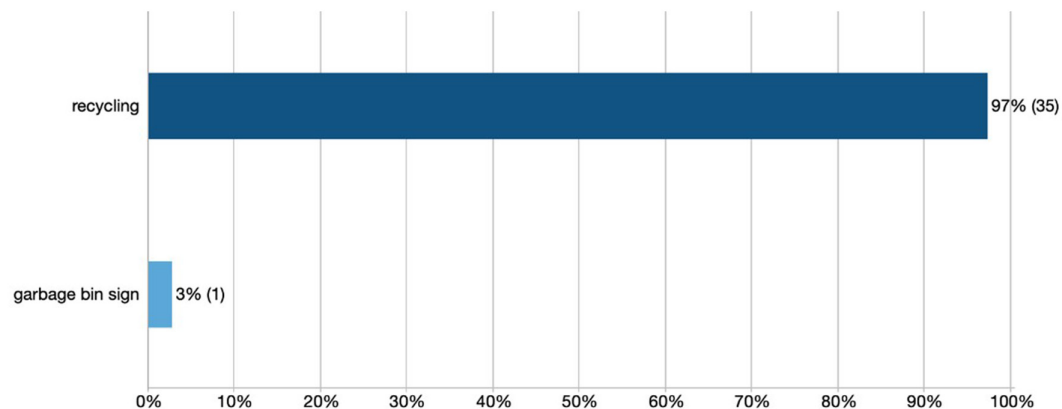


Figure 3.
Graph of the Meaning of the Recycling Symbol.

It means we can use things again (C25).

It is for recycling bins where we put paper, plastic, and glass (C18).
How do they identify and classify recyclable materials?

During the interviews, children were asked about their behaviors and attitudes toward worn-out, broken, or damaged items, with a specific focus on what they would do with these items. As illustrated in Figure 4, most children, accounting for 97%, indicated that they would recycle these items.

Some of the responses were:

"If my toy is broken, I can recycle it, or my dad can fix it" (C4).

We do not throw the paper away; we put it in the blue bin (C17).

As depicted in Figure 5, the children's responses regarding recyclable materials comprise 10 themes. Upon examining these themes, it is evident that the most frequently mentioned materials are paper (30%), glass (15%), plastic (15%), and batteries (11%).

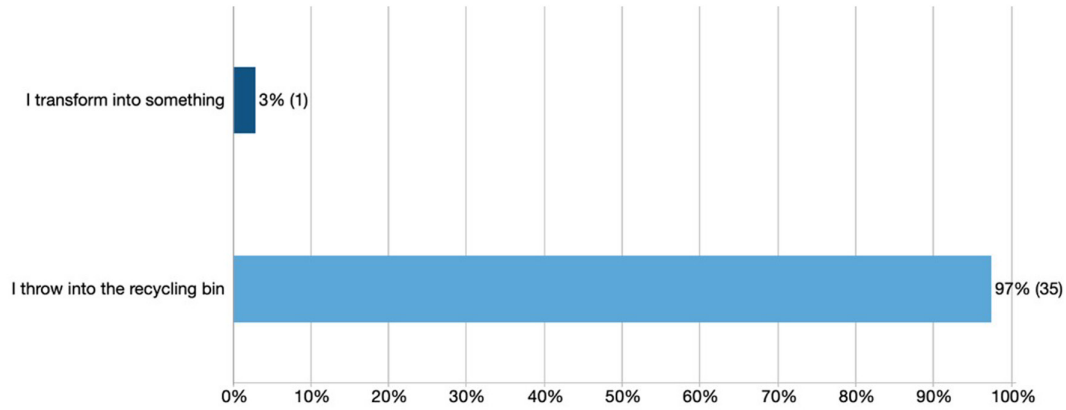


Figure 4.
Graph on Children's Behavior Toward Worn, Broken, or Damaged Items.

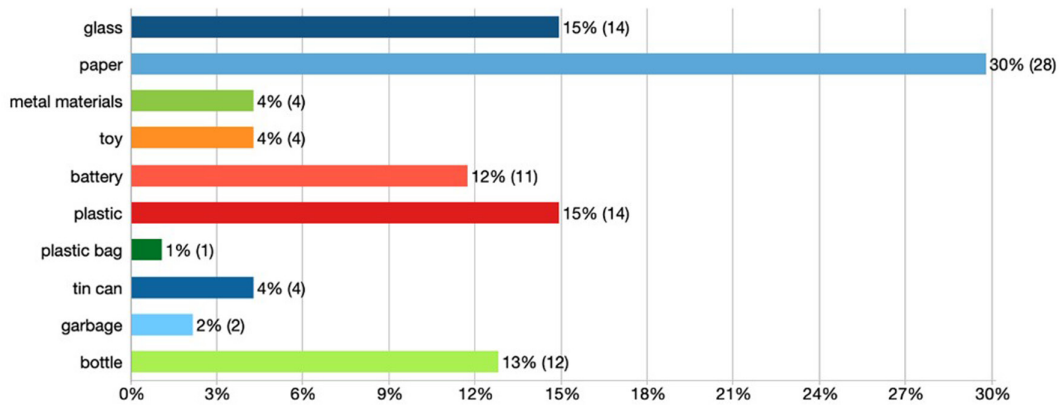


Figure 5.
Graph on Children's Knowledge of Recyclable Materials.

Children demonstrated their understanding with statements such as:

Paper, cans, and bottles can be recycled (C22).

Batteries go in special bins, not in the trash(C32).

Figure 6 inquires whether the children have previously used a recycling bin. All the children indicated that they have.

When asked about their experiences, children responded:

At school, we always put papers in the right bin (C9).

I help my mom recycle plastic bottles at home (C14).

As shown in Figure 7, the primary theme of materials deposited in recycling bins encompasses seven categories. The analysis of the responses reveals that paper (55%) is the most frequently recycled material, while glass (2%) is the least.

Children provided the following insights:

I always put my old homework pages in the recycling bin(C27)

Cans and bottles go in the recycling bin, not the trash (C3)

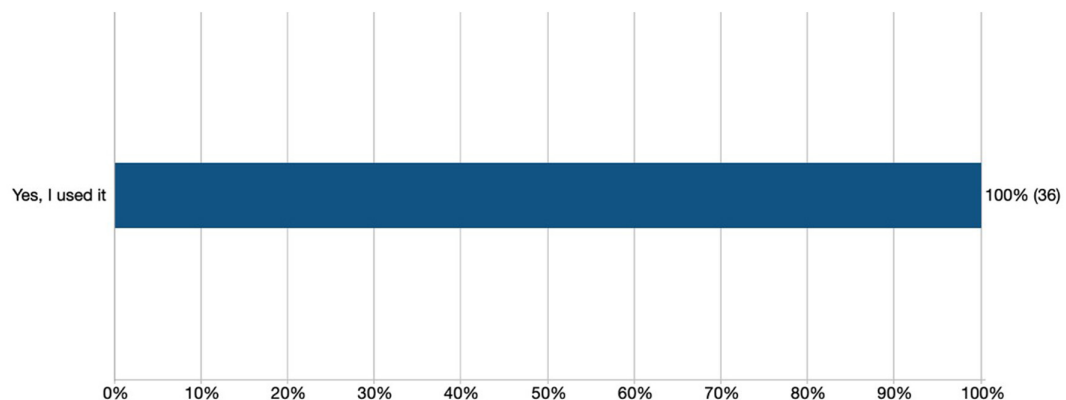


Figure 6.
Graph of Recycling Bin Usage Rate.

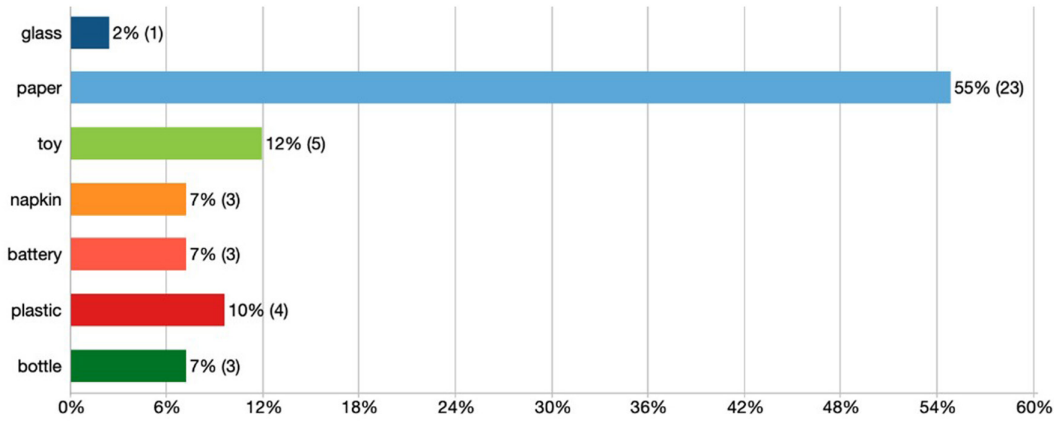


Figure 7.
Graph of Materials Deposited in Recycling Bins.

What criteria do they consider when assessing the suitability of different materials for recycling?

Figure 8 presents the children's responses regarding what can be made from recycled materials. The responses indicate that paper is the most commonly mentioned material (51%), while cardboard is the least mentioned (2%).

Some children's explanations included:

Recycled paper can be made into books again (C26).

We use plastic bottles again to make new ones(C6).

What are their views on the environmental benefits of recycling?

Figure 9 reflects the children's views on the environmental benefits of recycling. Upon examination of the responses, nine themes are observed. The highest-frequency response is being clean (39%), while the least frequent responses, each at 2%, include being happy, healthy, organized, innovative, and reducing waste.

Some of the responses were:

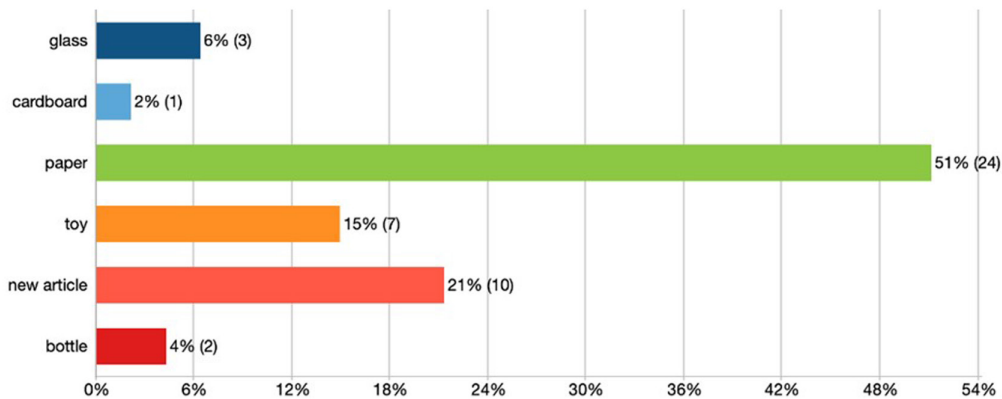


Figure 8.
Graph of Assessment of Recycled Materials.

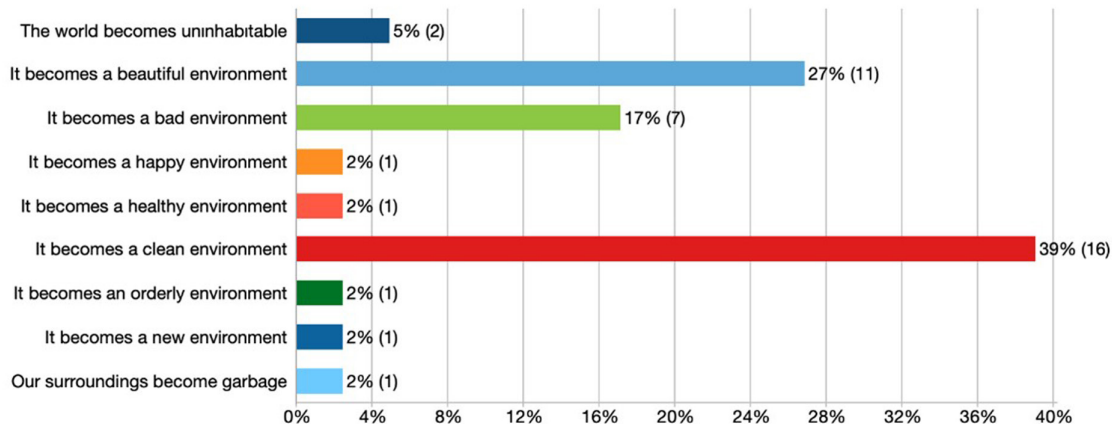


Figure 9.
Graph Showing the Environmental Impact of Recycling.

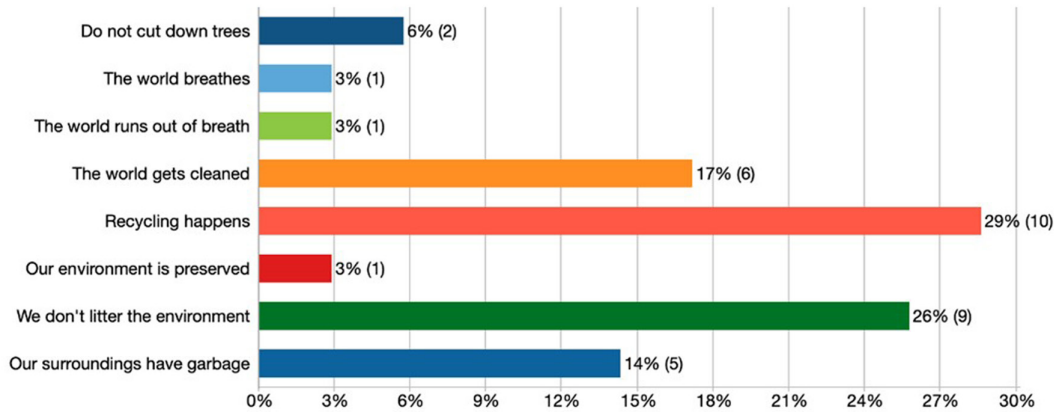


Figure 10.

Graph Showing the Reasons for Recycling's Environmental Impact.

Recycling helps keep the world clean (C21).

If we recycle, the Earth will not get dirty (C34).

Figure 10 displays the children's responses regarding the reasons for the environmental impact of recycling. Upon analysis of the graphic, it is evident that the responses encompass eight themes. Most children responded "because of recycling" (29%).

How do their drawings depict a sustainable environment and recycling process?

In Figure 11, children include sub-themes such as garbage, waste, paper, and batteries in their drawings on environmental pollution. The drawings predominantly feature depictions of trash (10 instances). Additionally, depictions of paper, waste, and batteries are equally represented in these drawings. The frequency of trash depictions in these drawings indicates that children predominantly associate environmental pollution with garbage.

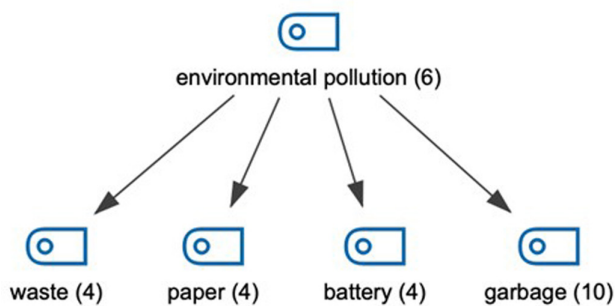


Figure 11.

Children's Drawings on the Theme of Environmental Pollution.



Figure 12.

Example of a Child's Drawing.

In Figure 12, the teacher asked the child to describe the drawing they made, and the response received was noted as "The child is throwing papers into the paper recycling bin."

In Figure 13, the theme of recycling is represented through sub-themes such as recycling bins, machines, and symbols. In their drawings, children most frequently depict recycling bins (21 instances). The recycling symbol (2) was the least frequently depicted visual element in their drawings.

In Figure 14, the teacher requested the child to describe the drawing they had made, and the response received was recorded as "The child is throwing batteries into the battery recycling bin."

In Figure 15, the theme of children and nature in the children's drawings comprises four sub-themes: the sea, the sun, children, and trash bins. In their drawings, children most frequently depicted the theme of children (25 instances), while the sea theme was the least depicted (3 instances).

In Figure 16, the child expressed that instead of throwing the plastic bottle into the sea, they put it in the recycling bin. The teacher noted the "plastic bottle" and "recycling bin" in the drawing.

When asked to describe their drawings, children provided the following explanations:

"I drew a boy throwing trash into the right bin" (Child 7).

"This is a picture of me putting paper in the recycling bin" (C23).

"Instead of throwing the plastic bottle in the sea, I put it in the recycling bin" (C16).

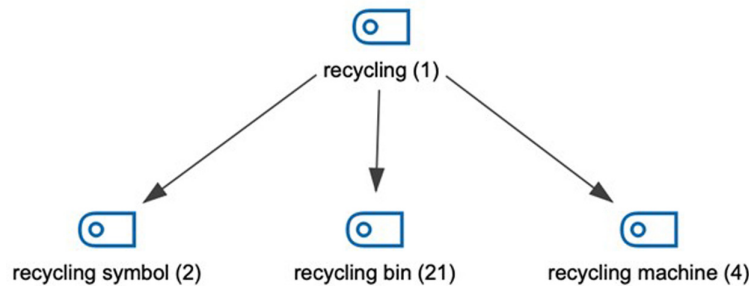


Figure 13.
Children's Drawings on the Theme of Recycling.



Figure 14.
Example of a Child's Drawing.

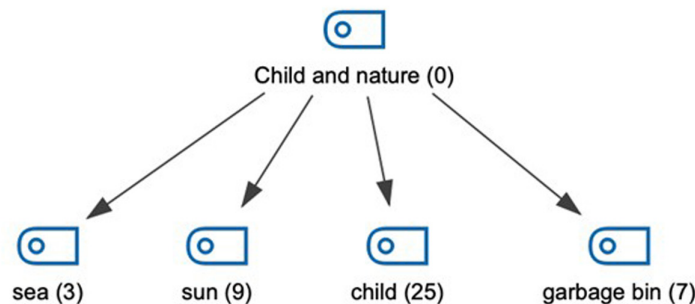


Figure 15.
Children's Drawings on the Theme of Children and Nature.

Figure 17 displays the frequency of words used by children during the interviews. The word cloud shows that terms such as recycling, I put it in recycling, used, and paper are more prominent.

Figure 18 displays a word cloud of elements related to recycling mentioned in the children's drawings. Terms like recycling bin, trash, and trash bin are prominently featured in the word cloud.



Figure 16.
Example of a Child's Drawing.

Discussion

The findings of this study highlight that preschool children primarily associate the concept of recycling with the term “recycling” itself. They demonstrate a strong recognition and understanding of the recycling symbol, reinforcing that young children can grasp environmental concepts when effectively introduced. Their ability to identify recyclable materials—particularly paper, glass, and plastic—and their frequent use of recycling bins suggest practical knowledge of recycling processes. Furthermore, their positive attitudes toward recycling old, broken, or damaged items indicate an early awareness of sustainable consumption habits.

A crucial aspect of preschoolers' recycling awareness is their ability to conceptualize the transformation of waste materials into new products. Their statements about reusing materials such as paper, plastic, and wood indicate a foundational understanding of the environmental benefits of recycling. Additionally, their drawings depict key themes related to environmental pollution and recycling, including elements like trash, waste, batteries, recycling bins, and machines. These findings align with existing literature, which suggests that early childhood



Figure 17.
Word Cloud Formed as a Result of Interviews with Children.

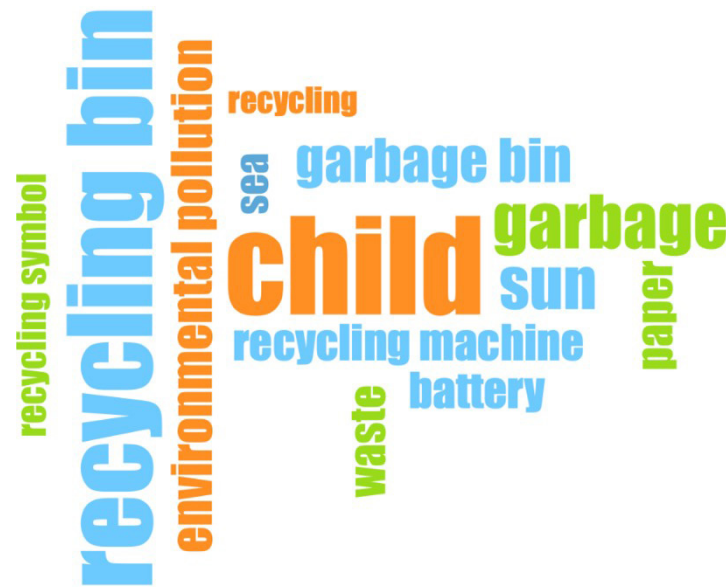


Figure 18.
Word Cloud of Elements Mentioned in Children's Drawings Related to Recycling.

education can significantly shape children's environmental attitudes and behaviors.

Preschool children's awareness of recycling extends beyond simply recognizing symbols and processes. They associate recycling with sorting materials, placing them in designated bins, and reducing waste. Palmer (1995) found that children as young as preschool age can comprehend recycling concepts, and the current study supports this finding by showing that children can articulate the purpose of recycling and its environmental impact. When describing recycling and the recycling symbol, children frequently referenced materials like "paper, glass, plastic, and bottles," emphasizing their awareness of different recyclable materials.

Furthermore, when asked about their opinions on recycling materials, children often believed that "I would recycle it, it can be transformed," suggesting an understanding of repurposing materials rather than simply discarding them. Their ability to connect recycling with environmental cleanliness also supports prior research that emphasizes the early development of environmental consciousness in young children.

In their drawings about sustainable environments and recycling, themes of environmental pollution and recycling were found, with trash

being the most depicted element representing pollution. Recycling bins, machines, and symbols were used to represent recycling, suggesting a deep understanding of sustainable environments and recycling processes among the children. Other elements in the drawings, like children, the sun, trash bins, and the sea, indicate that children view nature as an integral part of their lives.

Research (Ahi & Alisinanoğlu, 2016; Bahtić & Višnjić Jevtić, 2020; Buil et al., 2019; Erdaş Kartal & Ada, 2020; Şengül, 2010) indicates that preschool children can understand concepts of recycling, environment, and sustainability. These studies highlight the potential for developing environmental sensitivity and understanding in early childhood. Thus, instilling environmental consciousness in this age group is an important step in environmental education, laying the foundation for a deeper environmental understanding and sense of responsibility in later years. Implementing environmental education in preschool can contribute to building a sustainable world. Focusing on preschool children's understanding of recycling, environment, and sustainability concepts can guide further research and provide recommendations for effectively implementing environmental education in this age group.

Prior research underscores the pivotal role of preschool education in fostering children's environmental behaviors, mainly through

interactive and experiential learning methodologies (Kornilaki et al., 2022). Empirical evidence suggests that structured sustainability interventions and play-based recycling initiatives, such as the “Recycling Traffic Mini Park,” significantly enhance preschoolers’ recycling habits and problem-solving abilities. Likewise, creative pedagogical approaches, including drama and storytelling, have been shown to facilitate a more profound comprehension of sustainability concepts among young learners (Güvenir & Türkmen, 2024; Koçak Tümer, 2023). The findings of this study align with these insights, demonstrating that children who actively engage with recycling-related themes can effectively articulate their understanding through both verbal explanations and visual representations.

In addition to the role of preschool education, research highlights the importance of teachers and educational programs in fostering children’s environmental awareness. The study conducted by Tarım (2024) examined preschool teachers’ attitudes toward recycling, revealing that they generally hold positive perspectives on solid waste management and actively incorporate recycling concepts into their teaching. Similarly, Çeliker (2024) found that an ecological education program designed for 5-6-year-old preschool children significantly increased their environmental awareness, particularly regarding battery recycling. Activities involving arts, science, and drama played a crucial role in enhancing children’s understanding of sustainability. Öz (2024) further demonstrated that the Eco-Schools program had a significant impact on preschool children’s recycling awareness, with hands-on recycling activities fostering children’s active engagement in waste separation and recycling. Additionally, Yüçetürk (2024) explored sustainability perspectives among teachers, children, and families in early childhood education, identifying that private preschools exhibited higher levels of environmental sustainability awareness than public preschools. These studies collectively reinforce the importance of structured environmental education programs and emphasize the necessity of collaboration between teachers, families, and educational policymakers to strengthen recycling education in preschool settings.

Beyond formal education, external influences such as family and community are crucial in shaping children’s environmental awareness. Research indicates that exposure to recycling behaviors within the household substantially increases the likelihood of children adopting sustainable practices (Herdiansyah et al., 2021). Simsar (2021) highlights that while preschoolers generally exhibit limited awareness of their ecological footprint, their environmental attitudes are profoundly influenced by parental, particularly maternal guidance. These findings underscore the necessity of integrating family-oriented sustainability initiatives into early childhood education to reinforce environmentally responsible behaviors at school and at home.

Limitations

This study has several limitations that should be considered. Firstly, the sample size is relatively small, comprising only 36 children from two schools, which may limit the generalizability of the findings. Additionally, the study is restricted to a single geographical region which may not adequately represent the perceptions of children from different socioeconomic and cultural backgrounds. Using only semi-structured interviews and drawing forms as data collection methods may not fully capture the complexity of children’s thoughts, particularly considering the limited expressive abilities of children aged 48–60 months. Furthermore, the involvement of teachers in the data collection process could introduce subjective interpretations, potentially leading to bias.

Conclusion and Recommendations

The results show that preschool children strongly understand recycling concepts, recognize its environmental benefits, and actively

engage in recycling behaviors. However, while their awareness is high, their responses suggest that real-life implementation varies, particularly in home environments. These findings highlight the importance of reinforcing recycling habits through school and family engagement.

Researchers can design diverse studies on this topic using mixed-methods and longitudinal research approaches. A mixed-methods approach, integrating both quantitative and qualitative data, is recommended to achieve a more comprehensive understanding of preschool children’s environmental behaviors. Furthermore, longitudinal studies are crucial for evaluating the long-term effects of environmental education, enabling the assessment of sustained behavioral changes and the effectiveness of various instructional methodologies over time. To effectively translate children’s recycling awareness into sustainable behaviors, it is essential to integrate recycling activities into preschool curricula as practical, routine-based habits rather than isolated informational lessons. Additionally, fostering parental involvement is crucial, as some children do not practice recycling at home. Educational programs targeting families should be developed to encourage parents to actively participate in recycling activities with their children, reinforcing these behaviors in the home environment. Schools should also enhance recycling practices by increasing the availability of recycling bins and implementing structured activities where children actively sort and collect recyclable materials. For instance, organizing periodic recycling collection events can provide hands-on learning experiences that strengthen children’s commitment to sustainable practices. Moreover, integrating recycling education with broader sustainability topics, such as energy conservation, water management, and waste reduction, can further enhance children’s ecological consciousness by fostering a more comprehensive understanding of environmental responsibility.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical committee approval was received for this study from the Ethics Committee of Fatih Sultan Mehmet Vakıf University (Date: 02/08/2024; Number: 32/25).

Informed Consent: Written informed consent was obtained from parents of the children who participated in this study.

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References

- Ahi, B., & Alisinanoğlu, F. (2016). Okul öncesi eğitim programına entegre edilen çevre eğitimi programının çocukların ‘çevre’ kavramına ilişkin zihinsel model gelişimlerine etkisi [Effect of environmental education program integrated with preschool curriculum on children’s mental model development about the “environment” concept]. *Kafkas Üniversitesi Sosyal Bilimler Enstitüsü Dergisi [Kafkas University Journal of the Institute of Social Sciences]*, 18, 305–329. [\[CrossRef\]](#)
- Apriliana, N. I., Sucipto Dwijo, A. Q. N. E., & Mukhoyaroh, M. (2024). Implementation of learning activities using recycled materials in kindergarten.

- Indonesian Journal of Early Childhood Education Research, 3(2), 154–163. [CrossRef]
- Bahtić, K., & Višnjić Jevtić, A. (2020). Young children's conceptions of sustainability in Croatia. *International Journal of Early Childhood*, 52(2), 195–211. [CrossRef]
- Buil, P., Roger-Loppacher, O., & Tintoré, M. (2019). Creating the habit of recycling in early childhood: A sustainable practice in Spain. *Sustainability*, 11(22), 6393. [CrossRef]
- Büyüksaatçı, S., Küçükdeniz, T., & Esnaf, Ş. (2008). Geri dönüşüm tesislerinin yerinin Gustafson-Kessel algoritması-konveks programlama melez modeli tabanlı simülasyon ile belirlenmesi. *İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi*, 7(13), 1–20.
- Çeliker, B. (2024). 5-6 yaş grubu çocuklarda atık pillerin değerlendirilmesi ve çevre bilincinin kazandırılması [Yayınlanmamış yüksek lisans tezi]. Selçuk Üniversitesi, Sağlık Bilimleri Enstitüsü.
- Çimen, O., & Yılmaz, M. (2012). Elementary school students' knowledge of and behavior regarding recycling. *Uludağ University Faculty of Education Journal*, 25(1), 63–74.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed). SAGE Publications.
- Domka, L. (2004). Environmental education at preschool. *International Research in Geographical and Environmental Education*, 13(3), 258–263. [CrossRef]
- Environmental Protection Agency (EPA) (2013). *Municipal solid waste generation, recycling, and disposal in the United States: Facts and figures for 2012*. Environmental Protection Agency.
- Erdaş Kartal, E., & Ada, E. (2020). Okul öncesi dönem çocuklarının gözünden geri dönüşüm [Recycling from the perspective of pre-school children]. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 33(3), 778–801. [CrossRef]
- Gülay, H., & Öznacar, M. D. (2010). *Environmental education activities for preschool children*. Pegem Akademi.
- Güvenir, Z., & Türkmen, L. (2024). The examination of preschool children's environmental attitudes and awareness. *Journal of Turkish Science Education*, 21(3), 430–447. [CrossRef]
- Herdiansyah, H., Saiya, H. G., Afkarina, K. I. I., & Nugraha, R. (2021). Coastal community perspective, waste density, and spatial area towards sustainable waste management. *IOP Conference Series: Earth and Environmental Science*, 755(1), 012022. [CrossRef]
- Kızılkaya, G., & Beşoluk, Ş. (2017). Developing environmental education and recycling awareness in the preschool period. *International Online Journal of Educational Sciences*, 9(3), 905–915.
- Kornilaki, E. N., Skouteris, H., & Morris, H. (2022). Developing connections between healthy living and environmental sustainability concepts in Cretan preschool children: A randomized trial. *Early Child Development and Care*, 192(11), 1685–1698. [CrossRef]
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage Publications.
- Mohamad, N., Lee, Y., & Tan, W. (2024). Play-based sustainability education in Malaysian preschools: The impact of a recycling traffic mini-park. *Science-Gate Journal of Early Childhood Studies*, 29(1), 23–38.
- Onur, A., Çağlar, A., & Salman, M. (2016). Evaluation of waste paper and environmental awareness in 5-year-old preschool children. *Kastamonu Education Journal*, 24(5), 2457–2468.
- Öz, S. (2024). Okul öncesi dönemde uygulanan Eko-Okullar programının çocukların geri dönüşüm farkındalık düzeylerine etkisi [Yayınlanmamış Yüksek Lisans Tezi]. Kastamonu Üniversitesi, Sosyal Bilimler Enstitüsü, Temel Eğitim Anabilim Dalı, Okul Öncesi Eğitimi Bilim Dalı.
- Palmer, J. A. (1995). Environmental thinking in the early years: Understanding and misunderstanding of concepts related to waste management. *Environmental Education Research*, 1(1), 35–45. [CrossRef]
- Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed). SAGE Publications.
- Republic of Turkey Ministry of Environment (2004). Urban planning and climate change. *Turkey environment atlas*. Republic of Turkey Ministry of Environment, Urban Planning and Climate Change.
- Russo, S. (2001). Promoting attitudes towards environmental education depends on early childhood education. *Australian Primary and Junior Science Journal*, 17(4), 34–36.
- Şallı, D., Dağal, A. B., Küçükoğlu, E. K., Niran, S. Ş., & Tezcan, G. (2013). Okul öncesinde geri dönüşüm kavramı: Aile katılımlı proje tabanlı bir program örneği [The concept of recycling in preschool: An example of a project-based program with family participation]. *Eğitim ve Öğretim Araştırmaları Dergisi [Journal of Research in Education and Teaching]*, 2(2), 234–241.
- Şengül, Ü. (2010). Atıkların geri dönüşümü ve tersine lojistik [Recycling of wastes and reverse logistics]. *Paradoks Ekonomi, Sosyoloji ve Politika Dergisi*, 6(1), 73–86.
- Sihvonen, P., Lappalainen, R., Herranen, J., & Aksela, M. (2024). Promoting sustainability together with parents in early childhood education. *Education Sciences*, 14(5), 541. [CrossRef]
- Simsar, A. (2021). Young children's ecological footprint awareness and environmental attitudes in Turkey. *Child Indicators Research*, 14, 1387–1413. [CrossRef]
- Soğançılar, M. E. (2018). *Determining middle school students' knowledge levels and attitudes towards recycling* [Unpublished Master's Thesis]. Giresun University.
- Stake, R. E. (1995). *The art of case study research*. SAGE Publications.
- Tan, C. K., & Güler, M. P. D. (2024). Action research on environmental and recycling awareness of preschool children. *International Journal of Social Sciences*, 8(33), 57–81. [CrossRef]
- Tarım, R. (2024). Okul öncesi öğretmenlerinin katı atık ve geri dönüşümüne yönelik tutumları ile katı atık ve geri dönüşüm etkinliklerine yönelik görüşlerinin incelenmesi (Diyarbakır ili örneği) [Yayınlanmamış Yüksek Lisans Tezi]. Dicle Üniversitesi, Eğitim Bilimleri Enstitüsü, Temel Eğitim Anabilim Dalı, Sınıf Eğitimi Bilim Dalı.
- Koçak Tümer, N. B. (2023). Analysis of recycling perceptions of 5–6-year-old children through pictures. *European Journal of Alternative Education Studies*, 8(3). [CrossRef]
- Umut, A. G. M. Ö., Topuz, Y., & Velioglu, M. N. (2015). Sustainable consumers on the road to recycling from waste. *Celal Bayar University Journal of Social Sciences*, 13(2), 263–288.
- UNESCO (1992). Agenda 21 – Report of the United Nations Conference on Environment and Development. Chapter 36 Promoting education, public awareness, and training. UNESCO. 3–14.
- Worrell, E., & Reuter, M. A. (2013). *Handbook of Recycling: State-of-the-art for practitioners, analysts, and scientists*. Elsevier.
- Yaşar, M. C., İnal, G., Kaya, Ü. Ü., & Uyanık, Ö. (2012). Nature's mother's return through the eyes of children. *Journal of Education and Research*, 1(2), 30–40.
- Yıldırım, A., & Şimşek, H. (2016). *Qualitative research methods in social sciences*. Seçkin Yayıncılık.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed). SAGE Publications.
- Yüçetürk, T. (2024). Okul öncesi eğitim kurumlarının sürdürülebilirlik özellikleri bakımından çok yönlü değerlendirilmesi Öğretmen, çocuk ve aile görüşleri açısından bir değerlendirme [Yayınlanmamış Yüksek Lisans Tezi]. Trakya Üniversitesi, Sosyal Bilimleri Enstitüsü, Okul Öncesi Eğitimi Bilim Dalı.