

INVESTIGATING PRESCHOOLERS' AND MOTHERS' SELF-REPORTED
KNOWLEDGE OF ORGANIC WASTE RECYCLING AND THE ROLE OF
MOTHERS' CONVERSATIONAL STYLE ON CHILDREN'S MEMORY
REPORTS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

SEÇİL CENGİZOĞLU

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
IN
THE DEPARTMENT OF ELEMENTARY AND EARLY CHILDHOOD
EDUCATION

OCTOBER 2023

Approval of the thesis:

**INVESTIGATING PRESCHOOLERS' AND MOTHERS' SELF-REPORTED
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ABSTRACT

INVESTIGATING PRESCHOOLERS' AND THEIR MOTHERS' SELF- REPORTED KNOWLEDGE OF ORGANIC WASTE RECYCLING AND THE ROLE OF MOTHERS' CONVERSATIONAL STYLE ON CHILDREN'S MEMORY REPORTS

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October 2023, 367 Pages

The aim of this study is twofold. First, it attempts to reveal how organic waste recycling was conceptualized as a sustainable practice by preschool children and their mothers, before and after their joint participation in learning activities about composting. Second, the potential of the mothers' conversational style to enhance children's self-reported knowledge as well as memory reports of organic waste recycling was investigated. Twenty-three mothers and their 60–72-month-old children jointly participated in a five-day implementation of a series of learning activities (storytelling, science, play, math, music, etc.). Since this study was a descriptive qualitative study, one-to-one semi-structured interviews with children and mothers and mother-child joint conversations at the end of each implementation day were used as data collection tools.

The findings showed that the children's knowledge of what organic waste is, how organic waste can be recycled, and why this is necessary was increased. The children indicated that recycling organic waste is an effective waste management strategy that they can easily do themselves in their daily lives. Participating mothers see composting as an appropriate way to explore the cyclical process of recycling with their children. Moreover, they consider

composting as a feasible and convenient method that can be easily transformed into a collaborative activity where different stakeholders can come together for responsible consumption and production. Further analysis of the mother-child joint conversations revealed that there were multiple positive relationships between mothers' conversational variables and children's contributions to the joint conversations. Mothers who had more elaborations in joint conversations about composting learning activities encouraged their children by asking more open-ended questions, yes/no questions and providing more context statements. In addition, mothers' elaborations were closely related to the amount of detail children reported about learning activities in post and follow-up interviews.

Keywords: Early Childhood Education for Sustainability, Mothers' Conversational Style, Preschool Children, Organic Waste Recycling



ÖZ

OKUL ÖNCESİ DÖNEM ÇOCUKLARININ VE ANNELERİNİN ORGANİK ATIKLARIN GERİ DÖNÜŞÜMÜNE İLİŞKİN BİLGİLERİNİN VE ANNELERİN KONUŞMA STİLİNİN ÇOCUKLARIN BELLEK ÇIKTILARI ÜZERİNDEKİ ROLÜNÜN İNCELENMESİ

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Ekim 2023, 367 sayfa

Bu çalışmanın iki amacı bulunmaktadır. İlk amacı sürdürülebilir bir uygulama olarak organik atıkların geri dönüşüm sürecinin okul öncesi dönem çocukları ve anneleri tarafından, kompostlama ile ilgili öğrenme etkinliklerine birlikte katılımlarından önce ve sonra nasıl kavramsallaştırıldığını ortaya çıkarmaktır. İkinci olarak, annelerin ortak geçmişle ilgili konuşma stilinin, çocukların organik atıkların geri dönüşümüne ilişkin bilgi ve bellek raporlarını geliştirme potansiyeli araştırılmıştır. Yirmi üç anne ve 60-72 aylık çocukları, hikâye anlatımı, bilim, oyun, matematik, müzik, vb. bir dizi etkinlikten oluşan beş günlük uygulamaya birlikte katılmışlardır. Bu çalışma tanımlayıcı nitel bir çalışma olduğu için veri kaynağı olarak çocuklarla ve annelerle yapılan bire bir yarı yapılandırılmış görüşmeler ve her uygulama gününün sonunda annelerin çocukları ile birlikte kompostlama öğrenme etkinliklerine ilişkin yaptıkları konuşmalar kullanılmıştır.

Bulgular, katılımcı çocukların organik atığın ne olduğu, organik atığın nasıl geri dönüştürülebileceği ve bunun neden gerekli olduğu konusundaki bilgilerinin arttığını göstermiştir. Çocuklar, organik atıkların geri dönüştürülmesinin günlük yaşamlarında kendilerinin de kolayca yapabilecekleri etkili bir atık yönetimi stratejisi olduğunu belirtmişlerdir. Katılımcı anneler ise kompost yapımını, çocuklarıyla birlikte geri dönüşümün

döngüsel sürecini keşfetmek için uygun bir yol olarak ifade etmişlerdir. Dahası, kompostu, sorumlu tüketim ve üretim için farklı paydaşların bir araya gelebileceği işbirlikçi bir faaliyete kolayca dönüştürülebilecek uygulanabilir ve uygun bir yöntem olarak belirtmişlerdir. Annelerin çocuklarıyla kompostlama öğrenme etkinliklerine ilişkin yaptıkları sohbetlerin analizleri ise annelerin konuşma değişkenleri ile çocukların sohbet sürecine katkıları arasında çoklu pozitif ilişkiler olduğunu ortaya koymuştur. Birlikte gerçekleştirilen sohbetlerde daha ayrıntıcı anneler, daha fazla açık uçlu soru, evet/hayır sorusu sorarak ve daha fazla bağlam detaylarını betimleyen ifadeler kullanarak çocukları organik atıkların geri dönüşüm sürecini kavramsallaştırmasını teşvik etmiştir. Buna ek olarak, annelerin detaylandırmaları, çocuklar ile yapılan son ve takip görüşmelerinde öğrenme etkinlikleri hakkında bildirdikleri detay miktarıyla yakından ilişkilidir.

Anahtar Kelimeler: Sürdürülebilirlik için Erken Çocukluk Eğitimi, Organik Atıkların Geri Dönüşümü, Annelerin Konuşma Stili, Okul Öncesi Dönem Çocukları



To İpek ♥

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to the following people, without whom I could not have undertaken this research, and without whom I would not have made it through my PhD degree.

My most profound appreciation goes to my supervisor, my mentor, my constant source of support; Prof. Dr. Refika Olgan. Her endless guidance and offering encouragement precisely when needed and without which it would have been impossible to complete this work. I feel her unwavering presence and wealth of wisdom have been instrumental in shaping my academic growth not only on my path to doctorate, but also over the years that we have known each other. I would also like to express my gratitude to my thesis committee members; Prof Dr. Gaye Teksöz, Assoc. Prof. Dr. Başak Şahin Acar, Assoc. Prof. Dr. Selda Aras and Assist. Prof. Dr. Elif Buldu for their time, effort and contributions with their invaluable insights.

I would like to extend my sincere thanks to my dear colleague Dr. Serap Bilen who stimulate my thinking on my research interest but also inspire me with her genuine enthusiasm and dedication. I am extremely grateful to Dr. Şebnem Feriver Gezer for her kind and sincere cooperation during data processing and refinement. I have also very appreciated with the guidance and the support of Aysu Alkış and Yağmur İlgün who worked with me as research partners on data coding. I would like to articulate many thanks to Tuğçe Esra Terzioğlu for her guidance to my study in the process of data collection.

Among the most memorable highlights of this journey was the opportunity to work with children and mothers. I would like to extend a heartfelt thanks for their willingness to participate and for sharing their thoughts and views with me. I enjoyed, learnt and liked every session I met with them. I also owe thanks to school administrators for making me feel welcome and for facilitating my work.

My lifelong friends Dr. Sinem Demirci, Dr. Mehmet Şen and Dr. Gözde Kaplan Can also deserve a sincere, *thank you*, for their warmth and endless support when I totally lost my hopes in my difficult times. I would also express my special thanks to Dr. Beyza Himmetoğlu who always give me the hope and motivation. An immense thank also goes to Dr. Esma Daşcı,

Gölbahar Yılmaz and Dr. Senem Oğuz Balıktay. Your advice and encouragement have been invaluable.

Words cannot express how much unwavering belief of my extended family in me has meant. To start, I deeply thank my adorable parents Hacer Kocakaya and Akif Kocakaya for their unconditional and never-ending love and patience. Thank you for being with me whenever I need you in every moment of my life. I hope I make you all feel proud. I am also intensely grateful to my parents-in-law Nurdan Cengizoğlu and Erdal Cengizoğlu for their unconditional trust and timely encouragement. I will never truly be able to express my sincere appreciation to the both of you. I cherish the special bond we share. And profound thanks go to my beloved sister Büşra Güzey. There's no way I can articulate what I want to say. I love you more than anything. You and Mert Güzey made my accomplishments possible through helping me to enjoy my life besides PhD journey. My further appreciation goes to my sister-in-law Ayşegöl Aytemür and Ersin Aytemür who stood by me unconditionally. My heartfelt thanks are also due to my little nephew Defne Aytemür. Your cheerful smile always brightened up my days.

This work is dedicated to my beloved daughter, İpek Cengizoğlu, who fills my heart with unlimited love, happiness and joy each and every day. I deeply thank for your endless patience İpek. I love you to the moon and back.

Finally, and above all, I cannot begin to express my unfailing gratitude and love to my husband, my best friend and my greatest supporter, Hasan Güçlü Cengizoğlu, who has walked every step of this journey and has constantly supported me throughout the process. I would not be who and where I am not without the love of you. You have made me stronger, better and more fulfilled over the years.

I am also deeply indebted to the Scientific and Technological Research Council of Turkey (TÜBİTAK) for financially supporting me with the grant fund of the Domestic Doctorate Fellowship Programme.

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LIST OF ABBREVIATIONS

ECE	Early Childhood Education
ECEfS	Early Childhood Education for Sustainability
EfS	Education for Sustainability
ESD	Education for Sustainable Development
GAP	Global Action Program
IGL	Intergenerational Learning
MoNE	Ministry of National Education
NAEYC	National Association for the Education of Young Children
OECD	Organisation for Economic Co-Operation and Development
SCP	Sustainable Consumption and Production
SD	Sustainable Development
SDG	Sustainable Development Goals
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	The United Nations Children's Fund

CHAPTER I

INTRODUCTION

This introductory chapter begins with the background of the study and proceeds to the significance of the study, the purpose of the study, the research questions, the limitation and delimitation of the study, and the definitions of the key terms.

1.1 Background of the Study

The current situation of the population demand and consumption habits far exceed the ‘carrying capacity’ of planet Earth (Intergovernmental Panel on Climate Change [IPCC], 2018; OECD; 2022, 2023; Ritchie & Roser, 2019; Roser & Ortiz-Ospina, 2018; UN, 2019). The depletion of freshwater resources, the loss of biodiversity, desertification, climate change, the lack of waste management systems, rapid technological changes, and urbanization have adverse and widespread effects as the result of the anthropocentric lifestyles of human beings (Kahn, 2002; Kahn & Weiss, 2017). In modern society, more and more people are living in urban environments which can be considered diminishing the opportunities for everyone to feel and get in touch with the natural environment (Soga & Gaston, 2016). Particularly in Western societies, people are encouraged to turn into excessively materialistic consumers who do not critically think about the result of their overconsuming (Ward, 2010). On the other hand, the products consumed has also environmental impacts including resources that are used for packaging, emissions in transportation, and eventually, waste production. Due to overpopulation, consumption patterns of human beings provoke the “needs versus wants” discourse (Quinn, et al., 2014), which turns into a major challenge for sustainability.

Children across the world are considered the most vulnerable individuals who are subjected to the greatest risks of unsustainable living patterns (Davis, 2008; Davis & Elliott, 2014). Parental concerns about strangers and the dangers of traffic cause a loss of freedom in nature and age of technology make children living in a virtual reality as opposed to nature of the childhood (Close, 2012; Robertson, 2006). The shift to spending time indoors leaves children in a virtual world that results in less satisfying experiences with the natural world (Chawla, 2020; Pyle,

2002; Soga & Gaston, 2016; Truong & Clayton, 2020). Immensely, young children are also targeted by advertisers and they are growing up as consumers who are familiar with popular brands and trends (Singh et al., 2022; Watkins et al., 2019). This should be questioned since children are growing up as materialistic individuals who are not sensitive to thinking about what they need and what they want. On one hand, the individualistic view of people is a barrier to urgent actions that are aligned with sustaining the planet and this makes the term “sustainability” problematic to be interpreted. Hence, it is suggested that the everyday actions and everyday decisions of individuals are in need of reexamination in order to reduce consumption rather than putting effort into sustaining sources (Davis et al., 2005; Engdahl, 2015; Essiz & Mandrik, 2022; Hill et al., 2014; Vos et al., 2022). Herein, the foci point should be on how young children explore the causes and effects of being a responsible consumer as an agent for change for a sustainable future.

There are many compelling reasons why young children are the basis of sustainable development. The 2030 Agenda for Sustainable Development explicitly put children at the center of the 17 post-2015 Sustainable Development Goals (SDGs) and 168 child-focused targets designed for adaptation for sustainable lifestyles. (UNESCO, 2017). UNICEF specifically encourages *Goal 12: Responsible Consumption and Production* which targets to address priority areas for children. Accordingly, target 12.5, stating that “By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse” and target 12.8, stating that “By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature” are considered as relevant targets to include SDG focused learning opportunities for children and facilitate their connection to the natural environment (UN, 2022; UNESCO, 2017). In this regard, young children are considered as active citizens who want to engage in “real things to explore the world (Charlesworth, 2016; Philips, 2014; Starbuck et. al, 2014). Once children are provided developmentally appropriate opportunities to investigate the causes and effects, they are likely to participate in actions to eliminate the unfavorable patterns of their lifestyles (Watkins et al., 2019).

With this consideration in mind, it is critically important to understand how today’s children conceptualize sustainability. The key tenet in the pedagogies of early childhood education for sustainability is being meaningful and relevant to a child's everyday life. Given this belief, McCrea and Littledyke (2014) emphasize that even though young children are considered essential agents in the context of early childhood education for sustainability, it is not their responsibility to “save the planet”. Actually, such a notion does not fit the key point of early

childhood education for sustainability. Rather, early childhood education for sustainability is about offering developmentally appropriate and relevant learning experiences about everyday life and the explicit interactions within Earth systems (Barratt et al., 2014; Green, 2015, 2017; Green & Sommerville, 2017). Through active engagement, children are sheltered in sustainability topics which is a good starting point to be aware of and concerned with sustainability issues and understand their complexity (Davis, 2015; Davis & Elliott, 2014). The radical shifts are vital in individuals' minds to consider others through questioning the drastic impacts of unsustainable patterns on ecosystems and future generations. As reported by Phillips (2014), such a radical shift might be possible by immersing children in meaningful actions in order to engage them in real things that provide children to be equipped with the necessary knowledge, skills, and awareness (Malone, 2017; Percy-Smith & Burns, 2013).

With respect to meaningful and relevant sustainable practices, everyday issues and learning implementations are expanded with the new questions of educators and parents, experiences, possibilities, and perspectives that will gradually turn into a school culture (Davis, 2009; Ärlemalm-Hagsér & Elliott, 2017). To address those issues in early childhood settings, exploring life and food cycles and discussing the shared experience could be a good starting point to make children immerse into sustainability (Paddock, 2017; Young & Moore, 2010). Through exploring recycling practices, early childhood classrooms come with many learning opportunities on responsible consumption and production (Davis, 2009; Davis & Elliott, 2014; Buil et al., 2019; Siraj-Blatchford et al., 2010). The Early Childhood Australia Sustainability Interest Group suggested that making compost, worm farms, and vegetable patches could be practically addressed in school environments. Collecting food scraps from home and school lunch meals for composting is a popular practice to explore the immediacy and everydayness of sustainability. Recycling of organic wastes and composting systems provides rich learning opportunities to understand where all those products come from and how it contributes to sustainability through simply decomposing (Ärlemalm-Hagsér & Sandberg, 2011; Buil et al., 2019; Davis, 2005; Davis, 2015; Marchal-Gaillard, 2022; Pramling-Samuelsson & Park, 2017; Rahman & Yusop, 2020; Schwarz & Bonhot, 2017; Siraj-Blatchford et al., 2010).

1.2 Intergenerational learning as a tool for education for sustainability

As Siraj-Blatchford et al. (2016) suggested there needs to be opportunities for young children to experience sustainability through vivid and solid learning experiences. Children learn best through seeing, hearing, and reflecting on what they experience in their everyday lives (Pramling-Samuelsson & Park, 2017) which allows them to find strong kinship with the environment (Giusti, 2019; Kolb, 2014). Learning through play and the active exploration of

nature allows children to build their knowledge within social, cultural, and ecological contexts (Cutter-Mackenzie & Edwards, 2013). Since early years are the most responsive to the impact of external environments (Bronfenbrenner & Morris, 2006), stimulating early experiences, being responsive toward children's actions, offering possibilities, and encouraging children for explorations are critical to building a foundation for later years which would, in turn, lay a fundamental premise of early childhood education for sustainability. These formative years are also essential to develop behaviors, attitudes, habits, skills, and values which have a long-lasting impact on one's whole life (Pramling-Samuelsson & Kaga, 2008; Pramling et. al., 2017; OECD, 2021; UNESCO, 2014).

Above all, children's learning is well articulated when they are interacting with other agents such as teachers, school staff, and parents (Davis, 2005; Pramling-Samuelsson & Kaga, 2008; Walker, 2017). Further interactions with elders that stimulate children's play and active exploration are valued not only for children's whole development but also for the construction of shared meanings and knowledge under the scaffolded guidance of adults (Rogoff, 1990; Vygotsky, 1978). This view best fits the interwoven nature of education for sustainability in which the proactive and variable roles of adults may facilitate children's learning about the contradictions inherent in sustainable living in a responsive and supportive manner. As a diverse and learner-centered field, early childhood education for sustainability has the potential to centralize relationships between the youth and elderly and its essential nature for children's growth and achievement has already been well documented by research throughout the years (Daniel, 2011; Davis, 2008; Prince, 2010; Salvatierra & Cabello, 2022; Spiteri, 2020). With this in view, parents and grandparents are considered critical sources to foster children's education through playing together and sustaining intergenerational dialogues. According to Tali Tal (2004) appreciation of the natural environment, and developing the required knowledge and skills, attitudes, and values supported by the elderly is a fantastic medium to encourage young children to be an active contributor to the decision-making process for sustainability. In this respect, bringing children and adults into informal and formal learning environments is considered a suitable approach to develop a collaboration to act towards environmental challenges (Gough, 2002).

Collaboration with parents builds a strong foundation that supports children's family learning environment in line with sustainability (Green, 2017; UN, 2016). Since parents are important role models, shared values and actions among mothers, fathers, and children have positive associations with children's knowledge about sustainability issues (Borg et al., 2017; Elliott et al., 2016). Immersing children in sustainable development-related discussions in the home

environment helps children feel they are a part of real life and fosters their realization that sustainability is an integral part of everyday life. This provides children with valuable teaching moments for “sustained shared thinking” that includes authentic interactions between parents and their children (Elliott, 2008, Elliott et al., 2012; Pramling-Samuelson & Park, 2017) which then turns into intergenerational learning. Since guided participation plays a major role when children initially explore pro-environmental actions, interactions and communication with parent on early childhood education for sustainability are worth exploring (Pramling-Samuelsson & Park, 2017; Spiteri, 2020, 2022).

Ballantyne et al. (2006) proposed that parents’ pro-environmental attitudes might also be encouraged through the child-parent knowledge exchange. Herein, as more experienced people, parents have a critical role in sharing their experiences and supporting their children’s perceptions of environmental sustainability. As Rogoff et al. (2003) noted, parental communication about everyday pro-environmental behaviors potentially encourages children to build up responsive pro-environmental norms. In this respect, parental everyday pro-environmental behavior provides a site for children to acquire new behaviors. It is suggested that communication with parents and carrying out collective actions intrinsically motivate children to explore sustainable patterns. (Grønhøj & Thøgersen, 2009; Matthies et al., 2012). Besides, children can simply share news with their parents related to sustainable implementations and green practices that they have already learned in school. From this perspective, mutual learning and reciprocity are fostered through a reflective process in which the intergenerational dimension makes thinking “being more sustainable” more effective. Since children are encouraged to share what they think through engaging in intergenerational dialogues, they feel comfortable and capable to think, share and act for sustainability which potentially turns into an attitude of collective responsibility.

Considered together, early childhood education for sustainability is a highly generative framework for the field of autobiographical memory development which is also a conceptual base for this particular study. At this juncture, a central premise of the sociocultural approach proposed by Vygotsky (1978) and Rogoff (1990) is that social interactions which are socially and culturally guided serve children to construct their personal narratives and stories in favor of establishing autobiographical memory. Narrative exchanges with others provide opportunities for children to talk with others which results in developing coherent and meaningful personal stories (Mercer & Littleton, 2007). Within this consideration, everyday conversations with parents about shared experiences are bountiful avenues to foster the socialization of young children (Kulkofsky et al., 2010; Pillemer, 1998; Wang, 2013). Even

though the adults are the decision-makers when it comes to the structure of the conversation, children's willingness to participate and direct the way and the content of the dialogues enable children to construct meanings on their own. Differences in the magnitude, content, and structure of the conversations also have vital influences on children's cognitive outcomes and social recognition (Fivush, 2007). Recognizing the potential of an early conversation with young children is vital (Langley et al., 2017) because, in the context of a conversation about shared events, parents foster children's psychological understanding. Through dialogues, parents talk with their children about actions, emotions, intentions about relevant people, and behaviors in shared experiences (Fivush & Nelson, 2006). This enables children to revisit the shared experience and create mental representations through gaining new and embellished perspectives that emerge in these dialogues (Fivush, 2007; Neale & Pino-Pasternak, 2017; Reese et al., 2019). Notably, children begin to learn perspective-taking and create a psychological insight into their own behaviors and understanding.

To what extent a parent elaborates on the conversation is a consistent predictor for a child's outcomes on learning and recall (Fivush et al., 2006; Leyva et al., 2020; Taumoepeau & Reese, 2013). Mother-child talk provides children with opportunities to learn how they organize their memories as coherent narratives (Fivush et al., 2006; Haden, 2003; Valentino et al., 2014). The narratives belonging to a particular event are also the "story" of what the child personally experiences. All narratives delivered during the conversations also turn into meaningful personal stories including the details as to what happened during the event, where the event occurred, and who was already there during the event (Hedrick et al., 2009). Exchanging ideas during conversations is also guided by contextual details and background descriptions which extend the degree of the quality of narratives (Nelson, 2003; Reese et al., 2019; Van Bergen et al., 2009). Besides, mother-child conversations include evaluative descriptions and information to intensify and emphasize the different aspects of the experienced event. More importantly, this turns out to be a strategy for children that they may learn to organize the representations of the event in personally meaningful ways. Since asking divergent questions triggers children to add new information to previously existing memories and provide embellished details, they have a long-lasting impact on children's developing skills related to remembering (Hoffman, 2014; Wang, 2021). Literally, the parent-child conversation process turns into completing a puzzle. Verbal interchanges also help children to have a deep understanding. Children find opportunities to take references from others which enhances their interpretation of others' actions (Fivush et al., 2006; Fivush & Fromhoff, 1988). Broadly speaking, narratives transferred between mothers and children provide children with

“teachable moments” in which children learn new ways of representing their experiences (Camilleri et al., 2021; Leitchman et al., 2017; Wang, 2003).

The crux here is how parents – in particular mothers – guide the conversations with the unique, individual conversational styles they possess. Children of highly elaborative mothers absorb elaborative talking styles and become more interested in utilizing descriptive and evaluative verbal interactions as their mothers did (Haden et al., 2001; Salmon et al., 2011). In conjunction with this idea, children learn to use their language for retrieving and serving their personal memory reports (Taumoepeau & Reese, 2013). In this tradition, mothers who provide rich backgrounds and embellished details through divergent questions promote a child's understanding. Providing rich and elaborate details about personal experiences enables mothers to provide an opportunity for children to have a better understanding of the causes and consequences of their actions, intentions, and feelings (Boland et al., 2003; Hedrick et al., 2009; Langley et al., 2017). On the other hand, mothers who are less elaborative tend to ask repeated questions in a less collaborative manner. The mothers' styles of talking have an impact on children in regard to organizing their representations of an event in their memory (Fivush et al., 2006, Langley et al., 2017). Additionally, those dialogues might also be shaped by the children. Children are also capable of feeding the style, content, and structure of the conversations (Boland et al., 2003; Taumoepeau and Reese, 2013). Ultimately, the overall quality of the conversation is influenced by the reciprocal interaction between the child and their mother which provides a unique learning opportunity for children to understand their personal experience and construct its meaning on their own (Graci & Fivush, 2017; Neale & Pino-Pasternak, 2017; Pearson & Pillow, 2016; Reese & Cleveland, 2006, Schröder et al., 2013).

1.3 The significance of the study

This study builds on insights provided by social-cultural approaches that place value on building respectful, reciprocal, and responsive dialogues and actions with others. Social learning is considered a powerful tool in the development of a sustainable world (Glasser, 2007; Wals, 2007). By extension, social learning is defined as a transnational and transformative process that can help shift changes in unsustainability patterns (Wals, 2010; Wals & Ven der Leji, 2007). Since children are active agents and capable of building their own theories, interactions provide learning opportunities to construct the meanings of personal and shared experiences within a social environment. Learning explicitly happens through the direct observation of those others, and/or participation in joint activities and discussions on common interests (Bandura, 1977). In this theoretical framework, learning occurs within

relationships (Robinson & Vaealiki, 2010). Hence, it is crucial to understand how children's learning is influenced by culture and family as well as personally based.

This study is significant for several reasons. First of all, amongst investigated research studies in the context of early childhood education for sustainability, there are different scopes and research topics found. Various researchers decided to study young children in line with love and respect for the environment (Ballantyne, & Packer, 1996; Hadzigeorgiou, 2001; Melis et al., 2020; Wilson, 1993), the child-nature connection (Bailie, 2012; Beery et al., 2020; Chawla, 2015; Gill, 2014; Kahn et al., 2018; Rice & Torquati, 2013; Spiteri, 2016, 2020; Yilmaz & Olgan, 2017), gardening with children (Green & Duhn, 2015; Lee et al., 2017; Miller, 2007; Moore, 1995; Witt & Kimple, 2008), whole school approach toward sustainability (Bautista et al., 2018; Davis, 2005; Duhn, 2012; Duhn & Ritchie, 2014; Ji & Stuhmcke, 2014), and solid waste management and its usefulness (Buil et al., 2019; Kara et al., 2015); but very little is known about how young children conceptualize how composting practices are enacted and it influences children's and other agents' perspectives (Ergazaki et al. 2009; Marchal-Gaillard, 2022; Palmer et al., 2003) in the context of sustainability. Even though recycling, composting, and vegetable gardening are considered a topic of early childhood education for sustainability practice initiatives that fits well into partnerships for change (Ärlemalm-Hagser & Sandberg, 2017; Hill et al., 2014; Luff, 2018; Barratt & Barratt-Hacking, 2014; Palmer & Suggate, 2004; Spiteri, 2020), there is a lack of evidence to acknowledge the value of composting systems for sustainability that can be likely turned into a popular school activity for children, parents, teachers, and school staff (Moore, 1995; Williams & Brown, 2010).

Another idea influencing the current study is providing further insights into the potential of intergenerational learning of sustainability. Intergenerational learning is considered vital to support children in learning at home and in the communities (UNESCO, 2020) that maintain bidirectional learning between generations (Bostrom & Schmidt-Hertha, 2017). There is evidence emerging from many studies of intergenerational learning focusing on adults' roles in children's learning (Fielding, 2011; Istead & Shapiro, 2014). By the same token, a wealth of research also demonstrates that children are competent individuals in shaping parent's decisions (Kerrane et al. 2012; Lawson et al., 2019; Peterson et. al., 2019) and perspectives on different environmental issues (Ballantyne et al., 1998, 2001a, 2001b; Duvall & Zint, 2007; Lawson et al., 2019; Rickinson, 2002; Williams et al., 2017). As Vygotsky (1978) and Rogoff (1990) suggested, learning is a process of participation in which children are guided by values and practices. Plus, according to Tsethlikai and Rogoff (2013), knowledge that is socially and culturally constructed becomes meaningful for young children. In this vein, the current study

moves a step further and mothers were considered as important agents in fostering their children's learning for sustainability in school settings. Even though there are several studies on this claim (Bautista, 2018; Grodzieska-Jurczak et al., 2006; Tucker & Izadpanahi, 2017), there is a lack of evidence on the influence of parents on children's practices and understandings of environmental sustainability (Borg, 2017; Davis, 2014; Percy-Smith & Burns, 2013; Walker, 2017).

The current study contributes to two interrelated fields, namely, early childhood education for sustainability and developmental psychology, by demonstrating how learning takes place in a community context and how children are cognitively guided within an interactional process. The quality of the aforementioned interactional and intergenerational process is potentially serving as a way to have a deeper understanding of how children learn about sustainable practices in their daily life. The empirical research on intergenerational learning so far mainly focuses on primary and secondary school children (Damerell et al., 2013; Peterson et al., 2019; Williams et al., 2017), yet there is little done with preschool children (Boyd, 2020; Spiteri, 2020). Besides, parent involvement in environmental education and education for sustainability has been widely recognized (Ballantyne et al., 1998; Tal, 2004; Borg, 2017; Siraj-Blatchford & Samuelsson, 2015; Wals, 2012), there is a need for studies in which parents might be embedded to promote young children's learning on sustainability (Borg et al., 2017, 2019; Davis, 2014). Taken together, mothers in the current study have great potential and authentically act to foster children's learning through their individual conversational styles which makes this study significant to connect the home and school environments on a common and practical sustainability topic: recycling of organic wastes. Last but not least, even though a wealth of research has been available on the development of children's memory for specific personal events (Fivush, 2014; Fivush & Fromhoff, 1988; Haden et al., 2001; Leitchman et al., 2000), and the influences of conversation styles on the event memory of children has been widely recognized (Fivush et al., 2006; Fivush, 2011; Fivush, 2019; Haden et al., 2009; Laible, 2004; Reese & Fivush, 1993), young children's memory for academically relevant learning events is an emergent research area in the developmental literature. Recent research has started to focus on how children learn in the formal school context and how conversational interactions with adults fleshes out the academic experiences of children and make them vivid and memorable for them (Bemis et al., 2011; Camilleri et al., 2021; Leitchman et al., 2017, 2020; Bemis & Leitchman, 2019; Tang & Bartsch, 2012). In this tradition, investigating the degree of mother-child talk during museum exhibits (Benjamin et al., 2010; Callanan et al., 2012; Haden, 2010; Haden et al., 2014), science learning at an aquarium (Ocular et al., 2022; Kelly et al., 2023) and the potential of conversational interactions for learning about

conceptual knowledge on scientific concepts such as light, flight, animals, etc. (Callanan & Jipson, 2001; Camilleri et al., 2021; Conrad & LoBue, 2015; Haden, 2010; Leithman et al. 2017; Pagano et al., 2020; Stone, 2015) are the most common research topics to examine how parent-child conversations enhance the memories of learning specifically. On the other hand, to the best of our knowledge, no study has been conducted to reveal how parent-child interactional conversations contribute to children's knowledge on any topic related to environmental education and/or education for sustainability so far.

Moreover, related literature confirmed that in order to reorient education systems toward a sustainable future, it is critical to apply relevant and coherent assessment policies and practices to evaluate the effectiveness of designed programs, projects, initiatives, and learners' achievements within the school context (UNESCO, 2014; Rieckmann, 2017; Leicht et al., 2018). In this regard, there is a need to offer and develop eligible assessment tools in order to evaluate the effectiveness of educational programs and projects from the perspective of education for sustainability, and this has been extensively recognized in the present literature (Frantz & Mayer, 2014; Freitas et al., 2022; Papadakis et al., 2020). Even though there are several efforts in large-scale assessment (OECD, 2022; OMEP, 2019; UNESCO, 2017) and a focus on the assessment of education for sustainability in higher education (Caeiro et al., 2020; Mckeown, 2011; Shephard, 2008), there is a paucity of evidence on how designed education for sustainable development programs assessed to evaluate the desired changed in young children's knowledge, competencies, values and behaviors (Borg, 2017; Davis & Elliott, 2014). In the current study, *Learning Outcomes Rubric for Composting Learning Activities* was considered as an authentic assessment tool to reveal children's progress in line with the cognitive, behavioral, and social-emotional learning objectives already determined for SDG12. Given this consideration, the fundamental aim of the developed rubric was to make transparent to what extent children's knowledge encompassed and can differ in pre-, post-, and follow-up interviews. To put it in another way, the rubric provided a means of assessing children's level of knowledge on composting as a sustainable practice and provided a lens for understanding how participating children explore a sustainable practice across the learning activities with their mothers. This offered a bountiful framework to analyze children's altered knowledge about the recycling of organic waste.

The overall purpose of the current study is to provide a rationale for the role of mothers in fostering children's exploration of sustainable practices through intergenerational engagement. With respect to the abovementioned statements, the aim of this study is twofold. In the first place, it attempts to reveal how recycling of organic waste was conceptualized by the

participant children and mothers as a sustainable practice before and after jointly participating in the designed learning activities which are integrated and enacted in preschool settings. Secondly, it reveals the potential of mothers' individual conversational styles to foster children's self-reported knowledge as well as memory reports on the recycling of organic wastes as a sustainable practice. The study was guided by the following four research questions;

RQ 1. What is the self-reported knowledge of 60- to 72-month-old children about recycling organic wastes before and after participating in the composting learning activities?

RQ 2. Based on the *Learning Outcomes Rubric for Composting Learning Activities*, to what extent did the knowledge levels of the children related to composting process change?

RQ 3. What is the self-reported knowledge of mothers about recycling organic wastes before and after participating in composting learning activities?

RQ 4. How do mothers' conversation styles uniquely contribute to children's knowledge of recycling organic waste?

- a) Is there a relation between mothers' elaborations and children's contributions to mother-child joint conversations about composting learning activities?
- b) To what extent do high and low elaborative mothers contribute to the mother-child joint conversations about composting learning activities?
- c) Does the degree of mothers' elaborations predict what children reported about composting learning activities in post and follow-up interviews?

1.4 Delimitations

Due to the practical concerns in line with accessing mother-child dyads, the study context was limited to two preschools. Preschool children were easily accessible since they are at school the whole day; on the other hand, accessing mothers was somehow challenging. Optimally, all learning activities were scheduled during lunch break which was decided as a convenient time for all participating mothers.

Furthermore, the physical differences between the two preschool settings as the study contexts were not considered, since all learning activities were held in each school's yards surrounded by large open and green spaces. Besides, for each event day, all materials were provided, each learning activity environment was similarly organized and the implementation conducted by the only one and the same researcher that equalized and adjusted the implementation process for participating children and mothers of both of the study contexts.

1.5 Limitations

First of all, the study was conducted with mother-child dyads from two preschool settings. The study, therefore, is limited to the practices and learning experiences of participants and the findings in a bounded system. By its very nature, as an explorative study, the findings cannot be generalized to other study contexts. On this issue, Merriam and Tisdell (2014) emphasized that case studies are not considered as a limitation which does not make the generalizability issue for this study a drawback. Typically, the aim of the participatory case studies is not to generalize the findings to another context. Therefore, the current study is unique to the research context and participants, yet can potentially be interpreted in different contexts by different individuals. Secondly, the sample selection process is one of the distinct features of qualitative research design. The sample of the current study was constructed by accessing children and mothers who were willing to participate in this study. Though the sample size was large enough for the qualitative analysis, it would have been better to have a larger sample size to reach more mothers in order to obtain more diverse patterns regarding conversational styles unique to each mother. Furthermore, since the focus of case studies is human experiences, one of the limitations of case studies is about collecting subjective data rooted in researchers' personal observations and participants' statements (Merriam, 2015; Yin, 2003). In other words, collected data reflects personal feelings, notions, and stated ideas. No doubt, the data analysis process was completed with the collaboration of second and third coders to enhance inter-coder reliability, but collected data were also shaped and interpreted in line with the researcher's beliefs, notions, and skills.

1.6 Definition of key terms

The following operational definitions are used as key terminologies in this study;

Early childhood: Early childhood comprises a period up to 8 years of age marked by the developmental milestones of one, is critical not only for the whole development of a child but also for the context of sustainability as fundamental skills learned in early childhood years and extend throughout one's entire life. (UNESCO, 2008; UNICEF, 2023).

Early childhood education (ECE): Early childhood education aims for the holistic development of a child's cognitive, language, social-emotional, and motor (Borisova et al., 2019) skills. Of interest to the role of ECE, Agenda 2030 put a particular notice with Goal 4 and Target 4.2, namely, "By 2030, ensure that all girls and boys have access to quality early childhood development, care, and pre-primary education so that they are ready for primary

education” (UNESCO, 2015). For the purposes of the current study, the term early childhood education points to kindergarten education prior to formal schooling in which 60–72-month-old children were involved.

Education for sustainable development (ESD): Education for sustainable development is defined as learning to improve the quality of our lives through obtaining the knowledge, skills, attitudes, and values to think critically and act collaboratively. It is also about teaching, learning, and experiencing sustainability-related issues such as climate change, biodiversity, poverty reduction, and sustainable consumption (Sustainable Education Panel Report, 1999; UNESCO, 2014).

Early childhood education for sustainability (ECEfS): Early childhood education for sustainability was defined by Davis (2010) as the synthesis of the two fields; early childhood education and education for sustainability. ECEfS “can be described as the enactment of transformative, empowering and participative education around sustainability issues, topics and experiences within early education contexts” (Davis & Elliott, 2014, p.22). This definition guides the framework of this study. The central tenet of the current study is to immerse children into an everyday experience in order to foster their realization about “what is sustainable” and “what is unsustainable”. From this perspective, ECEfS can be conceptualized as a participatory and collaborative approach that is characterized by the foundations of early childhood education to equip young children with the knowledge, values, and skills to overcome a specified unsustainable pattern of an environmental issue.

Sustainable Development Practices: Sustainable practices aim at the goal of living sustainably within the environment and adapting our lifestyle with respect to other people. Sustainable development practices equip children with the knowledge, values, and skills, and the appreciation of the environment turns into significant life experiences (UNESCO, 2005; UNESCO, 2018).

Composting: Composting is an important act for sustainable waste management held through collecting and storing plant materials so they can decay to improve the quality of soil (Cambridge Advanced Learning Dictionary). For the current study, the terms "composting" and "recycling of organic waste" are used. Both refer to the management and recycling of kitchen scraps/leftovers and park and garden waste.

Autobiographical memory: Autobiographical memory is commonly defined as memories of specific events and experiences shaped by personal involvement which is fundamental to our

self. They are described as our life stories including our personal pasts (Fivush, 2011; Pillemer, 2009).

Guided participation: It is a learning process that reflects the nature of children's cognitive development in line with Vygotsky's sociocultural theory. It is simply defined as a learning process in which children's active participation and learning are promoted by a parent, teacher, etc. (Rogoff, 1990).

Maternal conversational style: Early conversations between parents and children potentially contribute to the child's memory content as Vygotsky (2012) suggested. Distinct maternal styles in talking with children are simply categorized into two as high and low elaborative parents who guide the content and structure of the conversations. High elaborative mothers seem more collaborative in conversing about shared events to contribute child's self, while low elaborative ones interpret the functions of conversations differently and they tend to perceive mother-child talk as practical remembering and contribute fewer personal narratives (Reese & Fivush, 1993; Reese et al, 1993).

Self-reported knowledge: The operational definition of knowledge is about the facts or being familiar and aware of something through gaining experience (Cambridge Advanced Learning Dictionary). Since young children are capable of constructing their own knowledge through observation, play, and interactions, the responses of children reflect their self-reported knowledge. In the current study, children and mothers are provided to extend their knowledge through participating and interacting in the entire learning process, thus knowledge of participants was revealed both from the pre- and post-interviews with researchers and the self-reported descriptions emerged from the mother-child conversations.

CHAPTER 2

LITERATURE REVIEW

This review explores the topics that support the rationale for this particular study. The purpose of this chapter is twofold and is guided by the twin interests of the researcher. In a nutshell, they focus on education for sustainability and the development of autobiographical memory. Education for sustainability is reviewed in line with its intersections with the understanding of education for sustainability, curriculum integration, the key characteristics of early childhood education for a sustainable future, the role of intergenerational learning for early childhood education for sustainability, and good practices in the field. Besides, the development of autobiographical memory skills simply links to maternal conversational styles and their profound impacts on young children's learning outcomes and memory reports.

2.1 The need for understanding education for sustainability

Modern education serves children a rigid clock that limits the nature of children's experiences (Williams & Brown, 2012). In this system, knowledge is detached from life experiences and children are equipped with a relatively predictable future which turns into education's core problem. The major problem of education is identified as the "irrelevant" content which is detached from practice (Kellert, 2002; Orr, 1992; Boeve-de Pauw et al., 2015). As Williams and Brown (2012) suggested, the modern education system provides little practical application that upsets the harmony among the Heads, Hands, and Hearts approach (Singleton, 2015; Sipos et al., 2008). One of the simplest ways of tackling this problem is considering children's development as a whole (Davis, 2010; Pramling-Samuelsson & Kaga, 2008; Tilbury & Wortman, 2005). From a holistic perspective, the epistemological aspect of education which refers to "how knowledge is acquired" is as important as the ontological aspect which points to the question of "what being human is" (MoNE, 2019; Sterling, 2002). Instead of building educational experiences upon technical and mechanistic frameworks, children should be provided with metaphoric frameworks to construct their ecological understanding by examining holistic and tangible relationships of Earth's systems (Davis, 2015; Duhn, 2012).

In today's world, modernist education misses the pivotal points of education that bring about sustainability. The decontextualization of learning, loss of curiosity, and decreasing the time of authentic learning are issues that block children's contact with the natural environment (Louv, 2005; Malone, 2008). Williams and Brown (2012) explain this position as follows: "a disconnection of education from life undermines the relevance of education to life" (p.11). It is usually an ill-posed problem in the case of practicing what we have learned. Urbanized populations particularly need to integrate life lessons into the curriculums to explore natural systems. At this juncture, the schools are perfect places to observe immediate changes in natural systems and immerse young children in observing the transformative processes within nature such as blossoming flowers, feeding compost bins, following ant paths, and building correct relationships with the natural environment (Sobel, 1996; 1998; Taylor et al., 2015).

Herein, the crucial question should be; "What is education for?". Indeed, education has a major role in enriching the life of children, families, and communities (Filho et al., 2018). It is at the heart of change and transforms the world for a sustainable future (Filho et. al, 2017; UNESCO, 2015). Education does not have a magic formula to make all individuals on Earth reach an ideal life, rather, it inspires our minds to create a strong social change that builds a deeper understanding based on lifelong learning, critical reflexivity, holistic interpretations, and cooperative learning relationships. It serves people in developing awareness about keeping the carrying capacity of the planet and encourages them to recognize their social roles. (Didham & Manu, 2015; Orr, 2004). The world is constantly changing; thus, education must also change. We need to rethink education. We need to address the quality of education and how it could be relevant to children as well as a part of the real world (Worldwatch Institute & Assadourian, 2017; Wilkins, 2011).

2.1.1 Conceptualizing education for sustainability: Evolution and insights

Sustainable development (SD) is defined as principles to ensure the well-being and prosperity of people and the Planet (Global Sustainable Development Report., 2019). This is about how people reach fulfilling lives in harmony with nature. Therefore, it is urgent to alter certain lifestyles and create change in human behavior toward a more sustainable life economically, socially, politically, and ecologically which are the four pillars of sustainability (UN, 2013; UNEP, 2013). Herein, a sustainable future will arise on the strong relationship between those four pillars, namely, environmental, economic, socio-cultural, and political systems. Those four systems are called "pillars" since focusing on the interrelationship between those dimensions is the key for a sustainable future (Figure 2.1). What is done for any dimension will affect and even also be affected by all other dimensions (UNESCO, 2015). Sometimes, it

is not easy to understand the complexity of the aspects of sustainability. It can be challenging, yet a holistic view is necessary to consider environmental problems, sociocultural values, and economic and political contexts.

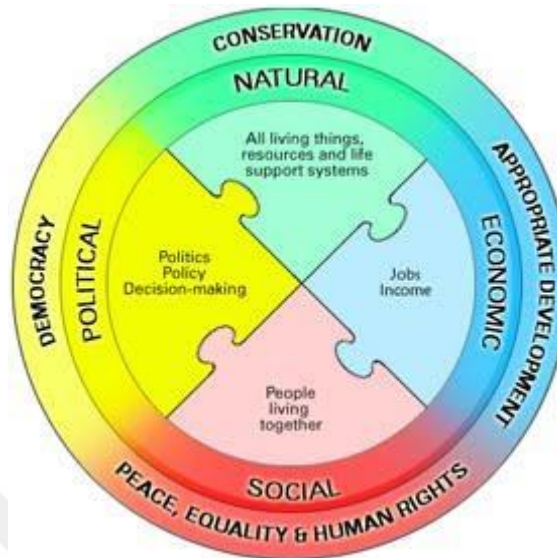


Figure 2.1 *The four pillars of sustainability (UNESCO, 2010).*

Sustainability is defined from different perspectives in the literature. Weaker and stronger sustainability is one of the points of view that capture a strong explanation of what we should focus on when it comes to sustainability (Ekins et al., 2003; Neumayer, 2013). Weaker sustainability points to the human-centered perspective in which the presence of nature is for the benefit of human beings. In this aspect, a growth-oriented approach, technological developments, and efficient economic growth are all for the well-being of humans. On the other hand, stronger sustainability refers to a more eco-centric approach that values the benefit of the natural environment for its own sake (Ekins et al., 2003). Stronger sustainability reflects a style in which human being needs to decrease the demands on nature and alter social and economic systems that put intense pressure on Earth (Buriti, 2019). To date, the topic of sustainability has been handled through the questions of either what it is or how it can be achieved; yet the common and well-known definition that takes part in the Brundtland Report is as follows: “Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987; p.1). The Rio Declaration consists of 27 principles of sustainability. Agenda 21, proposed in the Earth Summit in Rio de Janeiro, highlighted the role of education as “critical

for promoting sustainable development and improving the capacity of people to address environment and development issues” (WSSD, 1992, p.2). Since then, the focus was drawn to the potential of education for sustainability. This statement was perseveringly restated in The World Summit on Sustainable Development (UN, 2002) and in the United Nations Decade of Education for Sustainable Development (UNDESD, 2005-2014) and the Post-2015 Sustainable Development Goals (SDGs) (2015-2030) as well.

Among the efforts toward a more sustainable future, the United Nations Decade of Education for Sustainable Development (UNDESD) (2005-2014) is the keystone and perhaps a more compelling document that emphasizes the role of education in all its forms. There is a considerable emphasis in UNDESD on education which is needed to create a shift in knowledge, values, and skills acknowledged in all aspects of learning. Following UNDESD, the Global Action Program (GAP) on Education for Sustainability (EfS) is released to emphasize the role of concrete actions (UNESCO, 2014).

The global action program focuses on understanding the dimensions of EfS which are learning content, pedagogy and learning environments, learning outcomes, and societal transformation. The overarching aim of the GAP is to generate and scale up action in all levels and areas of education and learning to accelerate progress towards sustainable development”. The GAP draws a roadmap with the following underlying ideas: i) integrating sustainable development into education and ii) integrating education into sustainable development. Given this perspective, there are two main objectives: (1) “to reorient education and learning so that everyone has the opportunity to acquire the knowledge, skills, values, and attitudes that empower them to contribute to sustainable development” and (2) “to strengthen education and learning in all agendas, programs, and activities that promote sustainable development”. The GAP encompasses several practices and principles. One of them specifically emphasizes the transformative role of EfS in reorienting societies towards a sustainable lifestyle. *Priority Action Area 2* is defined as transforming the learning and training environment in order to put an emphasis on integrating sustainability practices into educational and training settings. EfS is considered a path that encompasses not only teaching about sustainability but also practicing it. Sustainable learning environments and sustainability-based pedagogies are noteworthy to integrate sustainability principles into daily life practices (UNESCO, 2014). Of significance to integrating sustainability into everyday life, the 2030 Agenda for Sustainable Development was released on 25 September 2015 as a new global framework to create a path for human beings to reach a more sustainable future. This global framework consists of 17 Sustainable Development Goals (SDGs) and 168 targets that reflect the needs of humanity to reach a

sustainable, prosperous, and equitable life and lifestyle. SDGs are systematically organized to be an essential guide for humanity to direct their everyday lives and challenge unsustainable consumption patterns and environmental degradation (UNESCO, 2017). Universality and indivisibility are acknowledged as the two key premises of the 2030 Agenda for Sustainable Development. On the other hand, everyone is considered as an integral stakeholder from governments to each individual across the world. All countries are responsible to implement the needs to meet those intertwined 17 goals by the year 2030. Thus, all countries are considered as developing countries that have to demonstrate their efforts to contribute to the agenda and foster each goal to promote sustainable patterns.

UNESCO, therefore, released a document with learning objectives on the cognitive, social, and behavioral domains of learning to guide stakeholders to equip them with the necessary knowledge, values, and skills (UNESCO, 2017). There are also suggested topics for each SDG with detailed descriptions of how sustainable practices are authentically applied in everyday life. The document serves the practitioners, policy-makers, and educators to develop the appropriate curricula to foster learning for each SDG. It is particularly indicated in the document that educators are profoundly benefited to develop a course and/or a program to promote sustainability. The outlined key competencies, learning outcomes, and objectives were designed at a mass level to reach diverse audiences and target groups across the world. Key competencies are considered vital to reach a full understanding of sustainability (UNESCO, 2014; 2015b; 2017).

Collaboration competency was defined as an ability to recognize others' values, ideas, and perspectives, and to respect others' values. It is about learning from others. Thus, a collaborative and participatory approach is pivotal to reaching collaboration competency. Besides, critical thinking competency is highlighted as one of the core competencies to advance sustainability. It is the ability to question the norms and practices relevant to practices. It is about immersing a discourse on sustainability issues and understanding the norms and perspectives and respecting the other's value on sustainability (UNESCO, 2015b; 2017).

Specific learning objectives were outlined for all SDGs in the form of cognitive, social-emotional, and behavioral domains. (UNESCO, 2017; UN, 2015). The cognitive domain focuses on the knowledge and thinking skills of one to gain a better understanding of the goal. The socio-emotional domain, on the other hand, comprises the ability to learn collaboratively and communicate with each other about the values of each SDG. This domain fosters self-reflection, values, and attitudes. The behavioral domain is about actions and practices. Development Goal 4 aims *to ensure inclusive and equitable quality education and promote*

life-long learning opportunities for all. Increasing the quality of pre-primary education to reach the necessary knowledge, skills, and behavioral competencies in the early stages is valued. Goal 4 acknowledges the potential of early years to gain a better future for all. It is emphasized that young children's education has positive and better outcomes for future trajectories. Hence, starting learning as early as possible would mean the next generations will be even more competent and more educated. Education has a vital role in encouraging children to be familiar with environmental issues (UNDP, 2014). Educated individuals will tend to be more concerned about environmental issues and to understand and eliminate unfavorable impacts (UNESCO, 2015b; 2017). Taken together, the abovementioned efforts toward a more sustainable future put the emphasis on the central role of education for sustainability which is to encourage individuals to be change-makers. Combining those approaches promotes the development of sustainability and transformation of the behaviors which is constantly confirmed throughout intergenerational meetings from the UN Conference (1992), World Summit (2002), Rio +20 (2012) to the Post-2015 Development Agenda. ESD empowers individuals to recognize their own actions and their own potential for environmental, economic, and social-cultural change. This contributes to the quality of education since it makes each individual responsible for their own actions which are relevant to their everyday life. The significance of good quality education is that it addresses appropriate learning content and outcomes with pedagogy and with a learning environment that fosters the holistic perspective of sustainability (Laurie et al., 2016; Ofei-Manu & Didhan, 2014). An action-oriented, learner-centered, participative and collaborative approach is profoundly linked with Sustainable Development Goals (SDGs), which points to the importance of what kind of curricula and pedagogies can be utilized to reach Goal 4: Quality of education and its indicators.

2.1.2 Teaching education for sustainability: from theory to practice

Traditionally, the transmission model in education considers individuals as “empty vessels” that teachers fill in (Scott & Gough, 2004). In this model, the children have little contribution to the learning process and have minimal opportunity to answer questions, take part in discussions, think creatively, and share their pre-knowledge with peers. Swimming against the tide, the constructivist approach has a radically different theoretical view than the transmission model and asserts that children come to the classroom with their own ideas and experiences (Gupta, 2011). What Piaget, Vygotsky, and Bruner propose is that teachers take children's ideas in the learner-centered process. The children are cognitively developed through their interaction with others. The knowledge is actively constructed through guided participation

within social contexts and interpersonal interaction (Jenkins, 2014). In this respect, Bruner (1996) proposed that “Learning should be participatory, proactive, communal, collaborative, and given over to the construction of meanings” (p.84). Children’s active participation in the learning process led to the construction of new knowledge and meanings (von Glasersfeld, 1992). Through their newly learned experiences as the result of interaction with others, children begin to question pre-existing ideas and start to challenge their current thinking. Learning becomes more authentic and powerful through the reconciliation between what the child already knows and what s/he explores in the light of the new experience. Vygotsky (1978), as a social constructivist, advocated that learning from and with others is pivotally significant. The cognition of a child is constructed through their interactions with their parents, peers, siblings, or teachers. Through working with others cooperatively and collaboratively, young children experience interdependence in which every member of the group works together (John-Steiner & Mahn, 1996). As a result, child’s perspectives expand with numerous examples, ideas, and notions, and they begin to feel more equipped with the knowledge and skills that provokes them to learn more with parents, friends, and teachers.

On these grounds, education for sustainability depends on constructivist theory (Armstrong, 2011). Through collaborative and cooperative strategies, children are actively engaged in sustainability topics which makes EfS a transformational constructivist model compared to the transmission model (Barth, 2013; Elliott & Davis, 2020; Jenkins, 2014). EfS is defined as transformative since creating a change in unsustainable patterns of society through sustainable practices is one of its major points. For an efficient change, Thomas (2009) implies that the focal point of pedagogy in teaching sustainability should be “how to learn” rather than simply the transmission and accumulation of knowledge. Herein, the children should be considered active agents that can question and think critically about issues. Education for sustainability is about how young children are immersed in sustainability and what they can learn (Andersen, 2016; Warwick et al., 2017). To be isolated and not be lost in crowded curriculums, Education for Sustainability can be simply embedded in different and specific content areas. This approach is effectively utilized in Australian Sustainable Schools Initiative as sustainability topics are integrated into the everyday curriculum and schools begin to adopt a whole school approach to meet the principles of sustainability. Furthermore, in their groundbreaking Enviro-school Program, New Zealand provides an inspiring example of how The New Zealand Curriculum is shaped to promote sustainability in preschools (Eames et al., 2010; Ritchie, 2013).

The cross-curricular manner is highly suggested to embed sustainability into the curriculum (Dyment et al., 2014). It is considered a bountiful way to integrate EfS across the curriculum by focusing essential content such as social sciences, natural sciences, physical education, literacy, and numeracy, and also points to rich concepts such as social justice, wellbeing, war, equality, resources and so forth (Taylor et al., 2013). Thus, teachers utilize their limited time by focusing on both content areas, teaching specific concepts, and highlighting the essential points of sustainability issues. Murdoch and Hornsby (1997) implied that children become more motivated toward learning when they participate in “real-life” issues and explore the rich concepts which are authentically meaningful for their daily life. Since authentic learning is about real-world issues, the learning practices about sustainability involve real-world problems (Barratt & Barratt-Hacking, 2014; Davis 2010). Authentic EfS learning provides children with the opportunity to explore collaboratively and exchange ideas through discussion on the problem. Collaborative learning on common tasks, perspective sharing, deeply critical conversations, and dialogues feed authenticity through embedding different curriculum areas and disciplines to enrich the strategies (Davis & Elliott, 2014; Dyment et al., 2014). At this juncture, the question that we should ask is how those rich concepts and real-life issues should be connected to the curriculum in order to teach and explore the pillars of sustainability.

Education for sustainable development is recognized as the central premise of high-quality education for all (World Education Forum, 2000). Two international documents, namely, The United Nations 2005 World Summit Outcome and UNDESD (2005-2014) have suggested that the key challenge for educators is how EfS is embraced into curriculums and pedagogies that provide a base to promote the pillars of sustainability with the aim of creating an understanding and awareness of sustainable development. Until fair recently, the post-2015 Development Agenda proposed principles to integrate sustainability into all formal learning settings. (UNESCO, 2015). Agenda 2030 is mentioned as ‘people-centered and planet sensitive’ with the aim of reaching human dignity, equity, environmental balance, and healthy economies. Within this aspect, education is key in shaping society and supporting them to reach their full potential as well as in equipping them with knowledge, skills, values, and attitudes. The 2030 Agenda has 17 goals and 169 targets which are intertwined and integrated into all levels of education from early childhood to vocational training (Rieckmann et al., 2017).

Central to the idea of integrating sustainability into education begins with qualified early childhood education and has the potential to provide foundations for lifelong learning (Engdahl, 2015; Huggins & Evans, 2017; Pramling- Samuelsson & Kaga, 2008). Since children in their early years have a great capacity to learn about the environment, to develop

skills, understanding, and knowledge, they are considered one of the pivotal citizen groups who have great potential for change and are influential for their families, peers, teachers and the rest of the community members in shifting unsustainable patterns (Siraj-Blatchford, et al., 2016). High-quality early childhood education is expected to embed sustainability concepts and practices into early childhood settings (Pramling-Samuelsson & Park, 2017; Spiteri, 2020). It is important to recognize the potential of utilizing alternative settings and organizing the programs. Pramling-Samuelsson and Park (2017) acknowledged several pre-conditions to make children an integral part of sustainability. Accordingly, curriculum integration is one of the essential issues to immerse children into sustainability. The existing curriculum should be reoriented to focus on dimensions equally. In light of the SDG *Target 4.7*, the central point of content and pedagogy in EfS is pointed out as:

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development (United Nations, 2015; p.19).

The importance of early years for learning sustainability is also tailored within the socio-ecological model (Bhagwanji, 2019; Montague, 2019). As it was mentioned in the first chapter of this work, social relationships are considered a pivotal “window of opportunity” for young children. According to the Socio-Ecological model, children are located at the center of four nested layers which are hierarchically organized (UNESCO, 2017). Figure 2.2 simply displays how a child-centered SDG wheel is established regarding the assumptions of 17 goals and 168 targets in the context of the socioecological model. The wheel and the numbers point to the relevant SDGs to maintain a child’s wellbeing in society.

In the broadest sense, education is needed for social transformation that aims to construct more sustainable societies. Reorienting existing educational programs and curricular activities is considered one of the four thrusts of ESD (Hopkins & McKeown, 2002; McKeown & Hopkins, 2007; Spiteri, 2016). Reorienting the curriculum can be started in early childhood education by revising the pedagogies on *what* is taught, *how* it is taught, and *what* is assessed. In this respect, education for sustainability is underpinned by some principles such as intergenerational equity, gender equity, poverty reduction, resource conservation, and social justice. (UNESCO, 2015, 2017).

There are three key pedagogical approaches to immerse learners into sustainability (Rieckmann, 2017, p.55); i) a learner-centered approach, ii) action-oriented learning, and iii) transformative learning

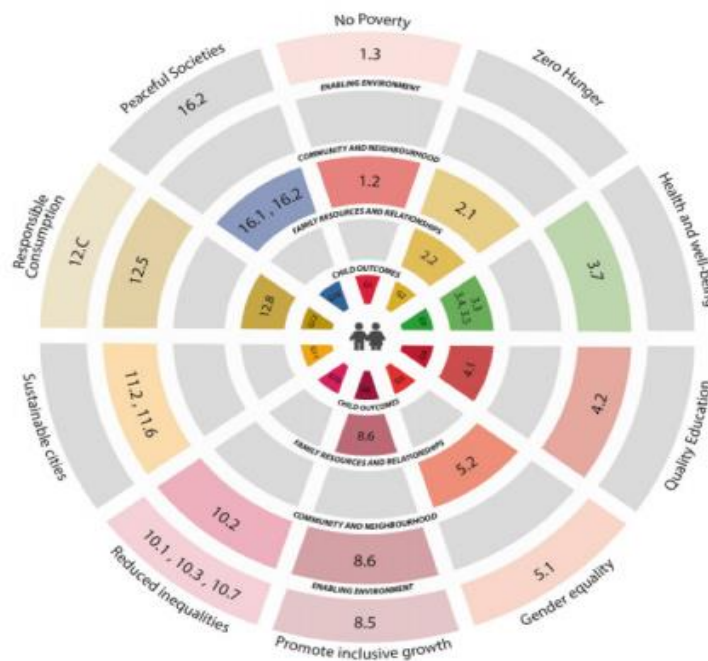


Figure 2.2 *Child-centered approach to SDG, based on socio-ecological model (UNICEF, 2017, p.15)*

The learner-centered approach sees children as active individuals in constructing his/her knowledge rather than transferring the knowledge through passive learning experiences. The learners' knowledge is constructed through active participation through experiences gained in the social context. In the learner-centered approach, educators are the catalyst and facilitators of the learning process (Tilbury & Wortman, 2008). The action-oriented approach highlights the importance of how experiences contribute to personal development (Davis, 2009). Action-oriented process heavily depends on Kolb's theory of the experiential learning cycle. In this cycle, learners are provided with a concrete experience that follows the observing and reflection stages. Afterwards, the learner develops abstract concepts for generalizations to use in new situations (Kolb, 2014).

From this, we can draw the conclusion that reorienting an already existing curriculum toward sustainability requires identifying knowledge, skills, and values for sustainable development regarding the pillars of it, which are environmental, economic, and social-cultural. For a better-quality future, the education systems integrate principles of sustainability into curricula and prepare the future of individuals. Besides, it is stressed that through adopting sustainable practices, educational institutions can support the active participation of children, teachers,

local partners, universities, and families to develop the necessary skills to advance in sustainable development (UNEP, 2012).

2.1.2.1 Fitting Sustainability into National Curriculum

The Ministry of Education has a pivotal role in integrating sustainability into national curricula all over the world (Pramling-Samuelsson & Park, 2017). The national quality standards and developing indicators that ensure that education systems promote individuals to take responsibility for sustainability challenges are vital. The United Nations Decade of Education for Sustainable Development (2005-2014) (DESD) acknowledged that integrating ESD into the curriculum is in good progress, yet reorienting already existing education patterns around the globe is still under construction (UNESCO, 2005). Immersing learners in education for sustainability through active participation will be a good indicator of high-quality teaching and learning. Hence, the standards and the principles of education for sustainability provide richness in the teaching and learning process which are good contributors to national education policies. National and international policies should be embraced into the teaching and learning process regarding the environmental, social, and economic aspects of countries (Davis, 2014; Engdahl, 2015). Hence, ESD should be an integral part of the curriculum and formal education in a wide range of early childhood to vocational education (UNESCO, 2017). The point that we should pay attention to is that ESD does not require newly developed curriculum policies. However, already existing curriculums can be simply reexamined and reoriented toward sustainability-related learning outcomes. From this aspect, it is expected that curricula should foster to “improve the capacity of our education systems to prepare people to pursue sustainable development” (United Nations, 2012: para 230).

2.1.2.2 Turkey as State-of-the-art

All Turkish preschools are required to follow a specified curriculum designed by the Ministry of National Education (MoNE). The national early childhood education program (MoNE, 2013) has been established for 36 to 72-month-old children around the goals and indicators in five (motor, cognitive, language, socio-emotional, and self-care) developmental domains. It does not explicitly use the term education for sustainability or sustainable development. Education for sustainability is not an integral system of national early childhood education programs. However, there are already existing goals and indicators pointing to the principles of sustainability including environmental, economic, and social pillars and democratic values. The Turkish framework for preschool children already parallel with ESD principles as play-based curriculum and flexible characteristics. The program guide also embeds concepts and

special days related to sustainable development. The curriculum framework serves as a guide for Turkish teachers to conceptualize goals and indicators and embraced them in everyday life with an integral and flexible approach.

The program was shaped by a holistic approach since the goals and indicators aim to prompt a child's every developmental domain such as the motor, cognitive, language, socio-emotional, language, and self-care domains. In parallel to education for sustainability principles, the national early childhood education program (MoNE, 2013) consists of goals and indicators such as "respect differences", "respect cultural characteristics", "be responsible to their environment", "solve problems", "associate cause and effect relationship" etc. (Haktanır et al., 2016). Further, the curriculum put a particular emphasis on the role of parents, teachers, and other community members to ensure high-quality early childhood education for a sustainable future.

2.1.3 The Key Characteristics of Early Childhood Education for Sustainability

The environmental issues that we are facing should also make us consider how economic attempts, cultural norms, and decision-making on politics and how our natural environment is shaped by our cultures, our consumption habits, and our lifestyles (Corcoran et al., 2017; Wals, 2009). Education for sustainability (EfS), therefore, is far from simply understanding the natural world. Just focusing on the environmental pillar of EfS is not enough to bring about solutions for environmental issues. Yet, environmental degradation that we face is about understanding how people interact with the world and how they recognize the four pillars of sustainability which are all interlinked. Agenda 21 particularly provides strong chapters to highlight the change in public awareness and behavior through education (UN, 1992). In this respect, all levels of education are important to make individuals recognize their full potential and build their capacity to take action. Education is a key tenet for a more sustainable future. Therefore, it is strongly emphasized that EfS should start as early as possible (Samuelsson et al., 2019; Spiteri, 2020). But what kind of education and approaches should be integrated into the early years? How should we immerse children in sustainability? Agenda 21 of the United Nations Conference on Environment and Development (UN, 1992) provides a framework for these critical questions;

25.12. Children not only will inherit the responsibility of looking after the Earth, but in many developing countries they comprise nearly half the population. Furthermore, children in both developing and industrialized countries are highly vulnerable to the effects of environmental degradation. They are also highly aware supporters of environmental thinking. The specific interests of children need to be taken fully into

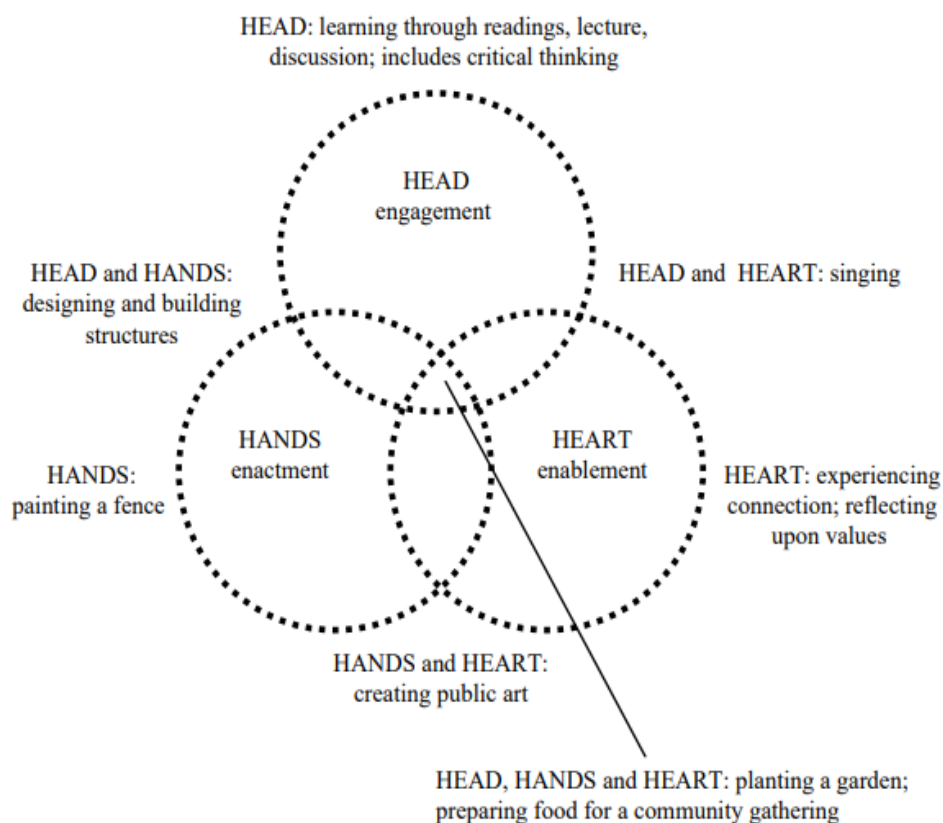
account in the participatory process of environment and development in order to safeguard the future sustainability of any actions taken to improve the environment.

With this in mind, early childhood education for sustainability (ECEfS) is more than engaging with the environment and just teaching children about the natural world (Pramling-Samuelsson & Kaga, 2008; Sommerville & Williams, 2015). It aims to help young children to gain knowledge, skills, values, and make them feel as if they are change and participative agents for a more sustainable future. The change should be toward “socially critical” form that children start to criticize their own actions and actions of the society. ECEfS, therefore, is emphasized as ‘transformative’, ‘empowering’, and ‘participative education’ that extends awareness through building critical thinking skills (Davis, 2010; Davis & Elliott, 2014).

Widely considered to be a good way to create a vision for social change is to provide vivid and reflective experiential responses during and after the actions on sustainable practices (Davis & Elliott, 2014; Elliott & Davis., 2020; Leal Filho et al., 2017; Li et al., 2019). Herein, all types of questions are noteworthy and be asked to children to immerse them in the inquiry of sustainability, yet divergent questions are the most useful tools to unfold children’s pre-knowledge and embellish their current thinking (Boyd, 2018; Weldemariam et al., 2017). Divergence in questions encourages children to reflect on their ideas in multiple aspects that they find the chance to review their own experiences and manifest their own questions which is quite valuable to reflect the inner ideas, feelings, reasoning and predictions on sustainability topics (Harlan & Rivkin, 2000). Speculative and open-ended questions asked by adults might have the potential to provoke children’s learning and reach relevant and meaningful knowledge that is linked to relevant people and places. Key to the rationale for this study is the opportunity to experience a sustainable-related topic with a hands-on and child-focused learning process. In this tradition, early childhood education for sustainability (ECEfS) supports the pedagogic approaches that reveal how young children think, learn, and inquire about the world surrounding them (Pratt, 2010). Thus, it is vital to provide learning experiences for children to share possibilities and wonder how things are working out. Planning learning opportunities through sustainability programs shape children’s point of view and everyday needs and routines (Barratt & Barratt & Hacking, 2014; Daries et al., 2009; Grogan & Hughes, 2020). As Littledyke and McCrea (2009) argued that a planning process that is purposefully designed and promotes reciprocal learning in early childhood settings should be fostered through questions for children to unfold how they perceive their environment. In order to create actual meaning, it is essential for children to link the new information and knowledge with prior

experiences through immediate communication with parents, teachers, and peers (Samuelsson & Park, 2017).

Figure 2.3 *A Venn diagram depicting the constituents (combinations of Head, Hands and*



Heart) and synergies (in spheres) of the HHH approach (Sipos et al., 2008, p.75)

This aspect was dealt with in the work of Samuelsson and Park (2017) who addressed the OECD's point on the issue of “how to learn”. According to the Organisation for Economic Co-operation and Development’s (OECD) survey, it is essential for the national curriculums to include “how to learn”. Those “what” and “how” aspects are also the touchstones of sustainable learning in the early years. On the other hand, it is vital to reveal how young children can reach the goals and indicators that are essential for sustainable development as well as a democratic society. Thus, the curriculum guides should include the content areas and learning objectives to foster children’s holistic development as well as encourage them to be active agents for a more sustainable future. In this respect, children are in need of opportunities to explore the world they are living in and construct their own meaning. Thus, engaging in sustainability practices open the door for children to act as agents with their feelings, minds,

and bodies (Ärlemalm-Hagsér, 2013). The curriculum should include everyday practices with children's active participation.

The learning process involves *Heads, Hands, and Hearts* focusing on daily routines and principles of early childhood education for sustainability (ECEfS). As Samuelsson and Park (2017) suggested, experiences provided by young children become vital if they are constructed on their own. Children's learning process includes creativity, play, and imagination that is achieved through what children directly experience and it becomes quite valuable for children to express their notions and fantasies. Holistic learning occurs in ECEfS when children engage in sustainability with their *Heads* (understanding), *Hearts* (feelings), and *Hands* (doing), called the "*HHH*" approach (Figure 2.3). This approach advocates that children learn better when they purposefully engage in sustainability by efficiently interacting with relevant people and places (İnan & İnan, 2015; Orr, 1992; Singleton, 2010, Tilbury & Turner, 1997). The *everydayness* issue actively feeds all of those three sections of this approach through daily life tasks which are vital for children's meaningful and authentic learning (Rogoff, 2003).

Last but not least, to support children's authentic learning, early childhood settings have also great potential to explore the world they live in. The setting is pivotal since it shapes a child's point of view and influences a child's later learning and how they perceive the disposition later in their school life. The school setting can be defined as an environment or a place that has a role as the "third teacher" (Copple & Bredekamp, 2009; Davis, 2008; Early Childhood Australia, 2018) Both indoors and outdoors provide rich learning opportunities for children and shape education practices. It is vital for teachers to realize the potential of the setting and school environment to reconnect children and provide authentic experiences that become essential teachable moments for children (Littledyke, 2007).

2.1.4 Connecting Children to SDGs: Goal 12 as a Practical Tool to Teach Sustainability

Our global footprint is increasing day by day. The total world population will be expected to be 9.6 billion by 2050. If individuals remain their current consumption patterns, at least three planets will be needed to sustain life (Network, 2019). It is crucial to shift our ways of living, how we consume goods, our current needs and wants, and our values on consumption and try to fit our lifestyles in order to live within the boundaries of Earth. Since global pandemics become wicked and increasingly complex, changes in lifestyles and solutions to overconsumption are needed. To reach the mindset of "more and better with less" (UN, 1992), to establish more sustainable societies, and increase the motivation of individuals toward more

responsible consumers, collaborative actions and traditional practices are vital (Horton & Horton, 2019).

As a central component of a sustainable life, the role of Sustainable Consumption and Production (SCP) was first mentioned at the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. It was stressed that the globe is faced with environmental degradation that is highly linked to unsustainable patterns of consumption and production (UN, 1992). Within this perspective, SCP has been declared as “the uses of services and related products which respond to basic needs and bring about a better quality of life, while minimizing the use of natural resources and toxic materials as well as the emission of waste and pollutants” (UNDP, 1994). The same perspectives were revisited at the World Summit for Sustainable Development in 2002. In the Johannesburg Plan of Implementation, SCP was considered a central theme and profoundly relevant to three dimensions of sustainability: environmental, economic, and social. All evidence and supporting documents pointed to changing individual consumer behavior and habits and making a shift in lifestyles will ensure the long-term benefits on natural resources and, therefore, on economic and environmental impacts.

A robust Post-2015 Development Agenda was also proposed in SDG 12 to ensure SCP patterns. More specifically, Target 12.5 states that *by 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse*, and Target 12.8, *by 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature*. Target 12.5 puts emphasis on the importance of reducing the waste flows and increasing the reuse waste through the 3R approach; reduce, reuse, and recycle. The target comprises industrial and household wastes to improve the waste management techniques and integrate them into everyday life practices and increase the overall waste management rates. Besides, Target 12.8 is profoundly linked with shifting consumption patterns toward a more sustainable lifestyle. Herein, the active involvement of individuals and alternative consumption proposals as well as production choices are valued. The overarching aim of Target 12.8 is changing awareness by increasing people’s familiarity and knowledge of SCP.

Notably, Sustainable Development Goals (SDGs) are a new path for actions that were proposed for the prosperity of the Planet (UN, 2015). 17 Sustainable Development Goals are embraced in the Agenda 2030 including quality of education to emphasize equality on acquiring knowledge for all learners to gain the necessary knowledge and skills to promote

sustainability by 2030. The *Education 2030 Framework for Action* highlights that SDGs should be evaluated by countries at the national level to reach targets efficiently.

1.2.12. SDG 12 Responsible Consumption and Production 	
Ensure sustainable consumption and production patterns	
Table 1.2.12. Learning objectives for SDG 12 "Responsible Consumption and Production"	
Cognitive learning objectives	1. The learner understands how individual lifestyle choices influence social, economic and environmental development. 2. The learner understands production and consumption patterns and value chains and the interrelatedness of production and consumption (supply and demand, toxics, CO2 emissions, waste generation, health, working conditions, poverty, etc.). 3. The learner knows roles, rights and duties of different actors in production and consumption (media and advertising, enterprises, municipalities, legislation, consumers, etc.). 4. The learner knows about strategies and practices of sustainable production and consumption. 5. The learner understands dilemmas/trade-offs related to and system changes necessary for achieving sustainable consumption and production.
Socio-emotional learning objectives	1. The learner is able to communicate the need for sustainable practices in production and consumption. 2. The learner is able to encourage others to engage in sustainable practices in consumption and production. 3. The learner is able to differentiate between needs and wants and to reflect on their own individual consumer behaviour in light of the needs of the natural world, other people, cultures and countries, and future generations. 4. The learner is able to envision sustainable lifestyles. 5. The learner is able to feel responsible for the environmental and social impacts of their own individual behaviour as a producer or consumer.
Behavioural learning objectives	1. The learner is able to plan, implement and evaluate consumption-related activities using existing sustainability criteria. 2. The learner is able to evaluate, participate in and influence decision-making processes about acquisitions in the public sector. 3. The learner is able to promote sustainable production patterns. 4. The learner is able to take on critically on their role as an active stakeholder in the market. 5. The learner is able to challenge cultural and societal orientations in consumption and production.

Figure 2.4 Specific *Learning Objectives on SDG 12: Responsible Consumption and Production* (Source: UNESCO, 2017).

In this aspect, this guideline becomes a complementary resource for already existing programs to simply revisit and reorient them toward the SDG. Education is the central premise for sustainable development. To explore new paths, expand minds, and create solutions for global pandemics, education, therefore, is reaffirmed as vital for a more sustainable future.

The evidence-based findings and sustainability-oriented programs are good starting points to assess the effectiveness of education for sustainability (EfS) in the school environment (UNESCO, 2016). Within the scope of the 10-Year Framework Program, Indicator 3.4 stresses the SCP as changing in practices and production processes supporting the shift to Sustainable Consumption and Production (SCP). For that, formal and informal education is considered an essential tool (UNESCO, 2017). Truly, Target 4.7 and 12.8 which are intersected to imply the integration of SCP-related information in curricula is essential. As suggested, indicators of target 12.8 SCP are embedded into formal education through determined learning objectives by UNESCO. Learning objectives are designed in the form of cognitive, affective, and behavioral in order to provide effective guidance for learning processes (Figure 2.4) and increase the frequency of research studies on SCP associated with sustainable development and lifestyles. In this respect, SCP is interested in individual consumer patterns and choices that are linked to the usage of natural sources and their environmental impacts. With this in mind, *the Sustainable Lifestyles and Education Programme of the 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP)* was facilitated by UNEP and UNESCO and has overall objectives that point the path to responsible consumption and production. Objective 4 specifically focuses on empowering individuals to adopt sustainable lifestyles through education, awareness-raising, and participation, through engaging all forms of education (formal/non-formal) (Figure 2.4)

The potential of education in the context of sustainable development is highlighted in this program to reach the three dimensions of sustainability, namely, the environmental, economic, and social dimensions of it. Further, individual lifestyles are mentioned as the reason for overconsumption which has an impact on the quality of life for all. To ensure sustainable lifestyles, education has a pivotal role in increasing knowledge, awareness, and skills. All forms of education have the potential to create a shift in an individual's mind and actions toward sustainable lifestyles since it encourages critical thinking and collective action taking. Schools, homes, and workplaces are possible learning environments that help create lifestyle choices and aspiring society to experience sustainable practices. The 10YFP Program proposes three main work areas (UN, 2012). Educating for sustainable lifestyles is one of them, and focuses on three aims; i) integrate sustainable lifestyles into formal education ii) make sustainable lifestyles a focus in every learning environment, and iii) mobilize and empower youth for sustainable lifestyles. Work area 2 particularly aims to teach sustainable lifestyles through formal education (Figure 2.5). Since daily life consists of the decisions of individuals, this program implies that it is significant to demonstrate how sustainable practices can be embedded in real-life settings. Regular and collaborative participation in sustainable practices

in the school and home environment alters unsustainable trends and consumption. Herein, the early years are key stages in which life-long skills and habits explicitly emerge through interventions. It is important to empower young children and provide them with a better understanding of common visions of responsible consumption so that they may adopt more sustainable ways of living as a priority (Leitch et al., 2018).

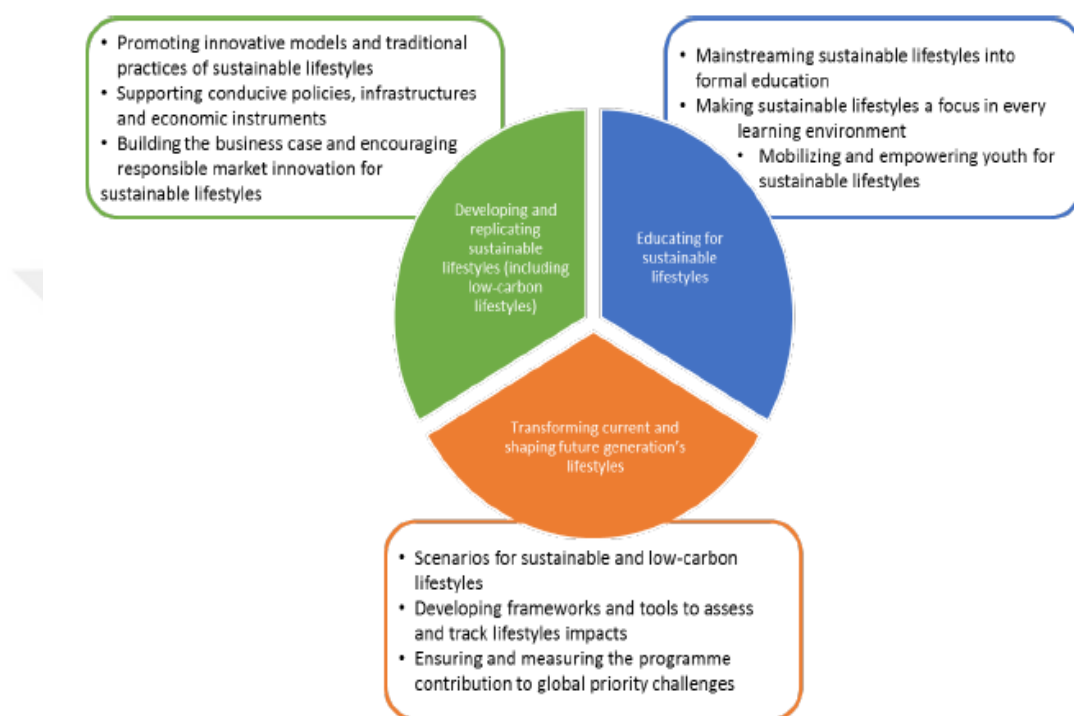


Figure 2.5 *Work areas of the proposed Sustainable Lifestyles and Education Programme*
(UNEP, 2017)

Please refer to Figure 2.2 in which children are centered in the nested layers of the socio-ecological system of Bronfenbrenner. The macro system here can be considered across the layers and the content areas of varied SDGs as children experience the interactions between the layers and causes and consequences of consumer choices which are not always linear. Typically, a sustainable future depends on how we educate our children to not only be green consumers but also extend their thinking skills to the wider issues of sustainable consumption (Fien & Tilbury, 2002; Luff, 2018; Sterling, 2002). Addressing the practices of being a responsible consumer needs to begin in the early years. The skills and the values on SCP

formed in early childhood years turn into long-term behavior, and therefore, it is pivotally crucial to teach children about consumption decisions so that they may be active agents of change and adopt more sustainable consumption patterns. As Donovan (2016) suggested, “Children have the capacity to adopt active roles as citizens and are crucial contributors to explorations of contemporary consumption practices and a sustainable future”. As a part of the education for sustainability (EfS), education for responsible consumption and production triggers children to think critically and analytically about our everyday practices and behaviors. This provides a great opportunity for them to examine their own consumption choices and behaviors which have a direct impact on the natural environment. On one hand, regarding SDG 12, it is not sufficient to develop only factual knowledge (“knowing-that”), but also procedural knowledge (“knowing-how”). Exploring know-how of the sustainable practices provide children a base to experience it in real context as well. This idea is also in parallel with SDGs specific learning objectives since those objectives were determined on the basis of cognitive, socio-emotional and behavioral outcomes (UNESCO, 2017).

2.1.5 Why Parents Should be Involved in Early Childhood Education?

A good quality of early childhood education and care (ECEC) includes parents in the educational process with the aim of making a positive difference in a child’s whole development (Sylva et al., 2004). In this tradition, parents are not just the influencers of their children, they are also influenced by their children and this dynamic turns into an interactive bidirectional relationship (Martin et al., 2013).

As UNICEF (2008) stated, the involvement of parents in children’s education is a fundamental right. For children’s increased adaptation and achievements, good quality early childhood education services should consider the mothers, fathers, and caregivers as important co-partners who have the right to be informed about and participate in educational processes (OECD, 2006; UNICEF, 2008). On this matter, Bronfenbrenner (1994) posits that interactions among the elements of the environment in which a child lives have a direct impact on the child’s development. More often than not, as a learning system, families have a remarkable role in encouraging young children to observe and understand the phenomenon that happens around them in everyday life. Preparing meals, constructing with blocks, reading storybooks together, and having parent-child conversations about everything they experience turns into a bountiful social context for the children (Callanan & Oakes, 1992). Scaffolding a child’s learning through asking questions and noticing the child’s attention to events and objects make parents a mediator in teach about the environment in which the child lives. As a more knowledgeable and experienced members of the families (Rogoff, 1990), parents have their

own “flexible learning systems” (Hike, 1989, p.101) to exchange information with children which turns into intergenerational information sharing (Diamond, 1986).

The importance of home-school collaborations was emphasized by different people via different models so far (Berger, 1991; Cervone & O’Leary, 1982; Chavkin, 1989; Greenwood & Hickman, 1991; Hester, 1989; Hill & Taylor, 2004). The common points of all those models are that parents should be an active partner. In Berger’s model (1991) parents were considered passive supporters and had a fundamental role in the academic achievement of the children. Likewise, Hester (1989) described the role of parents as supporters of children’s activities, learners, and communicators. Accordingly, Chavkin (1989) highlights that parents have some remarkable roles in the educational process as an audience, a home tutor, a co-learner, and also a decision maker. Among the models abovementioned, the most well-known parental involvement typologies in the current literature is proposed by Joyce Epstein and can be summarized in six categories. Epstein (1995) proposes a more comprehensive framework with six levels of parental involvement to put an embellished tip on how parents get involved in the educational process. According to Epstein (1995), it is pivotal to teach parents about effective *parenting* to establish a healthy home environment in which children’s learning is supported and parents are informed about the health, nutrition, play, and the educational process of children. Given this consideration *communicating* with parents about ongoing school activities and the children’s progress is identified as an important level to create a bond between the home-school and school-home environments. The role of parents in taking responsibility and volunteering to arrange school events, organizing school programs and/or participating in school activities is also emphasized. This is followed by *Learning at Home* through increasing parents’ awareness of assisting children’s homework and providing learning opportunities in the home environment. Plus, parents should be included in the *decision-making process* and be a *collaborator with the community* so that they may be provided with sources and services from the community.

There is a growing interest in the role of parent involvement in early childhood education all over the world. A substantial amount of research demonstrated the favorable impact on children’s cognitive, social, and socio-emotional development and academic achievement (Coleman & McNeese, 2009; Hakyemez-Paul et al., 2018; Venninen & Purola, 2013). While some researchers argue that parental involvement is not required for all ages (Ferrara, 2015; Rogers et al., 2009), most researchers claim that parents should be specifically involved in the academic achievement of their children (Gonzalez-DeHass et al., 2005; Greenwood & Hickman, 1991). Built on that belief, Jeynes (2007) stated that parental involvement is so

important that it makes children stay in school longer, do better in school, and like school more (p.85). Research also focuses on the benefits of parental involvement in children's behavior. Children whose parents have sustainable engagement and are regularly involved in school activities have better social skills, demonstrate improved behaviors, and are positively impacted when it comes to school attendance and success (Blatz, 2014; Comer, 2005; Garrett, 2008).

Parent involvement, engagement, and education are considered in national early childhood education programs as well. In the latest version of their report, the Ministry of National Education (MoNE) brought up some updates and put a specific highlight on the noticeable role of parents in early childhood education (MoNE, 2013). *Family Support and Education Guidebook Integrated with Early Childhood Education Program* was specifically designed to be a bountiful guide for early childhood professionals in Turkey. The guide aims to inform the audience about the basic principles of parent education. Moreover, parent education strategies such as sample event examination, demonstration, role-playing, and group studies are presented as useful methods. This follows a section in which parent communication methods and informative resources such as mobile calling, short message services, manuals, photographs, bulletins, newsletters, communication notebooks, development portfolios, internet-based applications, and suggestion boxes are exemplified.

2.1.5.1 Child-to Parent Intergenerational Learning for Education for Sustainability

Broadly speaking, ECEfS is a path in which the young generations' education should be addressed seriously (Siraj-Blatchford et al., 2016). It is acknowledged that investments in early years yield the greatest outcomes when compared to investments in later years (OECD, 2010; UNDP, 2014). High-quality early childhood education is not just for the young generation, but the parents also get enduring benefits with life and living styles (Bautista et al., 2018; Fien et al., 2008). Built on that fact, one of the pre-conditions of high-quality EfS in early childhood settings is acknowledged as parental involvement. The change for future and present generations starts from the previous generations (Corcoran & Hollingshead, 2014; Blaze-Corcoran et al., 2017). That aside, jointly participating in sustainability-oriented practices and sharing and communicating about the problems are also the key notion in reaching SDG 4.

There are many compelling reasons to focus on the role of parents and parental involvement policies in meeting the SDGs. The post-2015 agenda posits that without the participation of all levels of society, reaching a sustainable future could not be possible (UNESCO, 2015; 2017). As the smallest and the most fundamental unit of all societies (UNICEF, 2019), families

play a crucially pivotal role in maintaining sustainable, social, and cultural development. Parents have a critical role in every nation to support children and prepare them for a productive and fulfilling life. Thus, families are considered at the heart of sustainable development as an integral part of the SDGs. Related to this, Former UN Secretary-General Ban Ki-moon highlighted the following in 2010:

At the international level, the family is appreciated but not prioritized in development efforts. The very contribution of families to the achievement of development goals continues to be largely overlooked, while there seems to be a consensus on the fact that, so far, the stability and cohesiveness of communities and societies largely rest on the strength of the family. In effect, the very achievement of development goals depends on how well families are empowered to contribute to the achievement of those goals. Thus, policies focusing on improving the well-being of families are certain to benefit development (United Nations Secretary-General, 2010, p.4).

Taken together, the intergenerational linkage has the potential to overcome unsustainable patterns. The intergenerational influence was defined as “learning that exists or occurs between two or more generations. ... this form of learning might enhance and further the goals of environmental education and education for sustainability” (Istead & Shapiro, 2014, p. 115). Learning about sustainability becomes more critical when the home and school environments are linked to each other. Developing effective communication with parents and providing opportunities to take them into joint actions have positive outcomes on young children’s learning processes. Verbal discussions and jointly participating in practical experiences are quite fruitful in facilitating the learning of different generations together which, in turn, enriches their thoughts, feelings, and experiences (Ballantyne et al., 1998, 2001a).

When it comes to environmental sustainability, children benefit from intergenerational learning (IGL) in line with developing positive changes in their environmental behavior (Spiteri, 2020; Peterson et al., 2019). Herein, IGL refers to a bidirectional process in which different generations and different age groups learn together. Regarding sustainable development, it is considered quite a fruitful process to develop the necessary knowledge, skills, and attitudes about ecological, social, cultural, and economic issues through a participatory approach (Istead & Shapiro, 2014; Lawson et al., 2018; Peterson et al., 2019). Developing shared understanding through shared experiences is critically important to overcome the adverse impact of unsustainability. Therefore, intergenerational learning brings about a learning setting for different generations to share what they know, their thoughts, feelings, and experiences that expand the understanding of sustainability for both sides (Hollingshead, 2017). In this tradition, dialogues between generations enrich learning by

exposing them to different perspectives and aspirations on the issue of sustainable development.

In envisioning the future of education for sustainable development, intergenerational dialogues and learning together have the potential to reveal the contributions of elder and past generations. On the other hand, there are very few precise studies that reveal the meaning, methods, and goals of intergenerational learning and how it is contextualized in learning settings. There is a wealth of research on intergenerational learning which mainly focuses on primary and secondary school children (Chineka & Yasukawa, 2020; Lawson et al., 2019). Additionally, a little research has provided some evidence on how intergenerational learning can be embedded in early childhood education for sustainability (ECEfS). Despite its potential for education for sustainability (Ballantyne et al., 1998, 2001a), there is a dearth of research about this in the context of ECEfS. On the other hand, intergenerational learning has value to immerse adults into environmental issues. Likewise, it can turn into an effective tool for helping parents recognize the unsustainable patterns and develop pro-environmental behaviors (Ballantyne et al., 1998; Ballantyne et al., 2000, 2001a; Duvall & Zint, 2007; Istead & Shapiro, 2014; Uzzell, 1994).

As Ballantyne et al. (1998) pointed out, young children can also have the potential to influence others. Along these lines, it is proposed that children have great power to influence their family and community through participating in shared experiences. Thus, education for sustainable development programs provides opportunities for both children and adults in which they explore visions of each side and transfer knowledge during the programs (Ballantyne, 2001b). In this respect, focusing on local environmental problems including everyday household practices creates a sense of belonging and inspires a more proactive approach as well as encourages good communication patterns with others. Dealing with real and local issues, children and parents develop an interest in environmental issues which might be a good starting point to overcome the unfavorable impacts of unsustainable patterns (Payne, 2010). To illustrate, Davis and Pratt (2005) proposed that the Sustainable Learning Project linked parents and children to explore water and energy conservation in the Australian Kindergarten setting. Additionally, in their study, Davis et al. (2008) found that the Kindergarten Water Education Program had an impact on parents' household practices.

2.1.6 Efforts To Move Towards a More Sustainable Future

Children's active participation in change and critical thinking are two of the dimensions that have been receiving great attention from Australian and Swedish documents in the area of

early childhood education for sustainability (Ärlemalm-Hagsér, 2014; Ärlemalm-Hagsér & Engdahl, 2015). The formal curriculum in those two countries is shaped by those two concerns (Ärlemalm-Hagsér & Davis, 2014). While the Australian vision on education for sustainability (EfS) is covering approaches and learning strategies to reach goals for conservation, social justice, cultural diversity, democracy, and social change, around 20 percent of Swedish preschools foster education for sustainability through joining certificated programs as Green Flag, the Schools for Sustainable Development program which is sponsored by the government and an association called 'In Rain and Shine's (*I ur och skur*) forest schools.

Given this perspective, the "Sustainable Planet Project" can be considered an inspiring starting point to demonstrate how a school culture can be oriented toward sustainability. The project was guided by the idea that 'the environment' is the common interest for all, thus, this project was started with the aim of creating links between the home and school environments. The focal point of the project was to create a shared culture in a kindergarten campus which is located in Brisbane, Australia. In the first phase, mini projects and events such as designing a vegetable garden, worm farms, composting, reusing and recycling, and environmental aesthetics were organized to make the early childhood teachers, school staff, and the director maintain their motivation for sustainable projects. This specific project puts emphasis on the importance of place-based education. Since the project was conducted at Campus Kindergarten, it was context-specific. It is also worth noting that creating a collaborative learning culture was mentioned as the priority of building a sustainable environment. Children, staff, and parents were all participants and contributors that worked in interactive groups which makes the "Sustainable Planet Project" a good example to inspire others (Davis & Pratt, 2005).

A wealth of research on early childhood education for sustainability also highlights how children are considered agents for sustainability (Borg et al., 2017; Buil et al., 2019; Davis et al., 2005, 2008; Duhn et al., 2010; Fjørtoft, 2001; Green, 2017; Hill et al., 2014; Mackey 2012; Marchal-Gaillard et al., 2022; Melis et al., 2020; Prince, 2010; Stuhmcke, 2012). The study conducted in a Swedish preschool by Borg et al. (2017) reveals that recycling activities in the home and school environments, with the active participation of children, have positive outcomes on children's knowledge. Since children are actively involved in the practical and verbal process of recycling, they have learned how to sort out waste from adults. The vital point of this study was doing something "together with children". To what extent young children participate in recycling predicts a child's declarative and functional knowledge about it. The study underlines the significance of teachers and peers in developing children's knowledge either declaratively or functionally on sustainable-related issues. Additionally, the

study shows the importance of parent participation in developing children's declarative and functional knowledge about recycling.

A very recent study conducted by Marchal-Gaillard and her colleagues (2022) investigated preschool children's pre-conceptions on organic waste decomposition within the context of household waste management. The study hypothesized that preschool children whose parents utilized compost in their home environment have better knowledge of the process of decomposition. Data was collected from 38 5 to 6-year-old children through semi-structured interviews in two French cities. The researchers presented children composting based on a designed implementation including five essential stages to provide children a site for the exploration of the role of living things in soil for the composting cycle, the cycle of matter in the composting bin, and the decomposition of the plants. The findings of this particular study indicated that after exploring the decomposition of organic matter, children's initial conceptions have been expanded on the stages of decomposition, the role of worms in the compost cycle, and the use of a composter.

An intriguing example of how young children conceptualize a sustainable practice was found in a study conducted by Buil, Roger-Loppacher, and Tintore (2019) to foster Spanish preschool children's recycling habits with a teaching unit on a particular sustainable practice: recycling aluminum packaging. The implementation consisted of a wide range of learning methods such as storytelling, dramatization, field trips, and so forth conducted in collaboration with children, parents, and the school community. The teaching unit about aluminum packaging recycling for preschool children (under 6 years old) was developed by the teachers focusing on a concrete sustainable practice. The findings of the study acknowledged that the teaching unit has a very positive impact on not only children but also on parents, teachers, school managers, and community staff who all experience the advantages of collaborative participation. The collaboration among stakeholders provides a deeper understanding of each teaching unit that illustrates the potential of early childhood education for sustainability for a more sustainable future.

Moreover, Stuhkeme (2012) conducted an action research case study to reveal the potential of the project approach to teach children about environmental sustainability. The central premise of the study was to demonstrate how education for sustainability can be integrated into Australian formal curricula. The project approach was utilized to reveal children's experiences and in-depth investigations into sustainability. In this light, the co-constructivist and participatory approach guided the learning journey of both children and participant teachers. The study shed light on how children started to think critically about environmental

sustainability which has a profound impact on their local context. Children's voices were unfolded through their words, artworks, and play, all of which were considered an integral part of the project approach. These findings were noteworthy since children also interacted with families and created a shared understanding of what is going on throughout the project. Stuckme (2012) stressed that change started in kindergarten initially, but children reflected their experiences concerning practices such as water conservation and recycling practices in the home environment. This was a good example for intergenerational learning for sustainability.

Another study conducted by Hill et al. (2014) focused on three early childhood education for sustainability (ECEfS) professional learning workshops, one of which was "Living and Learning About Sustainability in the Early Years" held in Tasmania, in 2012. The ultimate goal of this study was to investigate how participants conceptualized the ECEfS and their current practices in early childhood settings. Early childhood educators, pre-service teachers, and parents joined the workshop. They were asked to describe their current sustainability-related practices and conceptualizations of ECEfS. The gathered data were analyzed regarding UNESCO's (2010) four pillars of sustainable development and ARIES's (2009) five components of EfS which were the theoretical frameworks of the study. The findings indicated that foods, energy, play spaces, and gardening including composting and worm composting were the most popular sustainability practice initiatives they experienced in a school day. The facts indicated that environmental pillars of sustainability were the dominant dimension in participants' initiatives. This is illustrated by the commonly mentioned practices as 'reduce, reuse, recycle'. As revealed by the authors, vegetable gardens potentially encourage children to explore social and political dimensions of sustainability. Since gardening provides children with opportunities about food production and consumption, health, well-being, and intergenerational learning, it was a valuable sustainable-related practice to recognize the strong connections to the social dimension of sustainability.

A growing body has focused on implementations in the context of early childhood education for sustainability (ECEfS) in Turkey as well (Ahi, 2017; Cengizoğlu et al., 2022; Gülay-Ögelman, 2012; Gülay-Ögelman & Durkan, 2014; Feriver et al., 2016; Yılmaz et al., 2020). In their study, Cengizoğlu et al. (2022) explored how 60 to 66-month-old preschool children conceptualize the human-environment relationship by participating in before and after ECEfS learning activities. The program was designed with regard to three global issues; desertification, loss of biological diversity, and climate change. The drawing technique was utilized as an evaluation tool to determine children's changed and developed perceptions.

Before participating in the ECEfS learning activities, preschoolers depicted the human-environment relationship from an anthropocentric perspective. Further, they preferred to draw unusual and fantastic figures and heroes to describe how their “human-environment” image has been emerging. On the other hand, after participating in learning activities, there were shifts in children’s perceptions toward the human-environment relationship in their post and follow-up drawings. Recycling was mentioned as one of the salient activities for children that potentially serves to build the human-environment relationship. Further, children reconstruct their understanding and recognize connections between global issues.

Plus, Gülay Ogelman (2012) conducted a project called *We Are Learning the Soil with Tipitop and his Friends* with 5 to 6-year-old preschool children in order to teach about soil and its components. A 9-day project included activities for children to have deep exploration of creatures living under the soil, as well as fruits and vegetables growing in the soil and this increased children’s knowledge about the value of soil for sustainability. Last, but not least, Feriver-Gezer et al., (2016) designed a small-scale project for in-service teachers to reveal the degree of perspective transformation in the context of ECEfS. 24 in-service teachers participated in designed training workshops including Mezirowian-inspired adult education activities. The findings indicated that transformative learning strategies offer a bountiful framework for early childhood teachers to embrace the sustainability issues in the early childhood education context.

Last but not least, although there is a limited number of studies dealing with the integration of waste management and consumption patterns early childhood education in Türkiye, it is possible to come across studies that integrate the recycling process of solid waste management within the framework to foster young children's environmental awareness, perception, and knowledge. In this context, Güngör and Kalburan (2018) discussed recycling and consumption patterns within the framework of the Ecological Footprint Awareness Scale (abbreviated as EKAY-O in Turkish), which they developed to measure the environmental awareness of children aged 60-72 months in studies with young children. Another study by Kahriman-Ozturk et al. (2012) aimed to investigate preschool children’s attitudes toward environmental issues from anthropocentric and ecocentric perspectives. The researchers collected data from preschool-aged children through interviews. Water use, paper use, recycling, and reuse were set as sub-dimensions of the interview protocol. According to the results, the participating children did not show positive attitudes toward recycling, but possessed ecocentric attitudes toward reusing materials. In terms of consumption patterns, it was found that a large number of participants indicated that it was important to turn off the water, use double-sided paper,

and turn off the electricity, but they did not provide sufficient reasons for their decisions, indicating that they had an antropocentric attitude toward consumption patterns. Together, in order to examine the dimensions of recycling practices and consumerism within children's pro-environmental behaviors, Gülay (2011) translated the Children's Attitudes Toward the Environment Scale for School-Age Children (CATES) into Turkish. An application supporting the environmental sensitivity of 60-month-old preschool children (n=11) was used in a much more recent study designed to increase environmental awareness. Five questions were used in the assessments before and after participation in the learning activities in the study, which used an experimental research design. This allowed for an evaluation of the effectiveness of the activities. Based on this study, which focuses on the idea of recycling and reuse, a statistically significant difference was found between the pre and pos tests. Therefore, it is conceivable to claim that preschoolers' ecological sensitivity was increased by activities that emphasize recycling and waste disposal.

2.2 Contextualizing Autobiographical Memory Development

The unique feature of autobiographical memory is to make individuals recognize that each person has personal histories in the social world which are different and unique on their own. This supports the construction of the “conservation of self” which exists gradually over time (Nelson, 1997). Establishing this kind of self profoundly depends on sharing “my experience”, “your experience”, and “our experience”. This turns into a practice that provides a shift in children’s thinking for further development of self-understanding (Fivush & Fromhoff, 1988; Nelson, 2003).

Clear trends are evident between social language practices and the development of autobiographical memory (Cleveland & Reese, 2005; Fivush & Nelson, 2004; Nelson, 2003; Leyva et al., 2009). Experiencing discourses with others becomes an important source to organize, interpret and remember personal experiences (Fivush, 2006; Habermas & Reese, 2015; Nelson & Fivush, 2004; Reese, Haden, & Fivush, 1993). More specifically, “tell your story” is a very valued and common activity in European and American cultures that motivates children to go back, remember, and share their personal events and experiences in their daily lives. Therefore, “sharing time” practices help children to construct their own strategies with respect to the organization of memories to be recalled. Essentially, sharing past events allows young children to retrace the piece of memory and figure out the event representations (Bauer, 2007; Leitchman et al., 2020). On these grounds, experiences specifically held in preschool years are good memory sources for children that turn into personal narratives when sharing and is meaningful to others. Sharing times provides bountiful cultural memory practices that

favor the development of autobiographical memory and self-understanding, as well (Pillemer, 2003).

As expressed by Nelson (2003), the development of self-understanding can be outlined through different perspectives such as the physical self, social understanding of self, cognitive understanding of self, the representational self, narrative self-understanding, and cultural self-understanding. Here, the narrative self-understanding feeds the autobiographical memory emerges during the last preschool years (Fivush & Haden, 2003; Nelson, 2003). In this period, the child starts to establish unique life stories and constructs a new awareness of self through narratives of their past and future experiences. Those experiences are represented through narratives that turn into unique life stories and recounts. It is well recognized in the developmental literature that preschool years are critical for children to develop a recognition of social and cognitive consciousness about social-cultural and linguistic aspects (Fivush & Hamond, 1990; Nelson, 1992; Nelson & Fivush, 2004; Wang, 2004). Preschool years are the starting point for children to construct and share their autobiographical memory reports with others. It is considered a period for one to realize the emerging capacity of autobiographical memory development that contributes to self-understanding. This shift in cognitive sense occurs gradually and depends on many skills such as language skills unique to each individual (Harley & Reese, 1999; Reese, 2009). The continuous and overlapping process of linguistic development turns into the most powerful and privileged aspect in relation to social and cultural language functions. Typically, how we experience the use of language socially depends on our “cultural self”. Therefore, social practices and their profound personal impacts influence the child’s social and cognitive awareness which leads to new levels of mental representations. It should be noted that this is a very slow and gradual process that can unfold through interactions, and eventuating by means of culturally shared thinking (Wang, 2011; Wang & Conway, 2006; Schröder et al., 2012).

As it was mentioned above, the development of autobiographical memory is linked with the self through the construction of narratives of life stories. It is the widely recognized assumption that social interactions of children with adults serve to construct autobiographical selves (Bruner, 1987; Fivush, 2001; Neisser, 1988; Nelson, 1993). Specific forms of social interactions and cultural frameworks guide how the autobiographical memory of one is shaped. At this juncture, experiences potentially serve children to reflect on what they are personally experiencing and eventually recognize the “mine” and “others” perspectives in the cognitive domain. In this vein, language becomes a tool that uniquely links the social and cultural norms with the personal, thus one starts to internalize either explicit or implicit social

and cultural norms (Fivush & Haden, 2003; Fivush & Nelson, 2004). On this, Shore (1996) is interested in how individuals absorb culture into their minds. In this tradition, language is considered as a coherently organized tool to evaluate the development of autobiographical memory. Donald (1991) claimed that early human beings develop language due to sharing and inspiring cultural understanding, and cultural myths, and thus it can be said that narrative was from the beginning the “natural product” of language. The verbal recollections of one are developed gradually in response to specific questions or prompts. More generally, language plays a critical role in the development of social recognition in early childhood years. It was acknowledged that learning about social norms displays similarities with how one learns about language (Fivush & Nelson, 2004) including learning through activities as storytelling, fictional tales, or personal experiences. In this regard, parent-child dialogues provide children with an avenue to rethink and reformulate their personal experiences which is called the “third voice” according to the anthropologist Crapanzano (1990). This third voice points to the culture, social norms, and what society says which shapes children’s understanding via conversations with parents. Parent-child exchanges manifest a route for children to understand the world, self, and others that gradually make children think in similar ways to their parents. The parental voices turn into powerful narratives for children to comprehend human cognition and social relations. Herein, narrative structures are learned by children and utilized as a remembering tool for what is personally experienced in the past and what s/he will experience in the future (Cleveland & Morris, 2014; Wang, 2001; Welch-Ross, 1997).

Taken together, varied forms of social interactions in which narratives are embedded guide what is remembered, how it is to be remembered, and what sense one makes with their autobiographical past. Many scholars from multiple disciplines such as developmental psychology, cognitive psychology, and anthropology focus on the role of social interactions and theorized that narratives potentially serve as a fruitful way to organize autobiographical memory that feeds the self-concept. Therefore, the narratives are considered a critical bridge between memory and the self. In this sense, “narratives play a role to understand the experienced events through the subjective evaluations of what has occurred” (Fivush and Haden, 2003, p.viii) and turns into meaningful pieces which are organized in the memory.

The key contribution of conversations with children about shared or unshared experiences is to encourage children to reflect on the self and get others’ perspectives (Blum-Kulka, 2012; Reese, 2013). Herein, “others” turn into knowledge sources which makes one dependent on others in deciding whether our memories are true or not. In this respect, the sociocultural view on developing autobiographical memory is precisely dependent on what is going on in the

social and cultural world. The cultural frameworks have the potential to shape the personally experienced events of individuals in line with what this event means. Individual differences open the individual pathways in which children learn the forms and functions to construct autobiographical memory and how we can think and share our memories with others and ourselves, as well (Nelson, 2003).

2.2.1 The Role of Guided Participation

The sociocultural developmental perspective argues that joint participation promotes children's learning to share personal experiences. Given this theoretical framework, social interactions form a base for developing autobiographical memory (Fivush & Reese, 1992; Fivush et. al, 1995; Harley & Reese, 1999; Reese, 2002; Wang, 2004). Developmentally appropriate adult-structured practices support children in observing, experiencing, and sharing feelings and information with others.

As Vygotsky (1987) proposed, the development of memory is a sign of developing higher-order thinking. In this vein, there are two kinds of remembering. The first type is direct remembering which occurs without any help of supplementary materials. The second type of remembering is mediated remembering. Mediated remembering includes imagination and a well-developed form of thinking. In this type of remembering there are some aids to facilitate remembering (Wang, 2014). Vygotsky declared that signs and auxiliary operations that are utilized for memory actions are noteworthy to create new connections and new structures. Rogoff (1990) defines learning as the transmission of participation as one of her key concepts. Transformation of participation provides individuals to develop his/her understanding through engaging in a process and contributing to an ongoing activity that prepares an individual for the future. Children and parents are active stakeholders in shared endeavors in which adults have the responsibility to guide the overall process as mature and experienced members. Further, children are also in collaboration with other children and adults and contribute to shape the overall orientation. Such kind of collaboration can be explained as a community of learners in which children learn from adults through jointly participated activities with them in informal learning settings (Farrant & Reese, 2000; Wang & Fivush, 2005). In this way, while children are in apprenticeships, they have a chance to observe and collaborate with others and learn about different roles and skills (Rogoff, 1990; Rogoff, Mistry, Göncü, & Moiser, 1993). The dyadic dialogues on shared endeavor make two sides active members in the learning process. In this transmission of the learning model, adults are the catalysts and the facilitators for the children, not the authority figures. Yet, mothers turn into social partners who facilitate a child's memory of shared experiences (Rogoff, 1990).

In the developmental research arena, focusing on how children's lived experiences and everyday practices influence their development is under research that needed to be theorized (Rogoff et al., 2018). Child development is affected by their everyday experiences which becomes a cultural activity. Children's participation depends on keen observation, contributing to the ongoing process, and discussing about and participating in cultural practices. In this way, children learn the socially developed norms and get a chance to grow up and create an understanding based on what they observe. The participation theory advocates that the individual and the cultural context are not thought as separate; rather they are mutually connected and form the process of life (Rogoff, 2003). Considering this, educators should not think places, individuals, and experiences are separate from the child. They are all influential touchstones for children to build their knowledge base.

2.2.2 Parent-Child Conversations: Links to Autobiographical Memory

The socio-cultural development model of autobiographical memory posits that autobiographical memory across preschool years is gradually emerging through social interactions (Nelson & Fivush, 2004). Parents are influential figures in children's life who share life and establish emotional bonds. The shared sustained thinking process is allegedly a key process in which adults and children collaboratively engage to construct meaningful and rich conversations (Sylva et al., 2004). Parent-child talk potentially facilitates children's learning through organizing the representations of a shared event. Correspondingly, verbal exchanges between children and more knowledgeable individuals strengthen children's ability to internalize personal experiences and events.

Memories emerge when an event is experienced and children start to make sense of it. Mother-child conversations during a novel event have not been investigated enough when compared to mother-child reminiscing about past activities. On the other hand, exchanging ideas during a shared event have the potential to enrich children's understanding of an experience and help children to organize them to have easy access for later retrieval (McGuigan & Salmon, 2004). At this juncture, the development of autobiographical development skills follows the development of the linguistic milieu of a child. When children develop verbally, the quality and the quantity of interaction with others becomes an integral part of their lives. Given this perspective, autobiographical memory development is promoted by representing and encoding the personally experienced events through using language. Therefore, parent-child conversations and idea exchanges during and after the events allow children to go back to the event and remember the salient points of the experience (Leitchman et al., 2000; Low & Durkin, 2001).

Parent-child talks start to be built almost as soon as children begin to utter their first words (Fivush & Fromhoff, 1988). In these early times, parents dominate the structure of the conversations about past events and the child tends to confirm what their caregiver talks about. Herein, the role of parents is to scaffold the interaction for children whose linguistic development is unfolding (Reese, 2009). Parents have a role in guiding the conversations and providing appropriate conversation tasks. By the time the children grow up, they gain an understanding of how they use narratives to express their own unique experiences with others. Most basically, children learn about the form and function of this representational exchange system which opens a gate to building an understanding of what is said and how it is organized in memory (Haden et al. 2001; Reese, 1995).

Herein, it is significant to note that this is a long and dynamic process. The children initially constructed their language ability and then they obtained new information through language which makes this process a fundamental exchange to represent what they individually experience. Parents are powerful figures to insert cultural power through narratives during parent-child exchanges. The communication between parents and their children supports, guides, and scaffolds through narratives creates children's cultural boundaries which in turn feeds the child's concept of self (Fivush et al., 1995; Bauer & Fivush, 2010).

2.2.2.1 Mothers' Conversational Styles

The sociocultural model potentially serves as a plausible base on how the mother-child talk extends children's autobiographical memory. Autobiographical memories are particularly specific to an individual and are shaped through reminiscing and talking about the past with others. One of the unique features of autobiographical memory is being social (Fivush, 1992; Nelson, 1993). That is, we talk with other people about the events we experienced in the past, and highlight the moments which are salient for us that contribute to our own personality. Thus, mother-child talks on shared and unshared events are considered a social practice and even also a kind of self-presentation (Bauer & Fivush, 2010).

The focus of autobiographical memory research is parent-child conversations before, during, and after the child's personal experiences. Parent-child conversations on shared past events enable children to revisit the event. This focus makes sense; parents have a role in shaping the structure of the conversation and scaffolding children's recall and remembering of what s/he experienced. Once the parent and the child join and experience the event together, the parent-child talk during and after the event connects the child and the parent which turns a social activity into a "social solidarity function" as Leithman (2000) proposed. In view of this,

parent conversation styles seem to be a strategy that contributes to children's narrative skills as well. On this, Kulkofsky, Wang, and Koh (2009) explore how parent-child talk potentially serves preschool children. According to reports by mothers, they believe that conversing on something is considered a tool to construct social relations with their children. Further, it was reported that talking about shared events helps children to understand their experiences and overcome emotional difficulties. Essentially, mothers' different conversation styles during an event or about past shared events are presumably guided by the culture in which parent-child dyads live. Empirical studies conducted on this issue pointed out that it is hard to decide whether the maternal reminiscing styles of mothers are universal or not. Since variety in cultures always exists, Maori, Chinese, Western Middle Class, and/or African-American families tend to talk with their children following different paths (Minami & McCabe, 1995). This brings us to the conclusion that different cultures have an impact on functioning parent-child conversations which resulted in differences in supporting autobiographical memory skills.

It is hypothesized by substantial research that parents' conversational style on autobiographical events has the potential to elicit children's memory and narrative development as well as their understanding and learning (Fivush, 2011; Fivush, Haden, & Reese, 2006; Reese, 2009; Salmon & Reese, 2016; Wang, 2001). Shared past events are effective tools to be discussed to ensure children organize and have better access to their own memory representations. Existing individual differences in shared and unshared events found in the studies showed that there are two distinct conversation styles of caregivers (Fivush & Fromhoff, 1988; Hudson, 1990; McCabe & Peterson, 1991; Reese & Fivush, 1993; Reese, Haden, & Fivush, 1993; Tessler & Nelson, 1994). In the first one, a highly elaborative, topic-extending, or narrative style is adopted by caregivers who tend to follow children's responses to embellish conversation and provide a great deal of details through questions and phrases. At this juncture, such kind of caregivers provide rich and descriptive evaluations, ask open-ended questions to make children "join on", and take and recognize different perspectives of the event. Children who have highly elaborative mothers tend to report richer and more accurate information on past events (Fivush et al., 2006).

Moreover, mothers' different conversation styles guide the volume and quality of conversation differently (Fivush, 2019). Highly elaborative mothers talk more frequently about shared events with their children and they tend to ask more embellished, detailed, and open-ended questions to keep children in the conversation. On the contrary, with the paradigmatic style, low elaborative parents generated little details for their children through repeated questions

and phrases over and over again. They tend to serve less descriptive information and evaluative comments on children's perspectives. Even though highly elaborative mothers are not interested in hearing one correct answer, the low elaborative parents insistently try to achieve a "correct" memory response. If the child does not provide the answer expected by those parents, the low elaborative parents tend to switch the topic. In this vein, low elaborative mothers do not create opportunities frequently to talk and discuss. The questions have single responses and they do not demand as many details from children as highly elaborative mothers (Fivush et al., 2006; Haden et al., 2009; Hedrick et al., 2009; Leichtman et al., 2000; Reese et al., 1993).

More embellished conversations have a positive impact on the quantity and quality of information children obtain. Herein, the embellished conversations are guided through more orienting (who, where, when) and evaluative (how, why, and emotion terms) talks (Haden et al., 2001; Ornstein et al., 2004). Questions were considered remarkable sources of the highly elaborative style which were highlighted in plenty of research studies on during (Boland et al., 2003) and after events (Farrant & Reese, 2000; Fivush & Fromhoff, 1988; Haden et al., 2009). In this vein, *questions* provide children the opportunity to elaborate on the conversations and serve personal evaluations as well. In those conversations, mothers typically support their children reporting abilities as well as using narrative skills. In their seminal study, Farrant and Reese (2000) pinpointed the potential of open-ended elaborative questioning with 2 years old children. When those children were 3, their memory responses were positively linked with their mothers' conversational styles when they were 2. Interestingly, asking questions also included follow-ins and confirmations which boosted children's long-term memory recall (Cleveland and Reese, 2005).

On the significance of mothers' unique conversation styles, mothers who discussed shared events in a highly elaborative way tend to ask open-ended questions which enables motivating children to generate new information, and more detailed and more accurate memory accounts (Bergen, 2009; Fivush, 2019; Küntay, 2004; Reese, 2013). In this respect, mothers' conversational style is considered a strong and unique predictor of a child's memory recall that turns into more insightful, longer, more meaningful pieces of narratives and knowledge in later age (Reese et al., 2019). Since adult-to-child "talk" has been a unique predictor of developmental change in children's recall skills, parent talks are considered a potential mediator to impact children's deliberate memory skills (Fivush, 2019). When a mother-child dyad has been participating in joint conversation, already established memory details are revisited by the child when mothers make memory requests through divergent questions.

Within this consideration, children are provided opportunities to practice searching memory details. Therefore, talking about shared and unshared events with young children is pivotally crucial to promote preschool children's deliberate memory skills (Liechman et al., 2020; Ornstein et al., 2006).

Moreover, a growing body of work has been focused on mother-child interaction during jointly experienced events (Haden et al., 2014; Hedrick et al., 2009; Jant et al., 2014; Laible, 2011; Pagano et al., 2020). In this vein, the parent-child talk offers development and learning which were profoundly highlighted in plenty of research studies (Fivush and Fromhoff, 1988; Fivush et al., 2006; Haden et al., 2001; Liechman, 2017; McCabe and Peterson, 1991). It was noted that if mothers adopt a highly elaborative talking style during a shared event, the preschooler children reported longer and more detailed aspects of this shared experience (Hedrick et al., 2009). More recent studies highlighted those conversations during events manifested "joint" verbal exchanges between mothers and their preschoolers which resulted in more accurate later memory reports than interactions in which only the mother and only the child talked (Haden et al., 2001; Ornstein et al., 2004; Tessler & Nelson, 1994). Talking about the events as they unfold, questions become particularly useful to orient children's attention to the specific aspects of events. In this vein, the child is triggered to retrieve the details of different aspects such as descriptions, explanations, specific features, and so on. Transferring the immediate responses as the event unfolds, highly elaborative mothers have a chance to guide the way of conversation through encouraging prompts such as with the when, where, who, which, why, and how questions.

On the one hand, research has tended to focus on mother-child talks on past events rather than talks during events. To date, a few studies in the literature point to how verbal interactions during an ongoing event may impact the event memory reports. One of the salient studies during the talk was conducted by Haden et al. (2001) with 2.5 to 3.5-year-old preschool children and their mothers to observe mother-child interaction in three specified activities; at 30 months, a pretend camping trip; at 36 months, a bird watching adventure; and 42 months, the opening of an ice-cream shop. It was revealed that open-ended questions utilized in the mother-child joint talk have a profound impact on remembered features of the abovementioned three events. Either way, the features of each event were better recalled by the children when they are retrieved and discussed by both the mother and the child. Not surprisingly, Hedrick et al. (2009) reported the findings of their experimental design study to unfold the effects of elaborative talk during or after an event on children's memory reports. 60 preschoolers were decided as the sample of the study participated in a camping event. Put forward the evidence

that children who engaged in highly elaborative conversational talk during or after the event reported more detailed information when compared to children who engaged in low-elaborative talk with their mothers. Considered together, it was suggested that mother-child conversations about ongoing and past events pivotally facilitate how children remember these events.

By the same token, a growing body of literature points to the longitudinal studies in which parent-child conversations on ongoing and past events contribute to the development of children's autobiographical memory (Fivush, 1991; McCabe & Peterson, 1991; Reese et al., 1993). The majority of those studies focus on conversations between mothers and their preschool children. In this respect, studies focusing on the individual differences of mothers in conversational styles (Haden et al., 1997; Leitchman et al., 2000; Nelson & Fivush, 2000; Tessler & Nelson, 1994) and longitudinal investigations (Fivush, et al., 2006; Fivush, 2009; Nelson, 2014) put forward that how mothers reminisce with their children have a longstanding impact on developing children's autobiographical memory. The study conducted by Haden, Haine, and Fivush (1997) explores how parental scaffolding in conversations about the past creates changes in preschool children's personal narratives over time. This longitudinal study was conducted with fifteen parents when their children aged 40 to 70 months old. Both mothers and fathers were the participants of the study and they were instructed to talk with their children about shared past events. The findings indicated that there is no statistical difference in how they structured the conversations, yet children display differences when talking with their fathers than with their mothers. The study emphasized that it was pivotal to support children's early abilities to develop narrative structures to construct their own personal stories.

Further, maternal emphasis on evaluations could be also a predictor of children's personal narrative skills. There is a substantial amount of research on maternal reminiscing which has a longitudinal design that informs the audience on concurrent relations between the maternal reminiscing style and a child's developing autobiographical memory, whereas experimentally controlled studies provide causality (Farrant & Reese, 2000; Haden et al., 2009; Newcombe & Reese, 2010; Reese et al., 2020). Such studies demonstrate that highly elaborative reminiscing helps children to recall a great deal about the specified event in which children internalize the elaborative strategies through observing their mothers. In parallel with this idea, Peterson et. al. (1999) designed an intervention study in which mothers were trained in regard to the highly elaborative reminiscing style. In this study, where the control group did not receive instruction, mothers in the experimental group receive training on the elaborative conversation style. Findings showed that children of instructed mothers showed higher recall

of specified events. Therefore, differences in mothers' conversational styles turn into a causal factor that shapes children's subsequent memory reports. The research studies mentioned above are quite clear in showing that mothers might differ in extending children's remembering due to having different conversation styles, yet the truth is that these differences have remarkable implications on how children shape their memory and will remember past events.

Previous studies on autobiographical memory shed light on parent-child conversations on personal events, yet the current study specifically tied two research literature which is the role of mother-child talk on autobiographical memory and education for sustainability. One of the primary aims of this study was to reveal the link between parent-child and researcher-child conversations. In this respect, it is expected that how parents' conversation style and/or parents' elaborations guide the degree of how children conceptualize composting as a sustainable practice and recall the objects, activity processes, and concepts they have recently learned. It is expected that the mother's conversational style is positively correlated with the number of details they provided in memory interviews between the researcher and the child. Related to this, Leitchman et al. (2020) suggested that research efforts on memory skills have been mostly focused on cultural and traditional events such as visiting the zoo, a birthday party, a camping experience etc. (Cleveland & Morris, 2014; Wang, 2007), yet children's event memories on specified learning episodes held in formal school contexts received little attention so far. Since the focal point of research studies in the field were personal event memories outside the academic contexts and how young children recall what they have experienced in school contexts is under-researched. On the other hand, focusing on educational episodes would provide a great opportunity for academic access (Pillemer, 1998; 2003). At this juncture, the study conducted by Bemis et al., (2013) aimed to address how accurately young children reported the two-stage learning events that they participated in. The events were determined as realistic and novel topics (the human visual system and the Aleutian Islands) in which 4-5-year-old preschool children had the opportunity to explore new materials and facts throughout the learning tasks. It was concluded that 75% of 4-year-old children and 83% of five-year-olds expressed a memory narrative that was correctly matched with the staged learning events. Further, children's memory narratives on event-specific details were highly correlated with correct answers to factual questions.

While there is a dearth of early childhood research considering how parents are influential figures to scaffold children's learning through conversations during and after shared events (Andrews et al., 2020), early childhood years are quite the best time period in which children

are increasingly capable individuals to talk about past and future events. In the case of differences in mothers' conversational styles, there has been extensive research on how mother shapes children's autobiographical memory skills and narrative development. Below the existing literature was reviewed in regard to individual differences in mothers' reminiscing style and implications for children's understanding and memory recall. A study conducted by Leitchman et al. (2000) also took place in a kindergarten classroom. One day, a preschool teacher who was on maternity arranged a surprise visit with her new baby, Maisy. One day later, the children were expected to participate in a conversation with their mothers in the home environment which was audiotaped. Mothers who did not know the details of the classroom visit of Baby Maisy talked with their preschoolers in line with focusing on this surprising visit. After this, the researcher conducted interviews with each child individually three weeks later. Mothers who tended to use the highly elaborative style on talking about the unexpected visit of Baby Maisy were truly supportive of children to generate more detailed information recounted to the researcher. Given these several merits of mother-child conversational interactions, this study expands on previous research in not only revealing how formal learning is supported in the preschool classroom but also providing us with how personal memories of preschoolers were constructed with the guidance of parental conversations.

Moreover, Andrews et al. (2020) considered not mothers or fathers, but educators' role in talking about past and future events. The study was conducted with 85 early childhood teacher-child dyads from Sydney, Australia. Each dyad was expected to talk about two novel and two past events. Further, a subsample of 42 mothers were expected to complete the same task with children. The results posited that teachers would display differences in their elaborateness in regard to their educational background. On the one hand, mothers provided better support while talking about past events when compared to educators. The findings highlighted the pivotal role of both educators and mothers to scaffold children's learning through talking about past and future events, yet there is a further need to reveal the role of educators in either high or low-elaborative talking with children. Moreover, educators' total elaborations were influenced by children's age and the novelty of the event. Early childhood educators with degree qualifications were more elaborative than educators with diploma-level qualifications.

Given the notion of the development of autobiographical memory and learning episodes, high-quality conversations between adults and children are widely realized in recent years which could be a key point to support what has been learned in the school context (Benjamin et al., 2010; Camilleri et al., 2021; Haden et al., 2001; Leitchman et al., 2017; Leitchman et al., 2019; Wareham & Salmon, 2006). Notably, the highly elaborative conversation style of mothers

potentially extends the deliberate memory of young children (Langley et al., 2017) academically (Leithman, 2020). The more divergent questions such as where, why, who, and how are utilized in discussions, the better performance on episodic details of the learning event that children demonstrated on learning even after substantial delays. Until fairly recently, Leithman and her colleagues (2017) shared two studies. One of these studies was about supporting children's scientific learning that linked two related disciplines, namely, education and developmental psychology. It was noted that parent-child verbal interactions have positive outcomes on children's learning and inquiring about science. The study aimed to provide insight into parent-child conversations and personal event memories. Indeed, this study differed from other experimental and longitudinal studies with its central research question; "Is young children's retention of the information presented in a classroom science demonstration positively associated with parents' use of elaborative memory talk when discussing about the lesson at home?" Typically, past research on early childhood science learning has been concerned with museum visiting and previous studies on parent-child conversations basically included family trips. Until this study, formal classroom activities have not been the focal point. It was concluded that highly elaborative talking facilitates children's understanding of implemented science activities. Children who individually participated in high joint talk elicited conceptual understanding and were able to connect concept and cause-effect relations intellectually. The light concept was determined as a science topic to be explored for this study. Children experienced a demonstration about the properties of light and then they were expected to immerse in a conversation with parents at home. It was hypothesized that parental elaborations will be positively correlated in the parent-child conversations about the explored science topic. That is to say, mothers who were more supportive in their talk through serving descriptions, children stressed more details on novel objects, concepts, and overall details in researcher-child interviews. Interestingly, when elaborateness was examined as the composite variable of this study, it was found that only memory/elaborative questions such as the who, what, and where questions were highly associated with children's recalling of novel details.

On these grounds, a study conducted by Camilleri et al., (2019) aimed to unfold how parent-child conversations facilitate the learning events of older children (56^{2nd} and 3rd grade and 53^{5th-6th} grade). The children were provided a rich episodic content event: watching balloons lift an object to explore weight and thrust. After experiencing the event, each parent talked about this unique learning episode with their children. After 2 and 14 days of delay, children's recall of concepts and details was correlated with parents' conversational styles. It should be noted

that when compared to preschool children, older children provided more conceptual details and extensive narratives when talking with parents.

These findings are also consistent with a swathe of similar findings in “joint-talking” studies that have been focused on talking about specified events. Nelson and Fivush (2004) pinpointed that joint reminiscing provided a structure for preschoolers to organize their representations which are valued for later recalls. In this vein, mothers systematically display differences in how they reminisce with their children. The two exploratory studies were conducted by Leithman et al. (2019) about the life story chapter. Leithman and her colleagues aimed to reveal the impact of mothers’ conversational style when proposing them to their preschool children. In study 1, children talked with their mothers naturally about two chapters which were decided by the mothers. On the one hand, in the second study, mothers recorded conversations about previously decided life chapters and also a specific episode related to their event. It was concluded that the maternal conversational style of discussing was positively correlated with children’s memory contributions. Joint talk between parents and children during an event is thoroughly linked with children’s open-ended recall which unfolds plenty of research studies. The findings are strongly relevant to highlighting the salient experiences of jointly shared events through asking open-ended questions in order to orient children’s attention to the unique component of features of an ongoing event. If this questioning process is followed by a child’s verbal additions, children’s representations are boosted and established due to explicit and here-and now narratives. In this way, experiencing the same event provided a great learning opportunity for children which may be more accessible in the future.

Essentially, to support the sociocultural perspective of autobiographical development, children benefit from joint participation with more experienced and knowledgeable individuals in socially and culturally valued activities. It was emphasized that with guided participation during and after events, children gained the skills to organize and coordinate their knowledge and experiences which are newly obtained. Herein, the language serves as a representational exchange system that helps children to construct their life stories and self-narratives. Another longitudinal study aimed to explore the linkages between mother-child conversations and children’s subsequent event memory reports with 89 mothers and their children who were jointly participating in a novel *adventure* in their homes when children were 36 and 42-month-old. The results indicate that mothers who were engaged through questions provided better facilitation by a high proportion of children’s correct responses when compared to mothers who tended to provide “low joint talk”. Children who experienced high joint talk also provide more memory information at 36 and 42 months old. It was concluded from the study that

mother-child conversational interactions could be a strong predictor for successful remembering. This Ph.D. study was motivated by the question that how young children learn about a sustainability issue and how linguistic interactions enrich children's understanding and learning. Joint-talk between mothers and children was required to present new information to children through the questions of who, what, when, why, and how. In addition, it was considered better to follow delays as 1 day and 3 weeks to unfold the impact of linkages between verbal exchanges (Hedrick et al., 2009b).

Last but not least, it is possible to point to a substantial body of research on how mothers shape children's remembering and narrative development through conversations (Boland et al., 2003; Haden et al., 2001; Hedrick et al., 2009b; Leithman et al., 2000, 2017; Reese & Newcombe, 2007; Wang, 2007). Besides, there is plenty of experimental research on parents' reminiscing with young children and the results fit the correlational findings. The typical correlational research work is determined to collect the baseline data including mother-child talk to detect a mother's conversational style and then train a randomly assigned subgroup of mothers to encourage them to talk with their children in an elaborative way. To illustrate, mothers' elaborative conversations with 40-month-old children were positively linked with children's memory reports on memory conversations when they are at 50 and 70 months of age (Reese et al., 1993). Furthermore, another study conducted by Haden et. al. (1994) demonstrated that the more elaborative mothers who talked elaborately with their 2-year-old children supported children's remembering skills which was investigated one and a half years later. Such studies put forward that the volume of the conversations was better since mothers tend to manifest longer details and report about experienced events when compared to low elaborative mothers. Those highly elaborative mothers also provided amplified representations with clear and embellished descriptions that facilitated children's recall abilities in a detailed way. Given this perspective, enriched and boosted personal narratives trigger children's mental processes. Since, parent-child conversations on events include many perspectives of the events such as thoughts, beliefs, feelings, intentions, expectations, and desires, children start to take others' perspectives and try to understand the reasons for actions from another point of view. This is the process in which narratives trigger children to recognize similarities, differences, or commonalities between a child's understanding and another person.

2.3 Summary

This chapter has focused on early childhood education for sustainability, contextualizing the profound role of parents in fostering children's learning for sustainability and how mothers' conversational style can be made use of as a tool to promote intergenerational dialogues on

sustainability. For the present chapter, the need for understanding education for sustainability was the starting point to get a deeper insight into why sustainability issues have received attention and which aspects must be taken into consideration. One of the most noticeable perspectives of this chapter is putting emphasis on involving parents to strengthen education for sustainability. In this vein, the integration of theoretical knowledge with practice in formal education settings was highlighted to pinpoint that it is not enough to teach young children about the environment; rather, exploring sustainability needs to collaborate with others to promote collective responsibility in which children and parents are considered equally important change agents.

Combining key insights of early childhood education for sustainability and the development of autobiographical memory potentially serves the current study. The role of mothers' unique conversational styles was also suggested as a strategy for children's learning. This section was concluded by providing a wealth of longitudinal and correlational studies that have now demonstrated how mother-child conversations have profoundly impacted children's memory reports on specified joint activities and learning episodes. The next chapter serves to illustrate the methodology of this study.

CHAPTER 3

METHODOLOGY

The methodology section is organized in line with the theoretical framework which has been discussed in the previous two chapters. This chapter starts by discussing the aim of the study and the research questions that guide the rationale of the case study design. Following the research design, the research procedure including the study settings, instruments, pilot study, and participants is explained. Next, the data collection, ethical considerations, data analysis, and trustworthiness of the study are offered.

The overall purpose of the current study is to provide a rationale for the role of mothers in fostering children's exploration of sustainable practices through intergenerational dialogues. In doing so, the aim of the study is twofold. Firstly, it attempts to reveal how recycling of organic waste was conceptualized by the participant children and mothers as a sustainable practice before and after jointly participating in a series of composting learning activities. Secondly, it aims to reveal the potential of mothers' individual conversational styles to foster children's knowledge as well as memory reports on the recycling of organic waste as a sustainable practice. The study was guided by the following research questions;

RQ 1. What is the self-reported knowledge of 60 to 72-months old children about recycling organic wastes before and after participating in the composting learning activities?

RQ 2. Based on the Composting Learning Activities Learning Outcomes Rubric, to what extent did the knowledge levels of the children related to composting process change?

RQ 3. What is the self-reported knowledge of mothers about recycling organic wastes before and after participating in composting learning activities?

RQ 4. How do mothers' conversation styles uniquely contribute to children's knowledge of recycling organic waste?

- a) Is there a relation between mothers' elaborations and children's contributions to mother-child joint conversations about composting learning activities?

- b) To what extent do high and low elaborative mothers contribute to the mother-child joint conversations about composting learning activities?
- c) Does the degree of mothers' elaborations predict what children reported about composting learning activities in post and follow-up interviews?

3.1 Research Design

The research design of a study is defined as an overall detailed strategy to help the researcher to structure the research process (Merriam & Tisdell, 2015). For this particular research, the research design is built on the foundations of a qualitative approach providing an overall clear pathway for the researcher to complete all the tasks and investigate the research problem thoroughly. By its very nature, qualitative research seeks answers to “what’s” which mainly focuses on respondents' self-reported knowledge before and after the implementation of composting learning activities. Considering Figure 3.1, the research design of the present study outlined as a case study consisted of three phases; the conceptual phase, the planning phase, and the empirical phase. The conceptual phase of this study includes determining the purpose and research questions of the study in light of the related literature. While the planning phase includes the research approach to be taken within the scope of the method, it includes determining the development of composting learning activities, the preparation of pre- and post-interview questions for children and mothers, and the testing of the developed tools within the scope of the pilot study. The empirical phase mainly involves the collection and analysis of data. Accordingly, after conducting a preliminary task with mothers and children to categorize mothers' conversation styles and semi-structured pre-interviews, mother-child dyads participated in five days of composting learning activities together. At the end of each activity, mothers' conversations with their children about what was learned and experienced that day were an important part of the empirical phase. Along with this, post and follow-up interviews with children and post-interviews with mothers were completed. Following the data collection, the data from the pre-and post-interviews with children and mothers were analyzed using content analysis. In addition, the rubric developed for the study was used to reveal the progress of the children before and after participating in the implementation of composting learning activities. Finally, mother-child conversations and the researcher's post and follow-up interviews with the children were analyzed based on the coding schemes provided by the related literature. The sections below provide detailed descriptions of the planning and empirical phase.

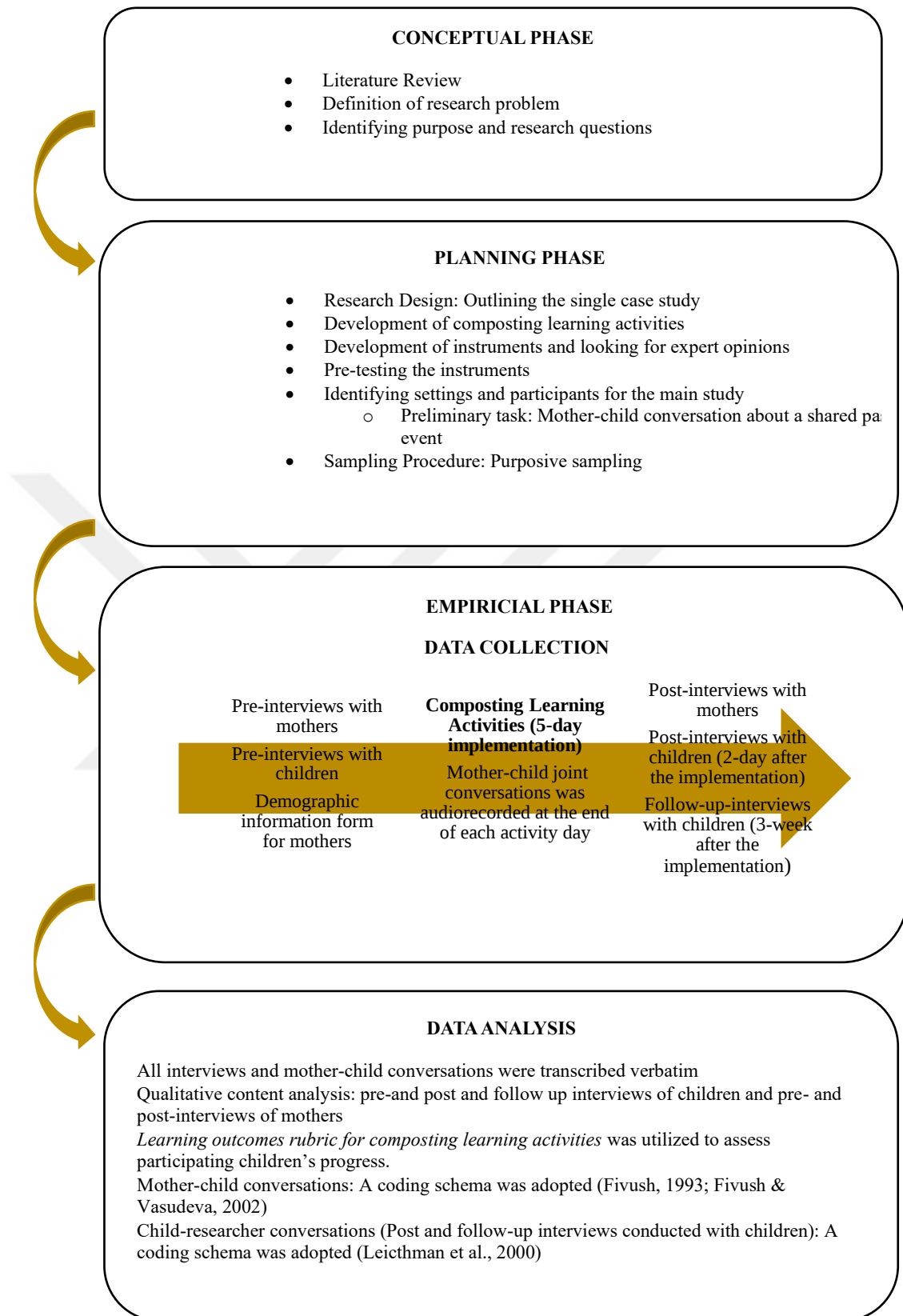


Figure 3.1 Overview of the research design

3.2 Rationale for a Qualitative Design

The methodology of a research study needs to fit the research purpose and research questions (Bogdan & Biklen, 1997). Smith (1998) argues that “research methodology is based on the skill of matching the problem with an appropriate set of investigative strategies” (p.173). In order to detect convenient investigative strategies to seek out research questions, it is critical to understand the methodological assumptions of the selected research design.

To expand, qualitative *descriptive* research is particularly eligible and best suited when a researcher is excited to look for the answers to the *who*, *what*, and *where* of events and to gather information related to existing conditions in order to find out detailed explanations, and descriptions of the research process systematically. Creswell, 1994; Lambert & Lambert, 2012; Sandelowski, 1995 also creates a methodological base for the present study. For this, the researcher stays close to data to make all inquiries unfold through descriptions that look like taking snapshots from individuals’ experiences. It is conducted in a real-life setting in which the researcher seeks to describe the experience of the participants or the selected event by focusing on certain aspects depending on the researchers’ choices about what to talk about. The present study employed a descriptive qualitative approach to provide insight into how participants of this particular work conceptualize the recycling of organic waste by providing embellished descriptions of the research process and subjects’ experiences. Given that, qualitative descriptive research methodology was utilized to provide details and straight descriptions of participating children’s and mothers’ experiences during composting learning activities. As Sandelowski (2000) noted, qualitative descriptive studies aim to provide a comprehensive study of the events in everyday terms. By its very nature, the researcher in this study aims to describe participants’ experiences in order to provide the audience with a framework or a kind of presentation about the case and what has been experienced in everyday language.

This particular study was designed in accordance with qualitative descriptive research assumptions. In the first place, as Stake (2005) and Bogdan and Biklen (2007) stated, being *naturalistic* is one of the key characteristics of qualitative research. A qualitative research study is naturalistic because the data authentically come from the participants whereby the researcher and the participants are constantly interacting. Likewise, Creswell (2012) stressed that since the qualitative inquiry takes part in the natural setting of the subjects in which the researcher is considered as the key instrument to collect the data through multiple strategies such as interviews, observations, and documents, it is naturalistic. This particular work is qualitative in nature when it comes to the types of data and the analysis of data. The source of the data

was semi-structured interviews conducted with participating children and mothers and mother-child joint conversations evidence to provide a better understanding of how participants conceptualize the recycling of organic waste. Utilizing multiple strategies during data collection and exploring composting with children and their mothers through child-centered learning activities within the research design (Creswell, 2012; Miles et al., 2014; Stake, 2005) made the process more open and less structured for the researcher. Thus, unexpected site events, personal comments, and developments are simply expected and welcomed throughout the entire process.

Secondly, as an important distinction from the quantitative studies, the contexts and the situations are important for descriptive qualitative studies. Even though they are not the direct focus of the research, a well-described study context gives a clear understanding of what is going on and how things work (Maxwell, 2013; Yin, 2003; Stake, 2010). According to Stake (2010), the context is the background of the study whilst the situation is the foreground. The context of the study is more stable, but as the foreground, the situations can be changed from day to day. As an interpretive element, context, and situations contribute to a better understanding of how things work during the research. In light of this, personal experiences are emphasized rather than trying to reach more generalizable and standardized measurements. For this particular study, the contexts were the preschools that participant children attended. Entire data collection procedures and meetings with researchers and mothers are all held in the authentic contexts of participant children. To provide a better understanding, more detailed explanations of study settings were given in sections 3.4.1. Besides, for the current study, situations were ongoing experiences of each participant in each day of learning activities. The composting learning activities consisted of varied kinds of activity processes in which mother-child dyads jointly participated. Details on learning activities were also provided in section 3.5.1.

In qualitative studies, the research process is constantly emerging depending on naturalistic observations, personal interpretations, the researcher's personal experiences and theoretical frameworks, and prior empirical studies which are all intertwined to shape the inductive process (Marshall & Rossman, 1995). Exploring "composting" –as a sustainable practice– with preschool children and their mothers through learning was an idea based on the theoretical framework of early childhood education for sustainability (Barratt & Barratt-Hacking, 2014; Davis, 2005, 2010; Dymont et al., 2014; Hill et al., 2014). Thus, this inductive process turns into a bountiful characteristic that enables the researcher to interpret the progress and deduce his/her own meaning. The interpretive characteristic opens space for the researcher

to understand relationships and ways of communication in social contexts. Since reality is constructed by the individuals in a qualitative study, it heavily relies on what individuals learn, and how they interpret and interact with their social worlds (Creswell, 2007; Merriam & Tisdell, 2014). In line with this idea, the purpose of the current study was to reveal the changes in each participant's self-reported knowledge of the recycling of organic waste. Further, each mother possessed an individual conversational style to contribute to her child's knowledge which was a good indicator to understand the relationship, communication styles, and the value of the mother-child interaction in order to learn about composting as a sustainable practice.

Additionally, multiple realities are at the heart of the qualitative study (Creswell, 2008; Yin, 2011). Researchers try to reach multiple realities and different meanings from different people. It is the purpose that at the end of the study one reality is more dominant compared to others, but for the readers, it is possible to reach all perspectives and realities. The point is not reach the best explanation, rather, meaning comes from varied interpretations (Yin, 2002; 2011). Reaching one general point is not the central premise for this particular study. Rather, each unique perspective from participants makes a remarkable contribution for a better understanding of how things worked in the field. A series of composting learning activities were there, yet there was not just one true meaning for all participant children and mothers. The meaning depended on how each child and mother interpret it with respect to their own personal experiences, communication with others, and interactions. There were multiple interpretations which were all welcomed.

Marshall and Rossman (2014) propose that in methodological eclecticism, "a variety of methods may be used, including those that generate quantitative data" (p.69). At this juncture, interpretations in qualitative studies can be misleading, since it depends on an individual's personal feelings and experiences. Thus, triangulation of the data increases the accuracy of interpreting the data. Multiple sources enhance to capture the emotions, actions, and highlights of one's life experiences (Stake, 2010). In this way, personal experiences can be transformed into meanings. Thus, experiential understanding emerges from the thick descriptions and is essential to understand how things work for participants. For this particular work, participants' developed understandings of recycling organic waste were revealed through pre and post semi-structured interviews. Moreover, each mother-child conversation enriched the researcher's understanding of participants' emotions, experiences, and interpretations of each activity process. The triangulation of pre- and post- and follow-up data and mother-child joint talks at the end of each activity day increased the accuracy of interpreting the data.

3.3 Rationale for the Case Study

As one of the prominent researchers in the field of case study work, Robert Yin (2009) depicts case study research as an empirical inquiry that focuses on a phenomenon within its real-life context in which multiple sources are utilized to investigate the issue within a clearly defined boundary. To support this, another influential researcher in the field of qualitative research methods, Robert Stake (2008), noted about the case study that “the object of study is a specific, unique and bounded system” (p.443). Since defining the case is not an easy task, ‘boundedness’ is described as a vital notion for the case study research.

Case study research is not aimed to analyze the cases, yet the main purpose is to define and explain the cases is a good way to understand what is going on within the process (Cousin, 2005). In the current research, the bounded system consisted of 60to 72 months old preschool children and their mothers who jointly participated in the designed composting learning activities in preschool learning environments. Such a design could provide a window to explore how participants explore a sustainable practice and to what extent their knowledge was developed. In this regard, Stake (1995) explained that “an innovative program may be a case”. Here, the case is a specific, characteristic, and a functioning thing...”. Related to this, Baxter and Jack (2008) proposed that case study design is eligible to investigate subjects through interventions, relationships, communities, and the program. Within this framework, case studies are interested in educational policies, people, and programs. The composting learning activities for preschool children were uniquely designed for the current study that has not been empirically studied in the early childhood context in Turkey so far. Hence, how composting practices might be integrated into the national curriculum and why it is studied as an inventive sustainable practice are the key questions that guide the current study. In this aspect, Merriam (1998) stresses;

A descriptive case study in education is one that presents a detailed account of the phenomenon under the study...They are useful, though, in presenting basic information about areas of education where little research has been conducted. Innovative programs and practices are often the focus of descriptive case studies in education. Such studies then form a database for future comparison and theory building (Chapter 2, “Overall Intent”, para.2).

As Creswell and Creswell stated (2017), the case study is a method built on contemporary bounded (case) or multiple bounded systems (cases) over time, through detailed and in-depth data collection involving multiple sources of information (p.97). From this perspective, a case study might include either a single or multiple studies. The researcher needs to take wise decisions to conduct a single case study or a multiple case study in order to explore the

phenomenon (Yin, 2003). As Baxter and Jack (2008) and Stake (1995) suggested for multiple case studies, the researcher studies multiple cases to reveal the differences and similarities between their cases. By way of explanation, in the multiple case study, the researcher is interested in more than one single case. On the other hand, the single case study is suggested if a researcher wants to conduct an in-depth exploration and richly describe the existence of the phenomenon. If a person or a group of people is studied, a single case study is suggested as the best option to have a deeper understanding (Baxter & Jack, 2008; Gustafsson, 2017). Research to date on exploring composting within a preschool setting is an under-researched topic. By this extension, choosing a single case study approach is well-suited to understand the experiences of participating children and mothers and how they conceptualize recycling of organic waste before and after jointly participating in learning activities in order to achieve a sharpened understanding and rich description of participants' experiences of conceptualizing composting together.

Taken together, the case study is situational which means it happens in a unique set of contexts with objects and activities (Baxter & Jack, 2010). The uniqueness of time, place, objects, and activities makes the case study situational. Therefore, thick descriptions are crucial to reveal the big picture. It is also personalistic. The case study focuses on understanding individual perspectives and perceptions. Individuals' points of view, values, and skills unfold the diversity which is purely honored. It is eligible for the researcher to be at the center of the research design. Interpretations of individuals are appreciated. In light of those characteristics, defining the case is the first step of a case study as Creswell (2012) stressed. Consistent with the characteristics of the case study design, the quality of the study was ensured through purposive sampling, systematic data collection, and clear and eligible data analysis procedures. Further, sampling and multiple sources of data were included to ensure the validity and member checking was ensured for the reliability of the study (Stake, 2005, 2010; Yin, 2010). More detail on collected data sources and the trustworthiness of the study will be presented in consecutive titles.

The case study design comprises multiple sources of evidence such as interviews, observations, documents, artifacts, drawings, and photographs that enable the researcher to converge the data and triangulate it (Yin, 2011). Typically, all kinds of data can be utilized as numerical measurements, photographs, indirect measurements and gather artifacts in qualitative designs. For this particular work, interviews conducted with participating children and mothers before and after the implementation and mother-child joint talks at the end of each day were the main data sources. From the researcher perspective, interviews provide

unique information and interpretations of the participants. Besides, there are factors that are not observable during the intervention and could simply unfold during interview sessions (Stake, 2010). One-to-one semi-structured interviews with each child and mother provided rich information and contributed to a better understanding. Those conversational interviews were eligible to clarify how each child and mother interprets recycling organic waste as a sustainable practice in their everyday life. The conversations were embellished with planned and even also unplanned probe questions that helps the researcher to clarify the understanding of the participants. The interview protocol was structured by the researcher depending on a certain framework, yet unplanned open-ended questions based on the personal experiences of each participant were quite helpful to expand the volume and the quality of interview sessions. In addition, mother-child joint conversations held at the end of each activity day are considered an important source of descriptive data. Through sharing their unique experiences with each other, joint conversations played a role in revealing the role of mothers' unique conversational styles in how children conceptualize composting.

3.4 The Research Sample

The importance of a qualitative study is to collect extensive detail from the study site and participants (Creswell, 2007). A two-step selective sampling was conducted for the current study. Selective sampling allows researchers to make more accurate decisions prior to the beginning of the study with respect to reasonable criteria. First, the researcher reached participants who were already available and convenient for the study. After, the purposeful sampling procedure was utilized. Purposive sampling is based on the assumptions that the investigator aims to discover, understand and gain insight and therefore must select a sample from which the most can be learned (Patton, 2002; Creswell, 2005).

Sampling is a critical part of a research study to reach confident data and findings as well. Barker (2008) proposes that “the quality of research depends not only upon the appropriateness of methodology and the method but also on the suitability of the sampling strategy” (p.1). Sampling strategies are varied. There are different kinds of study contexts, but the vital point is to select the most appropriate ones with respect to the nature of the research question and the aim of the study. In consideration of the overarching aim and the nature of the research design, the purposive sampling method was utilized. The criteria located below were established and obtained before the data collection process. Decisions on who will be the participants for the current study were obtained through a two-step process. In the first step, the researcher reached convenience cases that refer to schools. The current study consists

of participants from two different preschools which were already available to contribute to the study.

In the current study, there were pre-determined criteria to define the participants i) recycling organic waste must be a novel experience for all participants. ii) mother-child dyads must jointly have participated in the whole process. There are several factors why the joint event should be a novel event for both children and mothers. To eliminate the potential impacts of the prior experience on the outcomes of this particular study, experiencing a “novel” event was detected as the criteria for sample selection. Besides, as was mentioned in Chapter 2, autobiographical memory starts to emerge for most people on average at about 3^{1/2} years old. Autobiographical memories should include personal significance which differentiates them from episodic memory. As Nelson and Fivush (2004) articulate, the capacity of autobiographical memory is still developing in the first five years. That is the reason why, 60 to 72 months old children were determined as the research sample for this particular study.

3.5 Research Procedure

In this part, the research procedure comprised of study settings, instruments, pilot study, implementation of composting learning activities, participants, ethical considerations, and data analysis are presented.

3.5.1 Study Settings

In qualitative research, thick descriptions are crucial to draw a frame in order to understand how things work and occur in time. The source of descriptions could be the personal experiences, artifacts, and recollections of others. It is pivotal to describe the environment and the situation well and develop an understanding by comparing the current literature since the thick descriptions of the study context help the reader to comprehend how things occurred and understand the causal relations (Yin, 2018).

The educational settings for the current study were two single-unit preschools located in Ankara, Türkiye. They were selected as study sites for several reasons. Most basically, both two preschools were a conducive environment in which regular opportunities for children were provided related to environmental issues. The school administration and the teachers of the school₁ provide regular opportunities for children to immerse in the great outdoors and sustain the forest school approach in the long term through nature-based outdoor learning programs. Likewise, school₂ is a member of the Eco-preschool program that encourages children and

their families to participate in national and international projects in the school context to understand the importance of nature and the environment. In the second place, the demographic items of the participant mothers from the two study sites report similar levels in terms of the occupation and education levels of mothers which is considered critical to collect more accurate data.

The first center is a public preschool that affiliates with a state University presidency and is located at the university campus. The school was constructed in 1980 as one of the first preschools in Ankara for university staff members' children. The school has a low teacher-child ratio of 15:2 in classrooms. There are nearly 175 children aged between 3 to 6 years old. There are nine classrooms. For each classroom, there are one main teacher and one assistant teacher available. The staff is responsible for solely teaching and supervising the children as well as fostering children in their academic and extra-curricular activities.

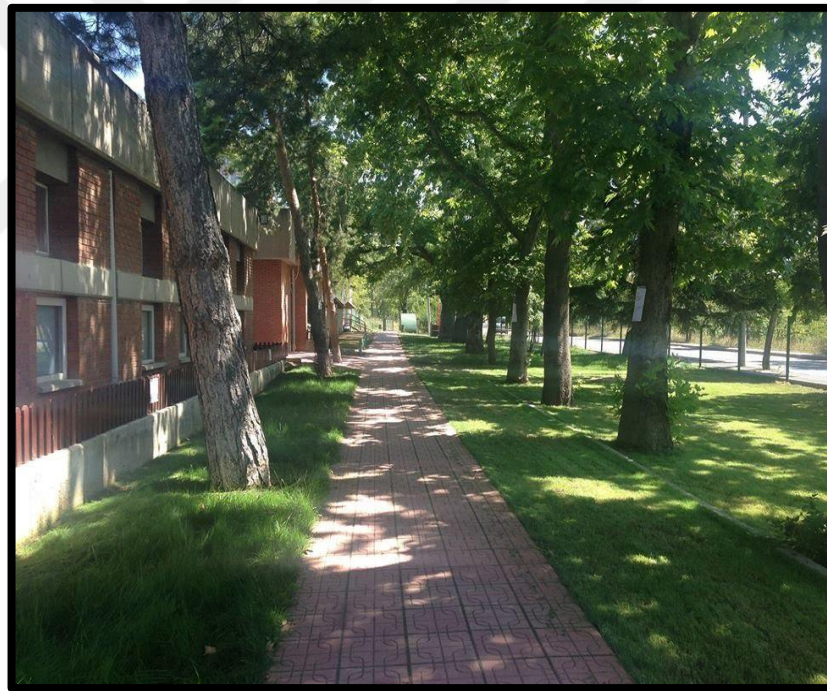


Figure 3.2 *The outdoor playground of the School₁ where the learning event activities were handled*

An integrated thematic approach fits best with the school's educational policy. Themes for the weeks are determined for each semester and all literacy, numeracy, and physical skills taught across the curriculum. In this respect, children are provided rich learning opportunities both in indoor and outdoor environments. Weekly plans of thematic curriculum put teaching and learning process to promote children's whole development. Also, extra-curricular activities such as physical education, music and movement, chess, arts and crafts, and English are carried out by branch teachers. The school is located in a wide full of high trees and a green playground that consists of traditional outdoor equipment. It was located nearby the university forest area. This privileged location inspires school staff to integrate the forest school approach into the curriculum. As a child-centered inspirational process, regular visits to the forest are arranged for all age groups to support play, exploration, and hands-on experiences in nature.

The school₂ is also situated in the center of Ankara. The school has a half-day education program for 60 to 72 months old children. The school is a public preschool that was constructed in 2008. The school is affiliated with the Ministry of Education. Thus, the school vision is shaped by the national early childhood education program (MoNE, 2013).



Figure 3.3 *The backyard of the School₂ where the learning event activities were handled*

There are six classes, morning and afternoon. Each classroom has one main teacher. There is a total of 100 children attending half and full-day program opportunities. The learning environment of preschool classrooms is designed according to the standards indicated in the MoNE Early Childhood Education program (2013). The school has a 25:1 child-teacher ratio. Considering the number of children, each class is equipped with diverse materials and toys. All teachers have at least a bachelor's degree in the field of early childhood education. This public preschool is a project-driven school. The school is already collaborating with the Ministry of National Education and other public preschools in the Etimesgut District for local, national, and international projects.

The school has green policies that gained them certification and awarded them a Green Flag. Recognizing the underlying goal of Eco-school projects, the school administration was supportive and open to working with academics on the issue of meaningful pathways with the aim of reaching sustainable schools.



Figure 3.4 *A snapshot of the front yard of School₂*

The school gained the right to join the Eco-School Project in 2016. In this sense, it has been an active member of the Eco-School program which is a fundamental initiative to encourage young people to experience a sense of achievement in environmental issues. To immerse young

children into sustainability practices, the school garden is equipped with vegetable beds, a greenhouse, a recycling corner, and barrels for rainwater. There are also outdoor material for children's active participation in nature-based activities.

3.5.2 Instruments

Since the current study was precisely guided by a descriptive qualitative study, it is vital to provide a rich and detailed account of the participant's personal experiences throughout the process. In this vein, qualitative research design enhances the researcher in obtaining in-depth data to explain specific and complex phenomena by utilizing multiple data collection tools which was critical to ensure rich, reliable, and contextual data (Merriam & Tisdell, 2015). Since the current study included multiple voices of participants, it would be better to obtain multi-sourced data from a number of different individuals. This particular study focuses on i) participating children's and their mothers' self-reported knowledge about recycling organic waste as a sustainable practice before and after engaging in a series of learning activities in which mother-child dyads jointly participated and ii) to what extent participating mothers' conversational styles facilitate children's learning about recycling organic waste.

To this end, i) one-to-one semi-structured pre-, post, and follow-up interviews were conducted with participating children, ii) pre- and post-interviews were conducted with participating mothers and iii) mother-child joint conversations held at the end of each day were considered major data collection tools that fit the scope and the aim of the current study which was worthy to reach wider perspectives of the participants. Since audio recording provides an easy and manageable data collection process, it was utilized as an essential tool to record all interviews and conversations among the mother-child, child-researcher, and mother-researcher.

3.5.2.1 Semi-Structured Interviews

Interviews are the most commonly used data collection tools in qualitative research and are used as "a way of finding out what others feel and think about their worlds" (Rubin and Rubin, 1995, p.1). Cohen Manion and Morrison (2002) stated that "literally the word 'inter-view' is a view between people" and "...the interview is a shared, negotiated and dynamic social moment" (p.151). To put it another way, an interview is a tool to develop a relationship by providing rich data sources which are also reflective and embedded in the natural context. Key to the rationale of data collection for the present study, semi-structured interviews were determined to be a flexible and conversational tool to gather the data from both participating children and mothers in order to reveal participants' changed knowledge before and after the

implementation of composting learning activities. For this particular study, the role of the researcher was to facilitate and elaborate the interviewing process and offer participants the opportunity to make them tell what they already know, learn and wonder about recycling organic waste as a sustainable practice. In so doing, semi-structural conversational interviews with children and mothers were conducted to gain in-depth data to understand the participants' perspectives (Morrison, 2013).

The set of interview protocols for both children and mothers consisted of a set of flexible open-ended questions designed in a sequence. The questions for pre-, post-, and follow-up interviews were designed in accordance with the specific learning objectives of SDG 12: Responsible Production and Consumption designed by UNESCO (2017), *10-year Framework Programmes on Sustainable Consumption and Production Patterns (10YFP)* and the current literature, as well. As waste generation and management (prevention, reduction, recycling, and reuse) is determined as a suggested topic to be explored to fulfill the standalone Goal 12 to ensure sustainable consumption and production and its specific targets for reduced waste generation (12.5) and promoted consumer action by ensuring universal access to information for sustainable lifestyles (12.8). From this perspective, the interview questions and composting learning activities prepared within the scope of this study are basically shaped according to the learning objectives identified and specifically outlined by UNESCO (2017) for each SDG. Additionally, composting learning activities were prepared by taking into account the cognitive, social-emotional, and behavioral outcomes identified for SDG12 and guided the learning process and conversational interviews conducted with participating mothers and children.

All questions were submitted to a panel that included academicians and experts in the field of early childhood education, education for sustainability, and developmental psychology. The comments gained from the four experts helped the researcher to tailor the content and the structure of the questions for both children's and mothers' interview protocols. In line with the expert opinions on the interview questions, some repetitive questions were removed from the interview protocol, while some follow-up questions were added to provoke the thoughts of children and mothers during the interviews. In addition, the active engagement of the participants was triggered with hypothetical questions such as "What would happen if there was no waste management?" and/or "What would happen if we could not recycle" which were asked to both participating children and mothers with the suggestion of the experts. The semi-structured interview protocols were a guide for the researcher, yet probe questions turned into extremely useful tools to dig deeper into the situation. Besides, the researcher encouraged

children in a positive manner so as to elicit children's memory reports as much as possible. Preprepared probes questions were remarkable aids for the researcher to reach embellished and rich information in order to ensure the credibility of the study as well (Gill et al., 2008). In the current study, probes and follow-up questions were utilized to deepen the knowledge and get a better understanding of what participants express. The probe and follow-up questions also encouraged children and mothers to think more deeply about the need, value, and process of recycling organic waste (Table 3.5).

Semi-Structured Pre-, Post, and Follow-Up Interviews with Children

During this study, the researcher met with the participant children three times to conduct interviews. Pre-interviews were conducted with each child before participating in the learning activities to reveal children's prior knowledge about recycling organic waste. Two days after the end of the learning activities, post-interviews were conducted with each child and follow-up interviews were conducted three weeks later. Pre-interviews with the participating children were mainly designed to reveal their prior knowledge about waste, waste recycling, and recycling of organic waste. In this context, the interview protocol structurally started with more general questions about waste, waste management, and recycling (Do you know what waste is? Have you ever heard of it? What comes to your mind when I say recycling? Which wastes can be recycled?)” to set the tone and encourage participating to feel comfortable to provide authentic responses. Towards the end of the pre-interviews, the last questions were typically focused on what participants already knew about composting as the specific focus of the present study.

Following the completion of the implementation of learning activities, the researcher met with participating children twice to conduct post and follow-up interviews. The post- and follow-up interview protocol consisted of the same and hierarchically structured questions and was designed as a neutral interview including questions in regard to the content of the learning activities. The post and follow-up interview questions for children also focused as much as possible on the details of the learning activities. Interviews started with providing general information about learning activities, such as; “Do you remember the several activities related to composting we did last week? Can you tell me the activity that you enjoyed the most?” Following these general questions, more specific open-ended questions were asked to touch upon the particular aspects of the event (e.g “Which fruits did we eat?”, “Which wastes are preferred by *Soso*?”, “What did you explore while observing the red worms?”, “What did the *Garbage Witch* wear?). Questions related to the learning activities potentially served children to remember what they have learned and at the same time provide the researcher with rich

information about how they conceptualized the recycling process of organic waste through the learning activities. Extended interview questions for children's post and follow-up interviews can be seen in Table 3.1.

Semi-Structured Pre- and Post-interviews with Mothers

The researcher met mothers twice to conduct pre- and post-interviews. Similar to the interviews with children, the design of semi-structured interviews with mothers was driven by the specific learning objectives for SDG12 and the designed composting learning activities. As seen in Table 3.1, interviews were elaborated through probing questions to gain deep insight into mothers' prior and post experiences and notions about recycling and their household consumption habits in their everyday lives. Further questions in pre-interviews particularly focused on mothers' already existing knowledge about organic waste and the recycling of organic waste. Different from the pre-interviews, the post-interviews were expanded with questions to reveal mothers' changed knowledge about the need and the value of recycling organic waste.

The pre-interviews conducted with the participant mothers aimed to reveal their prior knowledge about waste management, organic waste and the recycling process of organic waste. In the interview protocol going from general to specific, firstly, questions were added to the mothers to reveal what they know about waste and waste management. Then, the interview protocol, which focused on the concept of recycling, also included questions about the mothers' domestic consumption habits. The ten questions of the preliminary interview protocol with the mothers were prepared more specifically about organic wastes and recycling process. On the other hand, the post interviews conducted after the completion of the composting learning activities were conducted to reveal how the mothers conceptualized organic waste and organic waste management through their learning experiences.

The first questions of the post interviews focused on the personal experiences of the mothers about learning experience they jointly participated in with their children. Then, questions about waste and waste management were included and it was aimed to reveal the developing and changing knowledge of mothers in the focus of composting. With the questions prepared about hot composting and worm composting, it was aimed to obtain the opinions of the mothers especially on how to start up and sustain the recycling process of organic wastes. The last questions of post interview protocol were related to Compost Star activity to reveal mothers' self-reported knowledge on the need and value of organic waste recycling as a sustainable practice.

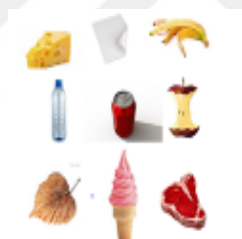
Table 3.1 Semi-structured Interview Questions for Participating Children and Mothers

<i>Specific learning objectives for achieving GOAL 12: Responsible Consumption and Production</i>	Pre-interview questions for children	Post and follow-up interview questions for children	Pre-interview questions for mothers	Post interview questions for mothers
<i>Cognitive Learning Objective 4.</i> The learner knows about strategies and practices of sustainable production and consumption. <i>Indicator(s):</i> The child investigates recycling as a strategy for responsible and sustainable consumption <i>Social-Emotional Learning Objective 1.</i> The learner is able to communicate the need for sustainable practices in production and consumption. <i>Indicator(s):</i> The child notices the need of recycling as a sustainable practice in production and consumption.	• What is recycling? What comes to your mind when you think of recycling? • What is waste? Is there a difference between garbage and waste? • Which wastes can be recycled? • Why do we need to recycle? • What would happen if we could not recycle?	• Last week you participated in activities with your mother in the school garden about composting. Could you please tell me about the activity/time you remember the most? • Which wastes were in my cloak when we first met? Where did these wastes come from? Where did we take these wastes from? Why did we do that? • What do you think recycling means? Why do we need to recycle? • Which wastes can be recycled? • What would happen if we could not recycle?	• What is waste management? What comes to your mind when you think of waste management? • What do you think is the difference between garbage and waste? How many garbage bins do you have at home? What do you put in them? • What comes to your mind when you think of recycling? How do you define it? Which wastes do you think can be recycled? • Where do you get information/learn about recycling? • How is the recycling process associated with daily life? • Have you participated in an activity related to recycling/waste management with your child? What kind of activity was it? What did you do? • Whose responsibility do you think it is to recycle and/or support the process?	• Last week, you and your child jointly participated in activities related to the recycling of organic waste. What did we do? Which aspects of this experience was noticeable for you? • How do you think your child's participation in the process was? What are the benefits and value of sharing this experience with your child? • What is waste management? • What do you think is the difference between garbage and waste? • What comes to your mind when you think of recycling? • Which wastes do you think can be recycled? • When you think about the recycling process of organic waste, whose responsibility do you think it is to support it?

Table 3.1 (continued)

Cognitive Learning Objective 2.
The learner understands production and consumption patterns and value chains and the interrelatedness of production and consumption (supply and demand, toxics, CO2 emissions, waste generation, health, working conditions, poverty, etc.)
Indicator(s): The child investigates the source of food/The child knows organic wastes are also part of the generation waste as a real-life issue.

- What is in this picture? Can you mark/explain which of them can be recycled?



- What is in this picture? Which/which ones are organic waste? Which/which ones can be recycled? How and where can it be recycled?



- What are your consumption habits?
- Are your consumption habits shaped according to your needs and/or wants?
- What are the food sources you consume more at home?
- Where do the fruits/vegetables we eat come from? Where and how are they grown? Have you ever grown a plant/vegetable/fruit?
- Can you mark/explain which of them can be recycled?



- How did your thinking about waste management change after exploring the recycling process of organic waste?
- What would you like to say when you reevaluate your consumption habits after learning activities?
- Was there anything you wanted to change about your household consumption habits after participating in the learning activities?
- Can you mark/explain which of them can be recycled?
- Which one(s) is/are organic waste?



- What are your favorite foods?
- Where do the fruits/vegetables we eat come from? Where and how are they grown? What is their importance for us?

- Do you remember the game that we played with fruit cards? (Which fruits were in the fruit basket game? What was the rule of the game? How and when did we change places in the game?)
- What did we eat at the picnic we had after the game? Where were the fruits that we ate grown? Why is it important for us to consume these foods?

Table 3.1 (continued)

Cognitive Learning Objective 4.

The learner knows about strategies and practices of sustainable production and consumption.

Indicator(s): The child investigates composting as a strategy and practice of responsible and sustainable consumption/The child learns about Do's and Don'ts for composting/The child notices the role of *greens* and *browns* for composting

- We cannot see the dry leaves that fall in autumn in spring. Have you ever thought about where these leaves go/how do you think they disappear?
- How do you think we can recycle vegetable-fruit and park-garden waste such as banana peel, apple peel, and leaves?
- Do you remember the story *Soso* told us? Could you please tell me what you remember about *Soso's* story?
- Where did *Soso* live? What were the foods that *Soso* did and did not eat? Who were the friends of *Soso*? What did *Soso* and its friends produce when they ate their favorite food? How? What were the greens and browns needed for a compost pile?
- Could you please tell me the play activity about Do's and Don'ts for composting? What do you remember?
- Which visuals were on the play cards?
- Which visuals did you select? How did you categorize your visual as Do's and Don'ts for composting?
- When autumn comes, the yellow leaves dry up and fall from the trees to the ground. Have you observed this? How do you think these leaves disappear?
- How do you think we can recycle vegetable-fruit and park-garden waste such as banana peel, apple scraps, dry leaves?
- What is compost? Have you ever heard of it before? What do you think it could be?
- Do you remember the story *Soso* told us? Could you please tell me what you remember about *Soso's story*?
- What were the greens and browns needed for a compost pile? What is the recycling of organic waste? How is it done? Why should we recycle organic waste?
- Could you please tell me about the play activity about Do's and Don'ts for composting?
- Which visuals did you select? How did you categorize your visual as Do's and Don'ts for composting?

Table 3.1 (continued)

<i>Cognitive Learning Objective 1.</i> The learner understands how individual lifestyle choices influence social, economic and environmental development. <i>Indicator(s):</i> The child understands that organic waste generation is an indispensable part of daily life as a real-life issue. <i>Cognitive Learning Objective 2.</i> The learner understands production and consumption patterns and value chains as well as the the interrelatedness of production and consumption (supply and demand, toxics, CO2 emissions, waste generation, health, working conditions, poverty, etc.) <i>Indicator(s):</i> The child investigates that other stakeholder (school community, home environment, neighborhood etc.) produce organic waste in daily life routines as well. <i>Behavioral Learning Objectives 1:</i> The learner is able to plan and implement consumption-related activities using existing sustainability criteria <i>Indicator(s):</i> The child learns required materials and equipment of composting process/The child participates in designing the composting pile.	• What waste(s) can be found in your home and school and/or in the environment in your daily life? • Can waste left over from an evening/lunch at home and/or at school, and/or waste such as leaves, dry branches, etc. in the school garden be recycled?	• Do you remember in the activity in which you measure the organic waste that you brought from home? Which wastes did you and your mother bring from home? • How did you decide on the waste you brought to school with your mom? • How did you prepare a compost pile? • Which waste did you collect from school garden? • Which waste did you bring from home with you mother? • Which leftovers were brought from the school kitchen? • Why did you break down the green and brown organic waste with your mother? • In which ratio of greens and browns did you mix in a compost bin? • Could you please tell me about the compost bin? What did it look like? • How did we moisture the compost pile? Why? • How did we measure the initial temperature of the compost pile? Why? How do we expect the temperature to change after a few days? How does the temperature increase in compost bin?	• What waste(s) can be found in your home and school and/or in the environment in your daily life? Can you give an example? • The recycling of organic wastes such as vegetable-fruit and park-garden wastes is called composting and the resulting mineral-rich product for soil is called compost. How do we get started with the composting process? • Why do we need to recycle organic waste? • Can waste left over from an evening/lunch at home and/or at school, and/or waste such as leaves, dry branches, etc. in the school garden be recycled?	• As part of the activities, we prepared a compost pile to get started with the composting process. Could you please tell me how we build a compost pile? • Which wastes did you and your child bring from home? What were the sources of these wastes? Where did they come from? • How did you decide on the waste you brought school with your child? • Which waste did you collect from school garden? • Why did you break down the green and organic waste with your child? • In which ratio of greens and browns did you mix in a compost bin? • Could you please tell me about the compost bin? What did it look like? • What are the other factors affecting the composting process? • Why did we moisture the compost pile? • How did we measure the initial temperature of the compost pile? Why? How do we expect the temperature to change after a few days? How does the temperature increase in the compost bin?
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Table 3.1 (continued)

<i>Cognitive Learning Objective 4:</i> The learner knows about strategies and practices of sustainable production and consumption. <i>Indicator(s):</i> The learner understands the unique role of red worms in the composting process as a sustainable practice. <i>Behavioral Learning Objectives 1:</i> The learner is able to plan and implement consumption related activities using existing sustainability criteria <i>Indicator(s):</i> The child experiences the implementation process of worm composting (vermicomposting) <i>Social-Emotional Learning Objective 1.</i> The learner is able to communicate the need for sustainable practices in production and consumption. <i>Indicator(s):</i> The child notices the value of worm composting as a unique sustainable practice.	• Have you had the opportunity to observe a worm on a rainy day or have you ever seen a worm? • How did it move? What was its color and shape? What other characteristics do you remember? • Where do earthworms live? What do they feed on? • Are earthworms important? Why are they important?	• Could you please tell me about the game we played today? How did we move? • How did you observe the earthworms? How did it look like? • Which experiments did you do? (Do you remember whether the earthworm you observed preferred the dark or light side? Do you remember whether the earthworm you observed preferred wet or dry side?) • Do you remember the worm farms you created with your mother? Could you please tell me about how you create a bin for a worm farm? • Which materials and in which order did we use when we created the worm farms? • What might the earthworms be doing in these farms right now? • What is the role of earthworms in the composting process? What is their value for the environment/nature? • Why did we build worm farms? • Where else can we build worm farms in our daily lives?	• Have you had the opportunity to observe a worm on a rainy day or have you ever seen a worm? • How did it move? What was its color and shape? What other characteristics do you remember? • Where do earthworms live? What do they feed on? • Are earthworms important? Why are they important?	• How did you build a worm farm with your child? • What could the worms be doing in these farms right now? • Why did we build worm farms? • What might the earthworms be doing in these farms right now? • What is the role of earthworms in the composting process? • Why did we build worm farms? • What is the role of worms in the composting process? What is their value for the environment/nature? • Where else can we build worm farms in our daily lives? •
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Table 3.1 (continued)

Social-Emotional Learning

Objective 1. The learner is able to communicate the need for sustainable practices in production and consumption.

Indicator(s): The child learns to transfer and share the knowledge about sustainability in order to communicate with others.

- How did you feel when you saw your photos and the activities you did during the whole week? What do you think it means to be a *Compost Star*?
- Do you remember how you prepared a song with your mother on the last day? Why did you prepare such a song? With whom did you share the song you prepared?
- Why did I give you and your mother the *Compost Star* necklaces? What does it mean to be a compost star? With whom have you shared what you have learned so far? Why?
- Why did I give you and your child the *Compost Star* necklaces? What does it mean to be a *Compost Star*? With whom have you shared what you have learned so far? Why?
- Do you think you can recycle your organic waste in your daily life? Where and how do you plan to do it?

3.5.2.2 Mother-Child Joint Conversations About Composting Learning Activities

On the same day of each composting learning activity, mothers were engaged in a conversation with their children which was audio recorded by the mother themselves. In the instruction, the participating mothers were told by the researcher that “On each activity day, we will explore the process of recycling organic waste. I am interested in how mother-child dyads learn about composting altogether. For that, after jointly participating, I would like you to talk with your child about each activity day’s content that you and your child experienced together. You can talk with your child as you normally would in your daily life.” The conversations mostly took in the evening of each learning event day. The audio-recorded conversations were sent to the researcher via *WhatsApp* application each evening.

3.5.3 Pilot Study

The pilot study of this research was conducted in one of the schools (School₂) where the main study was conducted. The aim of the pilot study was to reveal how designed composting learning activities works in terms of purpose, material, time, and space. In this respect, the pilot study provided a valuable opportunity to test how learning activities serve the purpose of the study and how data collection tools are useful to reach the data. The pilot study was conducted with 60 to 72 months old preschool children ($n=8$) and their mothers ($n=8$) in total. After getting ethical permission, the director of the school was informed about the aim and data collection process and the tools for data collection of the study. Semi-structured interviews conducted with participating children and their mothers before and after the implementation of composting learning activities and mother-child joint talks were held at the end of each day were the data sources for the pilot study, as well. Two weeks before initiating the pilot study, an information sheet was distributed to participating mothers of all 60 to 72 months old children. Eight of them indicated they were already ready and willing to be a participant with their children. Then, the researcher met with each mother one by one to schedule a meeting for a one-to-one interview. Both participant mothers and their children were presented with consent forms and obtained their desire to participate in the study.

Data collection of the pilot study started with a preliminary task which was significant to determine the participants. Firstly, each child-mother dyad came together in pre-planned time periods to identify the mother’s conversational style. For this task, the mother was instructed to draw a picture with her child about a shared past event that was recently (up to two weeks ago) experienced. The first task lasted 20 minutes and was video-recorded. Following this joint preliminary task, semi-structured pre-interviews were conducted before participating in

composting learning activities. All interviews with children and mothers were conducted by the researcher and were scheduled by mutual agreements with each mother.

As a context for the data collection, the school for the pilot study was determined as the most convenient place to meet and complete interviews. All interviews were audio recorded. Following completing the preliminary tasks and interviews, the composting learning activities were started five days a week, from Monday to Friday. Since there were working mothers, lunch break was decided as the most convenient time period to come to school and participate in the activities. Children were already in school at the decided time. Then, for five days each mother came to school during lunch break time and participated in the composting learning activities. Further, each mother-child dyad recorded the conversation about the activity of that day and shared it with the researcher via *Whatsapp* for five days. Moreover, following the implementation of the learning activities, post-interviews were conducted with the children 2 days after the completion of the learning activities and follow-up interviews were conducted three weeks later. In addition, post-interviews were conducted with each mother at the end of the implementation.

The pilot study provides a noticeable experience for the researcher to extend her vision in order to make a number of changes. After the pilot study, it was decided that the preliminary task session could be revised which was a joint drawing about a past shared event. However, in some cases, drawing sessions were dominated by the child and turned into a kind of art activity. Rather than utilizing drawings to decide on mothers' individual conversational style, one-to-one talk sessions on a shared past event were decided for the first task for the main study. Moreover, the drawing of a past shared event was video recorded in the pilot study, on the other hand, instead of using video recording, those mother-child talks were audio recorded which provided a marked change in the quality of mother-child talk in the main study. Pilot study findings demonstrated different perspectives of participants; thus, the content of the questions was changed as well. In this respect, pre-, post-, and follow-up interview questions for both mothers and children were extended for the main study. It is also worth noting that the pilot study guided the researcher to improve her interview skills. In order to elicit sufficient and rich data, the probe questions were added to be used in the main study.

More importantly, the researcher benefited from the pilot study in seeing how learning activities worked out. Composting learning activities were designed regarding the principles of the National early childhood education program (MoNE, 2013) and the learning objectives of SDG 12. In the pilot study, it was recognized that particularly play activities were attractive and made participants willing and motivated to play and learn about recycling organic waste.

Hence, the main study was deconstructed with more play activities to promote children's and mothers' participation. Likewise, the pilot study boosted the researcher for material preparation. For each session, all required materials were prepared by the researcher for each activity. For the main study, this process became more practical and the researcher developed strategies to prepare quick and qualified materials that help save time and energy.

3.5.4 The Participants

Twenty-three mothers participated with their 60 to 72 months old preschool children (12 boys, 11 girls; age range was 56 to 74 months old; $M = 63.74$, $SD = 4.39$) in the current study. The mean age of mothers was 38 ($M = 38.17$, $SD = 4.48$). All participants lived in Ankara, the capital city of Türkiye. Turkish was the primary language of all participants. None of the children had speech and language delays as reported by their teachers. Based on the information derived from the demographic information form which was administered to the mothers, all mothers declared their marital status as married. Additionally, the mothers were also asked about their children's preschool attendance years. The majority of mothers ($n=13$) indicated that their children have been attending preschool for more than three years. Five mothers expressed more than two years and 5 mothers indicated that their children attended preschool for more than one year (Table 3.2).

Table 3.2 Demographic characteristics of participant children

Variable name	Group	Number	Frequency
Gender	Girls	11	47.82%
	Boys	12	52.17%
Year of attending preschool	3+ year	13	56.5%
	2+ year	5	21.7%
	1+ year	5	21.7%

When the educational background was examined, the final education level was marked as 73.9% ($n=17$) of mothers having a bachelor's degree; 8.7 % ($n=2$) having two-year degrees; and 17.3% ($n= 4$) of them graduating from high school or less. Furthermore, 69,6 % ($n=16$) of mothers indicated their occupation to be working mothers whereas 23.4% ($n=7$) of the participant mothers were housewives. One of the working mothers was working in the private sector, the remaining mothers were working as government officers.

Following the demographics, the mothers were also asked to rate the daily conversations with their children with two separate but related questions. The mothers were asked about the

frequency of daily conversations (*frequency of conversations*) as; “How often do you talk with your child about daily life events?”. The mothers were requested to select 1 (hardly ever) point to 7 points (very frequently) to give a degree to their frequency of daily conversations. 30.4 % (n = 7) of mothers indicated point 7 as they very frequently converse with their children in everyday life. Likewise, 30.4% (n=7) of participant mothers declared point 6 (usually) to indicate the degree of their frequency of conversation. 21.7 % (n=5) of mothers expressed point 5 (frequently) and 13.04% (n=4) indicated point 4 as they sometimes have conversations with their children in everyday life. The mothers were also asked another single question which was “How long do you have a conversation with your child in everyday life?” to acknowledge the duration of their everyday talk (*duration of conversation*). The mothers were presented with four options to indicate the duration of their conversations. 39.13% (n=9) of participant mothers responded with the 21-30 min. option; 26% (n=6) of mothers indicated 30+ min. option; 26% (n=6) of mothers indicated 11-20 min. option; and 8.7% (n=2) of mothers responded 0-10 min. option to state the duration of their everyday conversations (Table 3.3)

Table 3.3 *Demographic characteristics of participant mothers*

Variable Name	Group	Number	Frequency
Education Level	High school and less	4	17.3 %
	Two-year degree	2	8.7%
	Bachelor’s degree	17	73.9%
Occupation	Working mothers	16	69,6%
	Housewife	7	23.4%
Frequency of conversation	Very frequently	7	30.4%
	Frequently	7	30.4%
	Often	5	21.7%
	Sometimes	4	13.04%
Duration of conversation (minutes)	30+	6	26%
	21-30	9	39.13%
	11-20	6	26%
	0-10	2	8.7%

Preliminary Task: Mother-Child Conversations on a Shared Past Event

The purpose of mother-child talking on a shared personal event was to categorize each mother's conversational style as either high or low elaborative. In line with this aim, the researcher particularly constructed a meeting time in the school environment to reveal the mother-child interaction. During this joint activity time, the mother and her child met in an interview room at the school. Each mother-child dyad was requested to talk about a particular topic; i) which should be shared by both mother and child, ii) experienced at least in the previous two weeks, and iii) should be a specific topic such as a birthday party, making cookies, visiting an aquarium, etc.

The mothers were nominated to determine two options that relied on those criteria and write down on a paper to select the most eligible one. After deciding on two options to talk about, the researcher selected the most eligible one and requested the mother to talk about this selected shared time with children for 5 to 10 minutes as they normally would in their daily lives. During this process, two separate audio recorders were placed on a table in order to increase the accuracy of the transcriptions and even also to eliminate the adverse impact of unclear parts on the primary recorder. Each mother-child talk was coded regarding the coding scheme adopted from the original study of Fivush (1993) and Fivush and Vasudeva (2002) which is outlined in detail in the section 3.6.3.

3.6 Data collection

As Merriam (1998) suggested “understanding the case in its totality, as well as the intensive, holistic description and analysis characteristics of a case study, mandates both breadth and depth of data collection” (para. 1). In this vein, to ensure the validity of the study and acquire in-depth investigation and understanding, multiple data collection methods are addressed in qualitative case studies (Creswell, 2012; Yin, 2010). For the current study, in-depth interviews conducted with participant children and mothers and mother-child joint conversations held at the end of each implementation day are the data sources which is indicated in Table 3.4.

Table 3.4 Data sources

Research Question(s)	Participant	Data Sources
What is the self-reported knowledge of 60 to 72-months old children about recycling organic	Children	Pre-, post and follow up interviews with children

wastes before and after participating in the composting learning activities?

Table 3.4 (continued)

Based on the Learning Outcomes Rubric for Composting Learning Activities, to what extent did the knowledge levels of the children related to composting process change?	Children	Pre-, post and follow up interviews with children
What is the self-reported knowledge of mothers about recycling organic wastes before and after participating in composting learning activities?	Mothers	Pre- and post-interviews with mothers
How do mothers' conversation styles uniquely contribute to children's knowledge of recycling organic waste?		
○ Is there a relation between mothers' elaborations and children's contributions to mother-child joint conversations about composting learning activities? ○ To what extent do high and low elaborative mothers contribute to the mother-child joint conversations about composting learning activities? ○ Does the degree of mothers' elaborations predict what children reported about composting learning activities in post and follow-up interviews?	Children & Mothers	Mother-child joint conversations held at the end of each activity day & post and follow-up interviews with children

3.6.1 Composting Learning Activities

The central focus of composting learning activities particularly designed for the current study is to make participating children and mothers jointly explore a sustainable practice. On this ground, recycling of organic waste was purposefully captured, since learning about waste and waste management is considered a valuable topic for individuals to recognize their impact on the environment. As Pratt (2010) noted, exploring composting potentially serves as a practical possibility for young children to appreciate one of the living systems of Planet Earth. It is closely related to everyone's everyday lives, so it has the potential to integrate theory and practice as one of the central tenets of early childhood education for sustainability. Likewise, UNESCO (2017) proposed waste generation and management as a suggested topic to explore for SDG12. Typically, composting learning activities which were specified to present the study rely on the key competencies and the specific learning outcomes that UNESCO (2017) put

forth. Since one of the biggest challenges of the early childhood education for sustainability research field is setting meaningful outcomes which are valid and sensitive to a range of program types (National Research Council, 2009), specific learning objectives specifically determined for SDG12 provided a path for the researcher to create the learning content.

In light of the perspectives mentioned above, composting learning activities were specifically designed for the current study in an integrated sequence of planned educational experiences and materials to support participating children and mothers with a particular setoff objective. A 5-day learning process was comprised of a series of learning activities (storytelling, music, science, play, math, language and so forth.) was developed in line with key competencies decided for sustainable development goals and national early childhood education program (MoNE, 2013). Each learning activity was grounded regarding specified learning objectives (including cognitive, behavioral, and social-emotional) of *Sustainable Development Goal 12* (UNESCO, 2017). Typically, learning activities have three leading stages of development. The first day of the learning activities has a strategic importance since the participants were introduced to the focus point of the learning activities to increase their motives and curiosity. Next three days, operationally theoretical and practical information and application were jointly experienced. The last day of the event included a reflective appraisal of the learning activities (Table 3.5).

Throughout the 5 days, participating children and mothers attended 14 composting-related activities in total. In each day, mother-child dyads met in the school yard and attended each day's activities that took approximately an hour from start to finish. All activities were handled in the outdoor area of the study sites. The process of developing composting learning activities for this study included reviewing related literature, identifying specific learning objectives and defining indicators for each learning objective, creating learning content and receiving expert opinions. Collaboration with an expert panel provided external feedback from multiple views for the researcher. The review team comprises of three members. Two members were from the field of early childhood education and their research interest was early childhood education for sustainability and the other member's interest area is education for sustainable development. Further considerations on learning objectives, learning content and materials allowed the researcher in-depth exploration for clarification and expansion of each learning activity. Several changes were made in activity content following the solicit review of experts. Accordingly, the duration of some activities was reduced, because it was predicted that it would exceed the one-hour time limit given to an activity. In addition, material changes were made considering that it would be more practical for hot and worm composting activities.

Questions provided for each activity to assess participants' achievements at the end of each day were also updated and elaborated. Plus, some activities that follow each other have been integrated into each other. The total number of learning activities, which was 17 before the expert opinion, was finalized as 14 after getting feedback from experts.

The learning activities on composting, which constitute the implementation phase of the current study, are basically aimed at enabling the participating children and mothers to explore organic waste recycling through hands-on activities. In this regard, the implementation was planned as a sequence of activities aimed at informing the participants about organic waste and the process of organic waste management from general to specific. On the first day, the participating mothers and children were asked general questions, such as "what is waste", "what is garbage", "what is the value of recycling and waste management", in order to raise their awareness about organic waste recycling in the following days. At this point, the first activity, the visit to the garbage witch, was helpful to give the participating children and mothers an idea of the activities that would be carried out in the following days. On the second day of implementation, it was time for participants who were already familiar with the concept of organic waste to deepen their knowledge and familiarize themselves with the concept of composting. The reading of a story provided detailed information about what composting is and how it is done, while the play activity about biodegradables and nonbiodegradables that was played all together served to reinforce the information learned by the participants. The activities planned for the third and fourth days of implementation were related to how to start the process of hot composting and vermicomposting. By collecting green and brown organic waste that they brought from home and collected from the school garden, discovering the proper ratio needed for a healthy compost, and understanding the need for moisture and air, participants were to learn through hands-on experience how to recycle the organic waste they produce in their daily lives.

The last day of the learning activities was used for the participants to share their experiences in the learning process and to share what they had learned with other participants and researchers. In this context, the participants started the day with a documentation activity where they could review their previous work. They wrote and composed a song about the value of composting to share with everyone else involved, and finally they got to become a compost star. For the *Compost Star* activity, each child-mother dyads presented with a star-shaped glitter necklace with the inscription "Compost Star" and were appreciated for their enthusiasm during the learning activities. In addition, the importance of sharing what they have learnt and discovered about composting as a *Compost Star* with their closest ones was emphasized the

importance and value of the recycling process of organic wastes and why it should be shared with the other stakeholders were highlighted.



Figure 3.5 Day 2- A sock puppet was utilized for a storytelling activity



Figure 3.6 Day 2 – Mothers and children jointly participated in a play activity to categorize biodegradable and non-biodegradable waste

Table 3.5 *Structure of the Composting Learning Activities*

	Process	Activity content
Day 1	<i>Science integrated language activity:</i> A discussion on what recycling is was guided by a researcher in a costume of a “Garbage Witch” <i>Play activity:</i> A game called “Meyve Sepeti” was jointly played with mothers and children.	An introduction activity: Children were asked questions in circle time to reveal their pre-conceptions: “what is recycling”, “why do we need recycling”, “how do we recycle”, and “which materials can be recycled” An introduction activity: Each child and mother were attributed a name of a fruit. The game was about exchanging the places of same fruits. At the end of the game, a picnic was arranged with real fruits to take participants’ attention to fruit wastes, that is; organic wastes
Day 2	<i>Storytelling activity:</i> A storybook “Soso’nun Kompost Kitabı” was interactively read through using a sock puppet (Figure 3.5, 3.6) <i>Play activity:</i> A small group competition was designed with colorful cards on which pictures of biodegradable and non-biodegradable wastes were placed	An earthworm, <i>Soso</i>, informed participant children and mothers about what is composting, how a compost bin is constructed, which materials are needed for an effective composting process, and which wastes are biodegradable and non-biodegradable. Participants formed two groups for a small competition. The competition was about categorizing biodegradable and non-biodegradable wastes and identifying the required materials for an efficient composting process.
Day 3	<i>Math integrated science activity:</i> Building a compost bin (Figure 3.7, 3.8, 3.9)	Organic wastes (greens) were brought to the activity setting from the home environment by each mother-child dyad. The browns were also collected from the schoolyard jointly by mothers and children. A compost bin was built altogether with accurate ratios of greens and browns. Participant children watered the bin and measured its initial temperature.
Day 4	<i>Play activity:</i> The participants explored movement of worms <i>Science activity:</i> Building a worm farm (Figure 3.10, 3.11)	In this entertaining play activity, all participants lined up in a row to create a big worm. The rule was that the head of the worm catches its own tail. Mother-child dyads were provided earthworms to observe worms’ physical and physiological features. Immediately after, worm farms were built by each mother-child dyads to start the vermicomposting process.
Day 5	<i>Music integrated language activity:</i> Documentation of what has been experienced was revisited. A song was created by each mother-child dyad. (Figure 3.12)	Each mother-child dyad revisited what has been discussed throughout a whole week in the documentary area. Then, to share with any stakeholders, a song was composed to share the importance of recycling of organic wastes. Mother-child dyads who shared their song were awarded with a <i>Compost Star</i>



Figure 3.7 Day 3 – Green organic wastes brought from home and brown organic wastes collected from the schoolyard



Figure 3.8 Day 3 – Mother-child dyads are breaking up the organic wastes into small pieces to speed up the composting process



Figure 3.9 *Day 3 – Participant children explore the initial temperature of the compost bin*

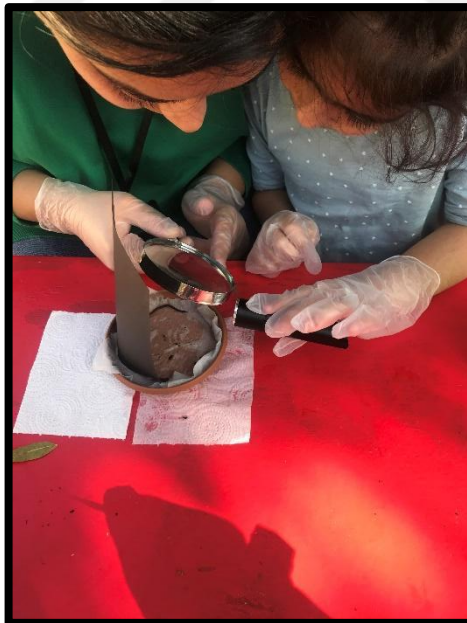


Figure 3.10 *Day 4 - A mother-child dyad explores about a red worm: Does it prefer the dark or light?*



Figure 3.11 *Day 4 – Two participating children are moisturizing their worm farms which are full of watermelon peels and tea leaves*



Figure 3.12 *Day 5 – Mother-child dyads are revisiting what has been experienced throughout the week*

3.6.2 Ethical Considerations

Ensuring the required ethical principles is pivotally crucial in qualitative studies to protect human subjects. More importantly, the participation of children who are intrinsically valuable individuals should be further considered toward possible threats in the research process. Notably, it is important to give opportunities to children to be involved in research strategies. Their voice and agency are worth being revealed. Yet, at the same time, we should be aware of the potential ethical challenges that have adverse impacts specifically on young children (Woodgate et al., 2017). In this tradition, Arditti (2015) emphasized ethical considerations for young children as “overprotection can silence vulnerable participants” (p.1568). In other words, it is critical to construct a balance during working with young children without limiting their agency.

For this particular study, written informed consent, voluntary participation, and thick descriptions of the research purpose and reflexivity were considered for ethics. To obtain ethical permission, all data collection tools, details of the designed learning event activities, and consent forms were submitted to the METU Ethical Commission to get ethical permission. At this juncture, designed consent forms were based on voluntary participation. Through consent forms, participants were ensured to take part in the research process or vice versa. Two consent forms were designed for mothers and children, respectively. The consent form for mothers specifically informs mothers about the central purpose of the study. It also ensures the confidentiality of the participants. The consent forms ensure the rights of participants' mothers and children that they can voluntarily withdraw from the study at any time.

The current study was completed with volunteer mothers and children. Both mothers and children were given written consent forms. Consent forms for mothers include brief information about the purpose of the study and the educational profile of the researcher. The forms included the researcher's and academic advisor's contact information. At the beginning of the study, each mother was asked for their consent to allow their children to be a participant in the study. Moreover, the mothers were informed about any questions they had and hesitations were welcomed. They were free to give up being a participant if they did not feel comfortable during any time in the study. In view of children's participation, a consent form was also designed to ask children whether they volunteer to be a participant in the activities which were about recycling. After the researcher introduced herself as a researcher, she added “I have varied activities on recycling. Would you like to participate in those activities with your mother in our school garden for the duration of next week? If you want to be a participant, you can color the smiling face. If you do not want to participate, you can color the unsmiling

face”. Given this explanation and question, there were two considerable points that attracted children’s attention to be a participant. First of all, the researcher talked about activities that could be attractive to children. The second point is the mother issue. The idea of meeting mothers each timetabled school day and jointly participating in a series of activities was a source of children’s motivation to color the smiling face. Therefore, there was no child who colored the unsmiling face. In this way, children’s written consent was obtained.

Last, but not least, with respect to confidentiality, all participants were informed that –as a major responsibility- all kinds of data including audio recordings, documentation, and photographs were handled only by the researcher and never shared with third parties. By signing the consent forms participant mothers gave permission for the subsequent usage of collected data. Stake (1995) points out that a data storage system makes the data collection and analyzing process more organized and systematic. In accordance with ethical procedures, all printed data were securely kept by the researcher.

3.6.3 The Role of the Researcher

In the qualitative research design, the researcher is the primary instrument (Stake, 1995) which makes the research process subjective. In other words, the level of involvement of the researcher is a key issue in qualitative studies. The unique journey for the researcher can be shaped by the researcher's epistemological and methodological beliefs as Merriam (2009) suggested. That is to say, the role and bias of the researcher are two premise elements to shape the direction of the study. Since the nature of the qualitative study is interpretive, the researcher's feelings and biases are pivotal. Thick and embellished descriptions of the research process and the reflexivity of the researcher ensure the validity of the data (Bogdan & Biklen, 2007; Stake, 1995).

In the current study, the researcher was introduced to participant mothers and children as a visitor. This particular research process is the journey of the researcher. Thus, the researcher’s personal history, interest, educational background, and values have shaped the entire process. Therefore, the reflexivity of the researcher is crucially pivotal to understanding who she is and what she is trying to do. First and foremost, the researcher graduated from early childhood education, and their interest area was related to how sustainable practices can be taught. Thus, this particular study takes its roots from her interest to demonstrate how a particular topic – composting- can be enacted in preschool settings. In this sense, reflexivity in qualitative research is defined as a methodological tool that is about the self-awareness of the researcher. It is about evaluating the researcher’s subjectivity and how this position influences the ongoing

process and vice versa. The reflexivity of the researcher also includes the self-criticism of the researcher. In the current study, the researcher has taken well-written journal notes immediately after each intervention session. This enabled her to critique her own effort and subjectivity. The study consists of three separate sessions. Personally taken journals in the first session became a tool to revise and reexamine the subjective role of the researcher for the second and the last session.

Moreover, the researcher spent a reasonable amount of time in two school contexts to establish a rapport with both participant children and mothers. It was better to observe children's everyday routines and interactions and even also children and mothers met with the researcher at the arrival and departure times of the everyday school routines. Participant observation is considered as a bountiful scientific method to become close to the participants and understand the process as a whole (Lincoln & Guba, 1985). For this particular study, the researcher was in the study context all the time as an observer, teacher, and researcher. Herein, it is worth to noting that the degree of participation is an important issue. Being a complete participant or complete observer should be taken into consideration. As a complete participant in the current study, the major role of the researcher was to guide the intervention process. On the other hand, being aware of all the data collection and intervention processes, she avoids influencing the dynamics of the data collection process. As a researcher, she did not seek absolute facts, rather, she tried to put forward a path and understand how sustainability can be embedded in preschool children's everyday routines.

3.7 Data analysis

Analyzing the process of the qualitative study starts with classifying and sorting the data which is called coding. Coding is about sorting all data sets according to topics, themes, and issues which are consistently repeated and highlighted by the participants (Stake, 2010). On this ground, data analysis is a systematic process of organizing all information gained from data sources. In other words, data analysis is associated with creating patterns in order to make sense of the collected data. The current study is designed as a multiple case study defined as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" as Markus (1989) reported. Essentially, interview techniques were profoundly utilized for this particular study in order to address the "what's" questions that guided the research process of this work. In this tradition, the type of questions was pivotal to the strategies to interpret the collected data (Yin, 2010). Typically, qualitative researchers in the field outlined specific strategies to analyses the qualitative data (Marshall & Rossman, 1995; Merriam, 2015; Yin, 2010). Of the significance of those strategies, qualitative content analysis

fits well with the current study to analyze the data generated from pre- and post-interviews conducted with children and mothers.

3.7.1 Conceptualizing Participant Children's and Mothers' Self-Reported Knowledge on the Recycling of Organic Waste Before and After Participating in the Composting Learning Activities

At a more general level, qualitative content analysis has originated from social research (Bengtsson, 2016). In this tradition, data is collected in the form of words and themes which furthers the analysis process to draw some interpretations. In other words, qualitative content analysis is considered eligible to analyze the text data. The focal point is to pay attention to the content and contextual meaning of the text. Likewise, Krippendorff (2004) defined qualitative content analysis as “a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use” (p.18). In this respect, the overall goal of qualitative content analysis is “to provide knowledge and understanding of the phenomenon under the study” (Downe-Wamboldt, 1992, p.314).

Bengtsson's frameworks of content analysis were utilized to seek the answers to the first two research questions. In this regard, children's pre-, post, and follow-up interviews and mothers' pre- and post-interviews were analyzed following Bengtsson's four main stages, which are; *decontextualization*, *recontextualization*, *categorization*, and *compilation*. (Bengtsson, 2016). In the *decontextualization* stage, all transcribed data achieved from children's and mothers' pre- and post-interviews was read to gain a sense of the whole to appreciate “what was going on?” before the entire data was broken into smaller units. Factually, to reach the smaller meaningful units that provided insight to the researcher, the first stage was critical to unfold the general meaning of the collected data. In the *recontextualization* stage, the researcher reread the original text and highlighted the salient and repeated meanings in the content. At this point, the researcher was guided by the research questions, since somehow, non-repetitive items and themes could also provide answers to the research questions. In Stage 3, *the categorization process* included creating categories and extending the meaning of the units. In this process, themes and categories and even also sub-categories emerged. Within the scope of this study, semi-structured interview questions were created by taking into account the cognitive, behavioral, and social-emotional learning objectives particularly determined for *SDG12: Responsible Consumption and Production*. *Cognitive Learning Objectives 1, 2, and 4, Behavioral Learning Objective 1, and Social-Emotional Learning Objective 1* were the starting points for the researcher while developing the composting learning activities which were also linked to semi-structured interview questions designed for participating children and

mothers. Thus, themes and sub-themes emerged from Stage 3 as a result of a deductive process in which the researcher categorized salient and meaning units in line with the abovementioned learning objectives and learning outcomes. In *the compilation stage*, the researcher started to report the analysis results. In this stage, the researcher tried to present the essence of the research study. That is to say, the researcher put forward a deeper understanding of what has been experienced in the research phenomena at the descriptive level (Figure 3.13).

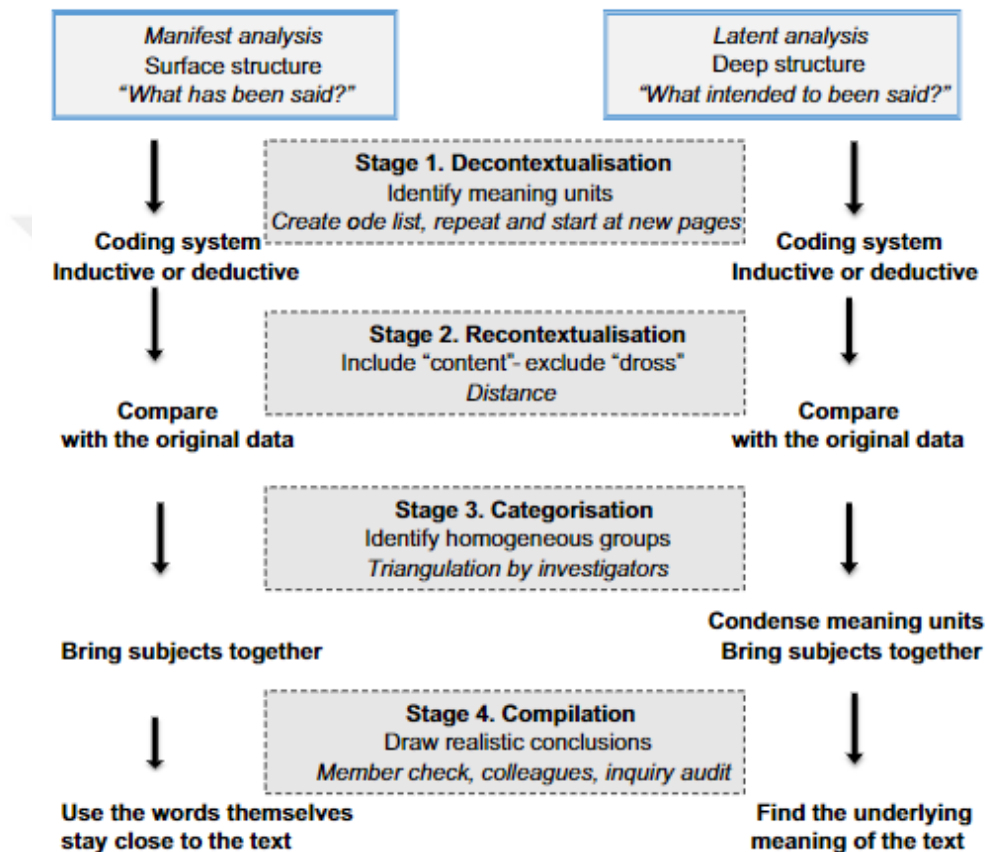


Figure 3.13 Overview of the process concerning the data analysis of pre-and post and follow-up semi-structured interviews of the main study (Bengtsson, 2016, p.9).

At the end of the data collection period, the verbatim transcriptions capturing everything that participating children and mothers said were all transcribed. For the content analysis of semi-structured interviews, a second coder who had a Ph.D. degree in early childhood education and a research interest in the field of early childhood education for sustainability worked on the transcriptions to flesh out the themes and subthemes. To ensure inter-rater reliability, the main researcher and the second coder coded the data separately. As an iterative process, the

two independent coders sought to figure out common and repeated words and phrases that captured the common meanings. The data was analyzed regarding the overall content. At the end of the coding process, the two independent coders compared 20% of the data to reveal how each of them interpreted the “meaning units” that conveyed similar meanings to calculate the level of concordance. For the inconsistent codes, discussions between the coders were conducted to inform each other and get a refinement to improve the precision of the process. In this respect, the discussions between the researchers turned into a collaborative exercise to reach well-defined themes and subthemes.

According to Miles and Huberman (1994), in relation to the interrater agreement among multiple coders, 80% agreement between the coders is considered sufficient agreement. For the current study, the formula used described in Miles and Huberman (1994) and the reliability scores of the two independent coders for the interviews conducted with participating children and mothers exceeded .92 to .86 respectively.

3.7.2 Learning Outcomes Rubric for Composting Learning Activities

In order to evaluate children’s self-reported knowledge on recycling organic waste, a *Learning Outcomes Rubric for the Composting Learning Activities* was developed in order to reveal to what extent children’s self-reported knowledge expanded and differ in the pre-, post, and follow-up interviews. In addition to the content analysis of pre-, post, and follow-up interviews, this rubric allowed the researcher to assess participating children’s performance quantitatively to support the findings emerged from qualitative content analysis. With this in mind, the rubric was developed as a means of assessing participant children’s level of knowledge before and after participating in composting learning activities so as to assess the quality of participating children’s responses in line with specific learning objectives determined for *SDG12: Responsible Consumption and Production* (UNESCO, 2017).

The learning outcomes rubric for the composting learning activities was utilized three times to assess the pre-, post, and follow-up interviews of children as an analytical tool to unfold children’s knowledge development before and after participating in composting learning activities. In the first place, learning objectives were determined to guide the implementation of the composting learning activities. For this study, *Cognitive Learning Objectives 1, 2, and 4; Behavioral Learning Objective 1*, and *Social-Emotional Learning Objective 1* were decided as a base for learning outcomes. In the second place, learning outcomes were determined for each specific learning objective in line with the research purpose. In this essence, cognitive learning objectives focus on children’s self-reported knowledge on composting as a

sustainable strategy and practice of sustainable production and consumption while behavioral learning objective's focal point is children's self-reported knowledge on planning and implementing composting. Additionally, social-emotional learning objective particularly related children's self-reported knowledge on communicating the need for composting for responsible consumption and production.

The designed rubric includes a comprehensive four levels of hierarchical sequence in which determined learning outcomes were elaborated into core indicators. Core indicators were described in a brief and clear manner. The first level of indicators implies that learners have no points or lacks an understanding of recycling organic waste and as such, that the learning outcome is not achieved and the child needs to be supported. At the second level, the child has a simple idea or has several ideas which can be relevant but inconsistent; in other words, the learning outcome is beginning to be developed, but not totally achieved by the child just as yet. At the third level the child has several ideas which are detailed, but the associations among those ideas are not connected. Herein, the learning outcome is achieved by the child with its fundamental aspects. At the fourth level the child has several ideas and those ideas are connected with each other and the child elaborates the ideas and utilize them to demonstrate new understandings. In this model, first the two levels indicate the child's surface level of knowledge, yet the last two levels are associated with a deeper and relational understanding of the children. The maximum score that can be obtained as a result of the assessment is 24, while the minimum score is 0 (Appendix A).

After developing a rubric according to the aforementioned outcomes and hierarchical levels, it was submitted to a panel review in order to ensure content validity. Four experts in the field of early childhood education and education for sustainable development provided necessary suggestions on the assessment criteria that can be considered critical to reach a judgement on child's expanded knowledge. In this respect, the feedbacks provided by the experts on the relevancy and consistency of learning outcomes and core indicators resulted in a more consist, reasonable and transparent rubric. Unlike the first version, the rubric items were stated as simply and concisely as possible in the final content which allowed the researcher a premise analyses of children's pre, post, and follow-up findings. Further, adjectives and adverbs were all eliminated in the last version.

To ensure interrater reliability, six of all participating children's transcripts (%25 of the collected data) were randomly selected and two researchers studied the children's transcripts and independently rated the rubric items for pre-, post, and follow-up interviews. The intercoder reliability was calculated for the *learning outcomes rubric for the composting*

learning activities as .94 for the pre-interviews. The agreement ensured between the raters was .90 for the post-interviews and .88 for the follow-up interviews.

3.7.3 Coding the Mother-Child Joint Conversations and Children's Post and Follow-Up Interviews

In order to seek answers for the fourth research question and its sub-questions, all conversations between mother-children and children-researcher (post and follow-up interviews) were first transcribed verbatim and then coded by the researcher of the current study. Before data collection, the researcher participated in individual coder training provided by two research assistants from the Department of Psychology in METU to learn how to code in line with coding schemes presented by current literature.

3.7.3.1 Coding Mother-Child Joint Conversations

The central focus of coding mother-child conversations was elaborations and repetitions of mothers and children in the conversation they mutually engaged in. There were little off-topic conversations and the coding was completed on the full conversations starting when the mothers and the researcher asked about the learning activities. Mothers' and children's statements were coded separately.

Coding schemes for parent-child conversations were adopted from the original study of Fivush (1993) and Fivush and Vasudeva (2002), which have been widely employed by a number of researchers in the field (Sahin-Acar & Leitchman, 2015; Leitchman, et al., 2000). In the context of coding, the memory/elaborative questions (Wh-questions), yes/no questions, context statements, evaluations, memory/ elaborative question repetitions (Wh-questions), yes/no question repetitions, and context statement repetitions in mothers' speech were coded (Fivush & Vasudeva, 2002). Elaborations were calculated by the sum of a number of memory/ elaborative questions, yes/no questions, context statements, evaluations; and repetitions were calculated as the total number of mothers' repetitions of memory questions, yes/no questions and context statements.

Children's speech was also coded by adopting the same variables, namely, the memory/elaborative questions (Wh-questions), yes/no questions, context statements, evaluations, memory/ elaborative question (Wh-questions) repetitions, yes/no question repetitions, and context statement repetitions (Fivush, 1993; Fivush & Vasudeva, 2002). Please refer to Table 3.6 including possible examples of coded utterances.

Table 3.6 Framework that guides the coding of mothers' and children's variables from mother-child joint conversations (Adopted from Fivush 1993; Fivush & Vasudeva, 2002; Leitchman et al., 2000; Sahin-Acar & Leitchman, 2015)

Variable	Definition	Example
<i>Mothers' variables</i>		
Words	Simply counted, meaningless utterances (e.g A-ha, uh-huh, umm) were excluded.	"Compost", "Worm", "Waste"
Components of elaborations (Mutually exclusive):		
Memory/Elaborative Questions	Questions asked by mothers in Wh-structure; "what, where, when, who, how, why". Open-ended repetitions of the same questions were not counted.	"How did we group organic wastes?" "Why might the earthworm prefer the dark?", "Why would be the temperature of the compost bin four days later?"
Yes/No Questions	Questions that make children confirm and/or deny information. Repetitions of the same question were not counted	"Did you separate the greens and browns?", "Did worms have eyes?"
Context Statements	Statements do not require any response from the children. Repetitions of the same statements were not counted.	"Well, my compost star necklace made me so happy"
Evaluations	Statements used to confirm or disconfirm children's sentences and/or phrases.	"Yes, you are right" "No, I do not think so"
<i>Children's variables</i>		
Components of elaborations (Mutually exclusive):		
Memory/Elaborative Questions	Questions asked by children in Wh-structure; "what, where, when, who, how, why". Open-ended repetitions of the same questions were not counted.	"Why we should not throw banana peels into the garbage?", "How do earth worms eat organic wastes?"
Yes/No Questions	Questions that make mothers confirm and/or deny information. Repetitions of the same question were not counted.	"Mom, did you enjoy the game that we played today?", "Did you also see the poop of the worms?"

Table 3.6 (continued)

Context Statements	Statements do not require any response from mothers. Repetitions of the same statements were not counted.	"I put the dry leaves In the compost bin", "Soso is an earthworm living under the soil"
Evaluations	Statements used to confirm or disconfirm mothers' sentences and/or phrases	"Yes, you are right" "No, I do not think so"

Herein, the *mother's total words and sentences* including the total number of words used by mothers were calculated using MS word. All sentences were counted manually. If there were any complete or partial phrases that were spoken, such as "yes", "no, that's not" were counted as a sentence, but "umm" was not). Comments and questions were also accepted as a sentence. In the same way, the child's total words and sentences were calculated using MS Word. All sentences were counted by hand. According to the popular work of Leitchman et al. (2000), any complete or partial phrase ("yes", "no, that's not") that is spoken is accepted, but meaningless sounds such as "umm" were not counted. Comments and questions of children were both counted as sentences. *Mother's memory/open-ended questions* were calculated by counting the total number of mother's memory/elaborative questions. Fivush, Haden, and Adams (1995) defined a memory question as a question aiming to elicit information from the child about the event. What, where, and who questions were coded as memory/elaborative questions. Some examples for the current study include "Can you tell me what was the name of the red worm in the picture storybook?", "What did we put in the compost bin to start up the hot composting?", "Please tell me what the worms looked like?", "What were the organic wastes?" (Table 3.6).

Questions eliciting simple yes/no answers or repetitions were not accepted as memory/elaborative questions. *Mother's yes/no questions* included the total number of times that the mother asked a yes/no question. Herein, yes/no questions simply require the child to confirm or deny information provided by the mother. To illustrate, the questions "Did you touch the worms...?", "Did you like the 'Meyve Sepeti' that we played in the schoolyard?", "Is banana peel appropriate organic waste to put in a compost bin?" were asked. In this regard, Memory/elaborative questions and yes/no questions are mutually exclusive in terms of coding. *Mothers' context statements* comprised of a total number of times that the mother made a context statement. These statements were about any content of the composting learning activities, yet they did not require an answer from the child. For instance, "Red worms do not like light, they live in the dark", "...then we break up dry brown leaves to prepare our compost bin" and/or "Soso also likes coffee piles". *Mothers' evaluations* were calculated by counting

the total number of times that the mother used either a positive or a negative statement. Those statements were used by mothers either to confirm or disconfirm the child's sentence or phrase. Some examples include, "You are right about the role of red worms in the recycling of organics" and/or "No, I do not think so" (Table 3.6).

Further, *mothers' memory/elaborative question repetitions* comprised the total number of times that the mother tried to elicit a piece of information that she already tried to ask about before in a memory/elaborative question. *Mothers' yes/no question repetitions* were the total number of times that the mother repeated a yes/no question, either verbatim or in meaning. Likewise, *mothers' context statements repetitions* included the total number of times that the mother made a statement that repeated verbatim or in meaning a previous context statement. Typically, the mothers' and children's conversation patterns were coded individually, and considered as composite variables which have been common in previous literature. Plus, positive and negative evaluations indicated by mothers and children during joint conversations were also calculated separately. All statistical analyses were conducted by using Statistical Package for Social Sciences (SPSS), 20th version of Windows.

To ensure the trustworthiness of the coding, two research assistants from the department of developmental psychology who were blind to the aim, research questions, and the details of the composting learning activities of the study split the coding. In order to reach intercoder reliability, 22 transcriptions (18% of total conversations), each comprising mother-child conversations about the composting learning activities, were randomly selected and coded by the two other coders (each of them coded 10 transcripts).

Intercoder reliability for the elaborations was calculated for five mutually exclusive categories; memory questions, yes/no questions, context statements, and positive and negative evaluations. The calculated intercoder agreement was .92 for open-ended (memory) questions, .92 for yes/no questions, .90 for context statements, .97 for positive evaluations, and .98 for negative evaluations. Additionally, the intercoder reliability was also calculated for the children's elaborations. Indexing children's memory responses, the reliability was calculated to be .92 for the open-ended questions, .94 for the yes/no questions, .90 for the context statements, .98 for the positive evaluations, and .98 for the negative evaluations.

3.7.3.2 Coding children's post and follow-up interviews

Post and follow-up interviews conducted with participating children were also coded in order to reveal how children's memory reports extended in two different time points; in post and

follow-up interviews. As mentioned in prior sections, post and follow-up interviews were hierarchically organized and began with a general open-ended question about the learning activities and were then followed by more specific questions in order to elaborate on children's depictions. The coding process of post and follow-up interviews started by transcribing and then hand-coding children's sentences. Here, the critical point was the number of children's spoke; thus, only children's statements were coded. In line with the coding variables adapted by Leithman et al. (2000) was utilized. For the coding process, 'child's descriptives', 'objects correctly recalled', 'actions correctly recalled', and 'time statements' were counted.

Table 3.7 The framework that guides coding children's variables from researcher-child conversations (Adopted from Leithman et al., 2000).

Variable	Definition	Example
Words	Simple count, meaningless utterances (e.g A-ha, uh-huh, umm) were excluded	"Compost", "Worm", "Waste"
Child descriptives	The total number of adjectives and modifiers that the child used	"There was a <i>blue</i> compost bin that we put our greens and brown wastes in it"; "My compost star was <i>shining</i> so brightly that everyone asked me about it."
Objects correctly recalled	The total number of the objects that the child presents	"We utilized a <i>compost thermometer</i> to measure the temperature"; "The Garbage Witch wore a <i>black hat</i> "
Actions correctly recalled	The total number of actions that the child talked about	"I remember the play activity in which we run and catch a card to categorize the biodegradables and non-biodegradables"
Time statements	The total number of statements that the child presented regarding time.	"After putting the dry leaves, we add the greens"

Child's descriptives included the total number of adjectives, adverbs, and modifiers that the child used to support his/her descriptions of objects and actions present during learning activities. Further, *objects correctly recalled* pointed to the number of objects present during learning activities that were correctly recalled by the child. Objects included such items as

fruits for the picnic, items on the Garbage Witch, *green* and *brown* organics, and materials used for vermicomposting etc., Likewise, *actions correctly recalled* were calculated by counting the number of actions present during learning activities that were correctly recalled. Measuring the initial temperature of the composting bin, reading the story of *Soso*, and categorizing the organic wastes as greens and browns can be illustrated for that category. *Time statements* (e.g after, before, during) were calculated as the total number of statements that the child presented regarding activities throughout the composting learning activities such as “after putting the dry leaves, we add the greens” (Table 3.7).

Trustworthiness of the coding of children’s memory reports in post and follow-up interviews was ensured through intra-coder reliability. Since the researcher was the only individual who witnessed the entire data collection procedure, memory reports provided by children in post and follow-up interviews needed to be coded by a single researcher. In order to gain consistency over time, the researcher coded children’s responses in post and follow-up interviews twice. Intra-coder reliability for children’s responses was calculated for four categories; children’s descriptives, objects correctly recalled, actions correctly recalled, and time statements. The calculated intercoder agreement was .96 for children’s descriptives, .98 for objects which were correctly recalled, .92 for actions that were correctly recalled, and .96 for time statements for post-interviews. Taken together, the calculated intercoder agreement was .92 for children’s descriptives, .98 for objects which were correctly recalled, .96 for actions that were correctly recalled, .90 and for time statements for follow-up interviews.

3.8 Trustworthiness of the Study

For this particular study, there are several strategies to ensure trustworthiness. Establishing the trustworthiness of a qualitative study is about making sure for the audience that the current study was built on systematic data collection that provides empirical data (Lincoln & Guba, 1985; Merriam, 2015). As a multiple case study, the current study aims to provide insight into participants’ deconstructed knowledge and understanding of recycling organic waste. Further, the potential of mothers’ conversational styles was explored as a tool to promote children’s learning and their ability to recall. Thus, rich and thick descriptions of the characteristics of participants, contexts, and the learning event were critical in understanding the context and how the research was conducted as well as under which ethical considerations. Rich descriptions also reflected the researcher’s reflexivity. It is significant since the researcher’s subjectivity as a qualitative researcher could be considered as a threat. On the other hand, the clearly defined purpose, position, and role of the researcher displays the level of their awareness about the whole process and this increased the trustworthiness of the study.

Accordingly, the trustworthiness of the study is highly dependent on the techniques and methods that were utilized, that is to say, triangulated to seek answers for the research questions. Denzin and Lincoln (2011) defined triangulation as “the display of multiple, refracted realities simultaneously” (p.5). Triangulation is about reaching rich data to obtain deep data. For this particular study, the data was yielded from different sources such as children and their mothers. Stake (2005) stresses that triangulation enhances “interest in the diversity of perception, even the multiple realities within which people live. Triangulation helps to identify these different realities” (p.38). In this study, the source of the data was pre- and post- interviews with each child and mother which were triangulated with the mother-child conversations during and after intervention. The mother-child joint talk was considered an important predictor for post-interviews to identify multiple realities across two cases. In this respect, triangulating data increases the verification and credibility of the current study. The credibility of the study is about prolonged engagement in the study settings and the use of more than one data source.

By its very nature, providing embellished descriptions and explanations about the methodology of the study is one of the techniques to ensure the dependability of the study. A detailed description on the data collection process, contexts of the study, and analyzing and reporting data was contextualized based on the researcher’s personal interest, background, and experiences on the research topic. The audit trail is enhanced by providing qualified and acceptable standards which are also consistent with the procedures and the findings of the study. The raw data of the current study includes one-to-one interviews with participant children and mothers which were triangulated with mother-child talks during and after the implementation of learning activities. Also, explaining reflexivity and the role of the researcher promotes the trustworthiness of the study. Each detail belonging to the process ensures dependability since it guides further research that attempts at replication.

This study was conducted in two different preschool settings. One of the preschools is located at the university campus preschool. For this reason, visiting the preschool for arrival and departure times was the everyday routine of the researcher. This position was considered bountiful to meet participant mothers and children in everyday life to enhance prolonged engagement. For the second setting, multiple visits to the school and spending time with children in the classroom environment as well as repeated engagements in the daily routines and social contexts of children helped the researcher to build trust. Before pre-interviews the researcher spent two full weeks to get to know the participants and vice versa.

In a nutshell, the trustworthiness of the current study was ensured with the research findings that reflect a real-life context and experience. The triangulation of data, rich and embellished descriptions, and audit trails enrich the conformability of findings in this particular work (Yin, 2010; Merriam, 2009).

3.9 Summary

This chapter unfolds the methodological approach and research procedures of the current study. Single case study design was at the heart of this research and was used to reveal how recycling organic waste was conceptualized by preschool children and mothers as a sustainable practice before and after jointly participating in the designed learning activities. In the second place, it reveals the potential of mothers' individual conversational styles to foster children's knowledge as well as memory reports on composting. Research questions were the starting points of this particular study. The nature of the study requires thick and rich descriptions to understand what was going on in the process and how the progress was obtained through systematic and consistent data collection tools and analyzing techniques.

CHAPTER 4

FINDINGS

The following section addresses the findings of the current study in line with the research aim and the research questions. This chapter is structured in two main parts. In the first part, the general profile of the participants and the research questions will be reminded for a better interpretation of the study findings. Thereafter, the findings of the qualitative assessment will be presented. The qualitative assessment part of this particular study includes participant children's and mothers' self-reported knowledge of recycling and in particular composting before and after jointly participating in the composting learning activities.

The second part of this chapter focuses on how mothers' individual conversational styles uniquely contribute to children's knowledge of recycling organic waste and the need for composting for sustainability. In this vein, the data aroused from mother-child joint talk after each activity day create a base to what extent mothers' conversational styles – either high or low elaborative – contribute to children's knowledge of composting as a sustainable recycling practice.

4.1 Outlining the Study's Aim and the Research Questions

In the current study, the participant children and the mothers explored recycling organic waste through discussions on the role of recycling, gaining information on what decomposition is, which materials are decomposed, and ultimately, starting two composting processes, namely, hot composting and vermicomposting. On this point, the composting learning activities aimed at two fundamental goals. First and foremost, it was considered vital for participants to recognize the nuanced process of decomposition of organic wastes as an environmentally sustainable practice. In so doing, it is aimed to unfold participants' prior knowledge and how and in which way designed learning activities contribute to their knowledge. Secondly, mothers' individual conversational styles as high and low elaborative were enacted as an essential learning tool to link children's experiences on learning about the recycling of organics into narratives that can be potentially turned into autobiographical memory.

In line with this goal, the research questions of this study are presented as follows;

RQ 1. What is the self-reported knowledge of 60 to 72-months old children about recycling organic wastes before and after participating in the composting learning activities?

RQ 2. Based on the *Learning Outcomes Rubric for Composting Learning Activities*, to what extent did the knowledge levels of the children related to composting process change?

RQ 3. What is the self-reported knowledge of mothers about recycling organic wastes before and after participating in composting learning activities?

RQ 4. How do mothers' conversation styles uniquely contribute to children's knowledge of recycling organic waste?

- a) Is there a relation between mothers' elaborations and children's contributions to mother-child joint conversations about composting learning activities?
- b) To what extent do high and low elaborative mothers contribute to the mother-child joint conversations about composting learning activities?
- c) Does the degree of mothers' elaborations predict what children reported about composting learning activities in post and follow-up interviews?

4.2 Revisiting Study Participants

The sample was selected to represent a deep understanding of what was going on in the entire study process. Twenty-three mothers ($M=38.17$, $SD=4.48$) participated with their 60 to 72 months old preschool children (12 boys, 11 girls; $M=63.74$, $SD=4.39$) in the current study. All participants live in Ankara, the capital city of Türkiye. Table 4.1. displays the detailed demographics of participants and includes the gender distribution of children, their preschool experience, and the education levels and occupations of participant mothers.

Table 4.1 Demographic characteristics of participant children

Variable name	Group	Number	Frequency
<i>Children's variables</i>			
Gender	Girls	11	47,82%
	Boys	12	52,17%
Years of attending preschool	3+ year	13	56,5%
	2+ year	5	21,7%
	1+ year	5	21,7%

Table 4.1 (continued)			
<i>Mothers' variables</i>			
Education Level	High school and less	4	17,3 %
	Two-year degree	2	8,7%
Occupation	Bachelor degree	17	73,9%
	Working mothers	16	69,6%
	Housewife	7	23,4%

4.3 Decontextualizing the Findings

As was mentioned in the first two chapters, it is vital to integrate environmentally focused and sustainability-related activities into the curriculum and the everyday life of children. 5-day learning activities were an ongoing process and children actively participated in them. Furthermore, mother-child interactions and conversations after each day's learning process assisted children in deconstructing their knowledge of recycling and exploring sustainability through conceptualizing the decomposition of organics. An iterative process in data analysis was followed in which the responses of participants were repeatedly reread to figure out the themes and subthemes they formed. Here, the decontextualization of participant children and mothers' knowledge was described in line with engaging in learning activities through first-hand experiences.

The current chapter presents the empirical research findings as reported by children and their mothers. The findings and interpretations in the current section are mostly illustrated through excerpts and direct verbatim quotations of participants and dialogues between child-researcher, mother-researcher, and child-mother dyads. In particular, excerpts helped to contextualize the interactions and clarify the themes and sub-themes which emerged through inductive data analysis. In this respect, the excerpts and quotations will be shared as much as possible to reflect the diversity among participants. The shared ideas of participants have not been formatted, that is; they are included in their original forms. All the participants' responses are declared without using the actual names for ethical reasons. Children will be represented with the letter "C", mothers' responses will be indicated with the letter "M" and "R" will be used to refer to the researcher. This present chapter only enacts the analysis of the study data stemming from children and their mothers. The interpretation of the findings will be presented in the next chapter.

4.4 Children's Knowledge of Recycling Organic Waste

In order to reveal how participant children conceptualize the recycling of organic waste, semi-structured interviews were administered before and after the learning activities on the recycling of organic waste. Prior to jointly participating in activities with the mothers, initial interviews were conducted with a total of 23 children. Moreover, following the implementation of learning activities, children participated in two separate but identical post and follow-up interviews at the second day and 3 weeks after, respectively.

4.4.1 Pre-Findings Related to Children's Knowledge of Recycling Organic Waste

Pre-interviews with children aimed to explore children's initial awareness and knowledge from their own perspectives on waste and recycling as a waste management strategy. It was already detected at the beginning of the data collection process that none of the participants having detailed knowledge of recycling organic waste and experience with composting was one of the criteria to be a participant, and the first set of data gained from children was a key concept to unfold children's already existing knowledge on recycling and waste management which provided a base to flesh out their pre- and post-knowledge. As the result of the inductive analysis process, main themes and sub-themes were manifested from initial interviews.

In pre-interviews, children expressed the knowledge that they already possessed about the meaning, importance, and value of recycling and they exemplified the recyclables. Moreover, children were asked to talk about their consumption choices for food on a daily basis. The last questions of the pre-interviews were asked to unfold children's general knowledge of earthworms. They answered the questions about earthworms and shared their prior knowledge and experiences. Please refer to Table 4.2 located below for the themes and sub-themes that emerged from the pre-interviews of participant children.

Table 4.2 Themes and sub-themes that emerged from the pre-interviews of children
($N_{pre}=23$)

Themes	Sub-themes
Self-reported knowledge on waste and recycling	- Waste as a synonym for garbage ($n=19$) - Recycling is for preserving the environment ($n=15$), and preventing lands to fill with garbage ($n=6$) - There are recyclables materials [paper ($n=21$), plastics ($n=17$), glass ($n=16$), metal ($n=9$), batteries ($n=2$)]

Table 4.2 (continued)	
Self-reported knowledge on the consumption of food choices	- The source of my favorite food is the soil and farms (n=15) - I eat fruits and vegetables to be a healthy (n=21) and strong (n=20) and smart (n=9) child.
Self-reported knowledge on earthworms	- Earthworms are sleeping under the soil (n=21) and digging tunnels (n=6) - Earthworms are in dark brown color (n=12) and red (n=5) - Earthworms eat mud and bugs. (n=11)

4.4.1.1 Children's Self-Reported Knowledge on Waste and Recycling

Subtheme₁: Waste as a Synonym for Garbage

The pre-interviews conducted with participant children started with a general question on recycling as a waste management strategy to reveal children's initial knowledge. On this ground, the first question for children was *"What is recycling? What comes to your mind when I say recycling?"*. The overall response to this question was associated with the same word; *garbage* (n=19). One participant (C₃) commented, *"When you asked me about recycling, garbage come to my mind. When we put the garbage into different bins, they already become ready to be recycled."* Likewise, C₁₁ stated that *I think recycling means garbage.*" Another interviewee (C₂₃) depicted recycling as; *"Recycling is about dirty things. I mean dirty materials"*. Other responses to this question included, *"I know that recycling is about all garbage collected from home and school"* (C₁₄) and *"Recycling is for garbage. The garbage can be recycled"* (C₁₃) and *"When a recycling truck comes, it collects all the garbage"* (C₅).

Of all the participants, 12 children described recycling as putting different kinds of materials into separate bins.

C₁₈: Recycling is separating cardboard, paper, and glass. We collect the wastes separately and put them in separate bins. Sometimes we put the batteries into a small bin to collect all waste batteries for recycling. I think recycling is separating wastes generated from home and school

C₁₉: After some artwork in our class, we put the cardboard which is left over from one of the activities into a separate bin located in our classroom. Also, we use small plastic materials during doing art. Then we put all those waste and useless plastics and papers into the recycling bins located in our school. That is recycling.

C₁₁: If we want to do recycling, we put the garbage into separate bins. The bins are generally in different colors. You can put the plastics into the yellow bin and a glass bottle into the blue bin. I have also recognized the green recycling bins. The green ones are for papers.

In the pre-interview session, a small minority of children ($n=3$) linked recycling with using something *over and over again*. Those children associated recycling as an important process of putting already used and old materials into separate bins in order to get new ones.

C₁₀: When we put paper into the paper bin, a garbage truck takes it away to a recycling factory. In the factory, there are workers. They work to make some new materials from the old for us. So, we can use them again. I have recognized that the workers were so hardworking.

C₁: One day, I saw a truck in METU. My mother told me that this was a recycling truck. The truck man took all the waste that was accumulated in the bins and carried them to the recycling center. And a recycling guy in the center sent them to another big recycling center in Ankara. In this way, the disused materials are transformed into new, usable materials.

Subtheme₂: Recycling is for Preserving the Environment, and Preventing Lands to Fill with Garbage

Following the first question, the researcher elaborated on children's general knowledge of the need for recycling. Children were asked, "*Why do we recycle?*". Given a specific consideration to recycling, there is one notable reason that was revealed in pre-interviews with children: to preserve the natural environment ($n=15$). Some of the children's answers are as follows:

C₁₆: [Hmm]. Recycling is for our environment. We should keep it clean. Right? That is why, we should support recycling, because when we collect the waste materials separately and send them to recycling centers, we preserve nature in which bugs and rabbits live.

C₄: Recycling helps our environment. It protects the animals. It is important to preserve the grass and trees. I have heard about it. If we do not recycle, the garbage fills nature. Then where will the animals live? For example, where will ants live if we throw away the garbage?

With respect to the need for recycling, children generally accept the rationale for recycling and directly linked it to preserving the natural environment; however, a limited perspective and a low sense of agency were still noted when it came to the need for recycling. The following dialogue between the researcher and the C₈ presents an example of the common expressions of the participant children.

R: I want to ask you about recycling. Have you ever heard about it?

C₈: Hmm. I know about recycling. I have heard about it. There are some boxes in our school with different colors for recycling. We put the garbage in each box.

R: What is put into those boxes?

C₈: I do not know.

R: How do you use them?

C₈: We put cardboard in it for recycling for example.

R: Okay. I got it. What is recycling, then?
C₈: Recycling is for preserving our environment.
R: Preserving from what or how?
C₈: I do not know.

Taken together, children ($n=6$) identified recycling as an important activity in order to reduce waste going to landfills. Of the participants, nine children explained that garbage fills the lands and this causes environmental pollution. Those children stated that we do recycling to prevent accumulating garbage which could have unfavorable impacts on the natural environment. Six children particularly emphasized that trashes were dumped which resulted in dirt in the landfills. Related responses are as follows:

C₄: Recycling is important because it eliminates garbage from our gardens, streets, and the schoolyard. In our school, we have recycling boxes that we put our waste cardboard in instead of leaving them in the natural environment. Thus, we protect our school garden

C₂₁: Hmm. I guess we should do recycling. When we use or we do recycling, we do not leave garbage in our environment. Thus, we protect the environment. But if we leave them in the environment, I think it fills everywhere and it would smell very bad.

Once they were asked “*Why do we need to separate those materials?*”, seven children expressed their concern about helping waste pickers who earn through collecting garbage from garbage bins. Related to this, the dialogue between C₁₆ and the researcher illustrates children’s further perspective as follows:

R: Why do we need to separate the materials and put them into separate boxes?
C₁₆: For example, for recycling, we collect some cardboard, plastic bottles, and sometimes old clothes in separate bags. Then, we put them all in separate bags in garbage bins located at the corner of our street.
R: So, let me be clear. Where is the recycling in your example?
C₁₆: I mean when we put the garbage separately, we will help people who come near the garbage bins and look for waste. My father told me once that those people earn money when they sell all those stuffs. So, we can help those people. This is recycling.

Participant children were also asked a hypothetical question in the pre-interview session. The researcher made children think about the potential of recycling with a question; “*What would happen if we did not recycle?*”. In parallel with the question about the need for recycling, further analysis showed that 14 respondents associated the absence of recycling with a dirty and smelly environment. C₁₇ expressed, “.... there could be garbage everywhere” and C₁₀ explained, “Recycling bins are for collecting the materials. Everyone, every child should use them. Otherwise, garbage will accumulate and release a bad smell [*Iyk*]”. The dialogue between the researcher and the C₉ is as follows:

R: Now, I want to ask the same question in reverse. Think about that. What would you think if we couldn't do recycling?

C₉: Hmm. If we couldn't do recycling, then everywhere would be filled with garbage.

R: So, what would happen then?

C₉: I think it would be smelly. If we throw our garbage into the street and gardens, we could not breathe, because of smelly air. Also, we would have to step on them.
[Makes facial grimace]

Children who identified recycling as a significant practice, particularly for the well-being of the natural environment, display a low sense of agency. In regard to the idea of recycling, most of the children accepted the rationale of recycling, yet a minority of the children ($n=5$) expressed their personal actions as having separate bins in their home environment to put some recyclables into different bins. In this vein, five children mentioned that separating plastics, glass, and paper is a shared goal in their home environment in which household members mostly identified as mothers and fathers display an interest to collect paper and plastics separately. Those children described that collecting recyclables is done through teamwork in their home environment. Family members jointly participate in keeping recyclables in separate bins which provides great help to waste pickers and the workers in recycling factories. About this, a domestic division of labor was indicated to facilitate the collecting and storing of the recyclables process in their home environment. Of those children, two of them (C₅ & C₈) stated parallel responses as "I verbally encourage my father when he puts a recyclable in the trash. I gently warn him." Other related responses on separating recyclables in the home environment are stated as:

C₉: There was a science magazine that taught children about recycling. One day, when we read it with my mum, I asked about the recycling boxes. They seemed to be in different colors. To my knowledge, there are blue, red, and yellow boxes. Then, we decided to construct our own recycling boxes to put it our balcony. We did three boxes, one for paper, one for plastic bottles, and toys, and one for glass to collect soda bottles.

C₁₀: We all collect our garbage in our homes. Instead of putting them into the trash, we separately collect them. We collect plastic bottles and paper. We put them in bags separately to help workers in recycling factories.

C₂₂: My little brother does not know how to put the garbage in the correct boxes yet, but I will teach him. My father and mother told us that this is for the sake of our environment. My father once told me that if we throw plastic bottles or soda cans into nature, nature feels so bad. Therefore, we separately collect the garbage and put them in garbage bins in our home.

C₁: My mum put a box in my room and told me to put my already used paper waste into that bin. At first, it was surprising for me, but she explained to me that it is all about recycling. I guess, by collecting the waste papers separately, we help the waste pickers and thus, recycling. That's all.

Subtheme₃: There are Recyclable Materials

Another set of questions was designed to reveal children's pre-knowledge of *recyclables*. When the subjects were asked what they already know about recyclables, all participant children stated at least one recyclable. Paper is the first and most frequently expressed recyclable item by the 21 children. Following paper, 17 respondents identified plastics and 16 children stated glass as recyclable materials. Besides, nine children reported metals and two children described batteries as recyclable materials. Apart from all that was said, no other recyclable item was mentioned. The word cloud demonstrated in Figure 4.1 illustrates the most shared recyclables by the participant children.

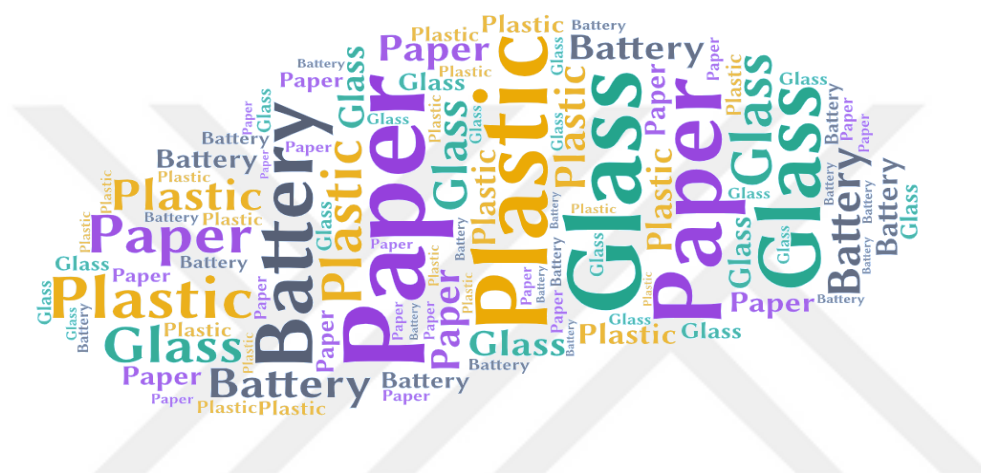


Figure 4.1 *Word Cloud Visualizes the Most Common Recyclables Expressed in Pre-Interviews by Participant Children*

In pre-interviews, in order to unfold children's initial knowledge about recyclables and make a smooth start on conversations about organic waste, children were presented with several visuals (Figure 4.2). At first, the researcher presented the visuals and clarified each of them. After all the visuals were comprehended and became clear, each child was asked to point out which were recyclables. The overall response to this visual question –as in parallel with the previous question–, was that the majority of children identified paper ($n=23$), the plastic bottle ($n=20$), and the can ($n=18$) as recyclables. Moreover, none of the children indicated an idea that the banana peel, an eaten apple, and a dry leaf can be recycled.



Figure 4.2 A Designed Visual Includes Recyclable and Non-Recyclable Materials

Of all the participants, seven children pointed to ice cream as a recyclable material, yet they did not further extend their perspective and explain the rationale for this choice. At last, three children put forth an idea that the banana peels can also be reused in art activities. C₃ stated that “.... banana peels can be useful when I draw a princess and use the peels as the hair of my princess, right?” and C₁₇ shared another idea that “.... I can stick that banana peel on a paper and then turn it into a banana tree using with my pastel crayons. Thus, I can recycle it”.

After talking about the visuals, a smooth transition to recycling organic materials was done by a question about the fallen dry leaves in autumn and fallen apples found on the ground. To assess participant children’s pre-knowledge, the researcher made a brief entrance to trigger the children’s interest and asked questions about the fallen leaves in autumn. Seven children expressed that they never thought about the fallen leaves and even also fallen apples from the tree, and they added, “*but most probably someone swept them out when autumn came*”. Besides, eight children conveyed a perspective that due to strong wind, the leaves are flying out to other countries and they disappear and when springtime comes, they appear and blossom on the trees again. The dialogue between C₁ and the researcher is given below:

R: Now we are in autumn [It was October when the interview was conducted], right? Could you please tell me what you see when you look out of the window?

C₁: There are a lot of dry and yellow leaves that cover our playground.

R: That’s right. Every year, all the leaves fall off the trees. But after a while, we cannot see those leaves. Right? At this point, I was wondering about your ideas about all of those fallen leaves. What happens to those fallen leaves after time passes? Even the apples are falling on the ground and after a while, they are disappearing? How could this happen?

C₁: They are all swept.
R: Could there be another reason?
C₁: And sometimes the winds take it away.
R: Okay.

As indicated in Figure 4.3 the most common explanation of children about leaf and apple decomposition was identified as them being blown away due to strong wind. Children also fleshed out that the possible reason could be that some workers swept out the fallen leaves. The remaining children suggested that the leaves could be hidden somewhere or disappeared.

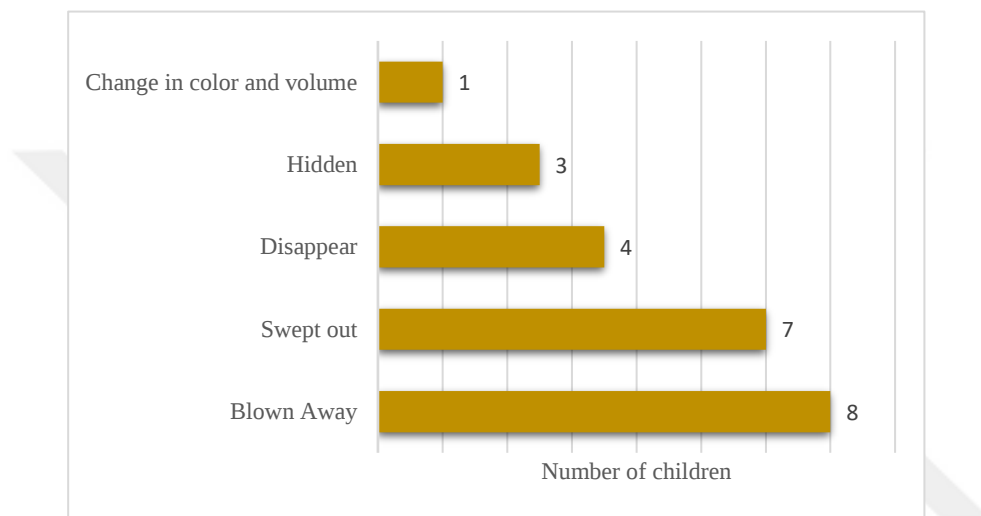


Figure 4.3 *Children's Responses to the Question Related to Leaf and Apple Decomposition*

Broadly speaking, participant children did not indicate any differences between the leaves and apples on the trees and on the ground before. On the other hand, only one child (C₁₂) stated that he observed such apples before and described it as a morphological change that becomes 'black' and 'rotten'. Most of the participants were not able to imagine what would happen to a fallen leaf or an apple if it had to stay for a long time. The children expressed that it can disappear and/or some staff swept them out. The children's explanations can be categorized into two types: i) explanations depending on environmental conditions such as warmth and wind, and ii) explanations depending on human beings, that is to say, some people came near trees and took them or swept them out.

C₈: I think strong winds blow them away to other countries. They fly to other countries, but then, the wind brings them back and puts them on the tree branches again. When autumn comes again, they will go again. That's all.

C₂₁: I see those dry leaves. They are flying. The wind is blowing them away. Maybe they change their places. They may travel. They may be happy to meet new trees, new leaf friends, Actually, I do not know.

C₃: Hmm. I have no idea, but someone can have swept them out and put them into the garbage bin. I see it sometimes. Some staff sweeps it with a broom. I think they try to clear walkways. I see them sometimes. They fill dry leaves and put them in bags. I don't know where they take them away, though.

C₁₇: Since there are heavy rains in autumn, most probably they disappear. Could rain and snow be the reason they disappear? What an interesting question you asked me. [Hmm]. My last decision is due to rain and snow. Rain and snow may be melting them. That's how they disappear.

C₁₆: I think they are hidden. They will appear next spring. The spring will call for their return, and they will come. When the spring comes, they all blossom on the trees. When the spring comes, they all appear again. for now, they are just hiding Right?

C₁₃: I think people collect the fallen apples to eat. Thus, we cannot see them after a while. I think also there are leaf collectors. They collect the autumn leaves and store them. I saw once that there was a man sweeping and picking leaves. But I don't know where he took it to after that.

To add, the two remaining children mentioned the physical change of fallen leaves and apples. The personal observation of C₁ is depicted as follows:

There are lots of dry leaves in our schoolyard now because it is the beginning of autumn. Last week, we collected a lot of leaves with my mom to examine them. But now, they all turned into very dark brown. Their color has changed and they even became smaller.

Of particular interest, participant children were also asked about the source of their knowledge on recycling. In response to the question, “*How did you learn what you know about recycling?*” 7 children were able to express that they have heard about recycling from cartoons. Related to this response, C₁₀ and C₃ expressed as follows:

C₁₀: There was an episode in ‘Peppa Pig’ about recycling. *Peppa* and *George* [Peppa’s little brother] learn about separating bottles and cans into separate bins. The mother pig shows them separated boxes. I think they are in different colors such as red, blue, and green. Peppa put the bottle into the green box and George put the newspaper in the red box. It was so much fun to watch it.

C₃: My mother and I watched an animated movie about the story of recycling. The movie showed me how some adults do not put cans and paper into the recycling bin. However, their children warn them about the importance of recycling and teach them how different materials can be grouped into different boxes.

Another seven children mentioned regular school activities such as collecting blue bottle caps and putting the remaining cardboard and paper from the art activities into the recycling bins.

Related to this, C₇ explained; “... our art teacher always reminds us to collect the remaining papers and cardboard to put into recycling boxes located in our school yard.” C₁₂ also mentioned the campaign launched by the school to collect plastics.”

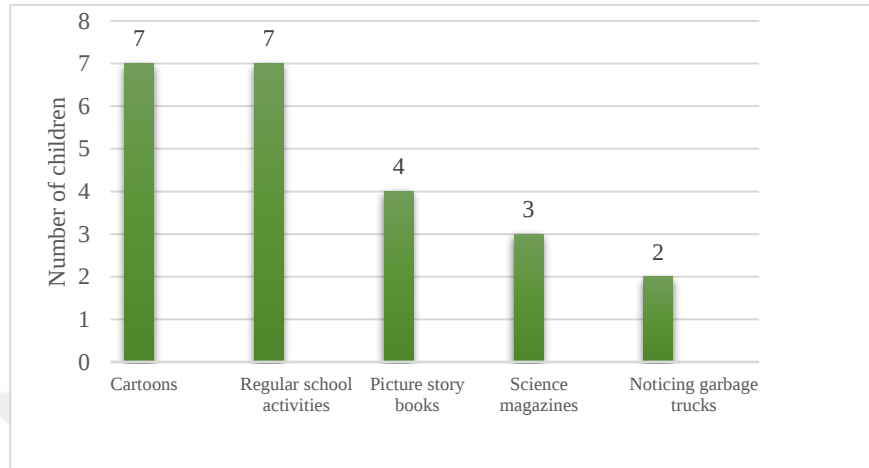


Figure 4.4 *The Source of Children's Knowledge on Recycling*

Of all the participants, seven children stated picture story books and science magazines as the source of their knowledge on recycling. Further, two of the respondents shared their experience about regularly noticing recycling trucks and talking about it with their family members as an essential tool to explore recycling (Figure 4.4). The following conversation between the researcher and the C₁₄ brings about the child's perspective on noticing recycling trucks:

C₁₄: On Fridays a big white truck visits our street and collects the garbage. When I asked about the truck, my mom told me that it is a recycling truck.

R: How did you know that it is a recycling truck, then?

C₁₄: There was a recycling picture on it.

R: What does this recycling picture look like?

C₁₄: I mean it was a symbol. My mom told me that it is a recycling symbol. It looks like arrows following each other [showing by drawing with her finger in the air]

R: I understand. Then, where does the recycling truck take what it collects?

C₁₄: I do not know. But my mom told me there is a center in Ankara and all that garbage is accumulated there. But I have never seen it before. One of my friends visited there with his parents.

R: Okay. Do you want to go there?

C₁₄: Yes of course, I am wondering about how stuff is recycled in a center.

R: When you go there, what do you expect to see?

C₁₄: I can see many recycling truck and recycling staff.

R: Okay, I see.

4.4.1.2 Children's Self-Reported Knowledge of Food Consumption Choices

Subtheme1: The Source of My Favorite Food is the Soil and Farms

To specify the recycling issue into recycling of organic waste, the children were further questioned about their eating habits in everyday life to link researcher-child dialogues to biodegradable wastes as the central tenet of the current study. Following the conversation on eating habits, to assess children's knowledge of the source of the food they like to eat, they were asked about the sources of all of those healthy foods that make children healthier, stronger/taller, and smarter. Approximately two-thirds of the participants ($n=15$) reported that soil is the main source. To that extent, C₈ expressed that "...once I saw little cute cherry tomatoes. They were growing from the soil" and C₁₂ explained, "The soil feeds the fruits and vegetables. The soil provides water and food to grow a cucumber or a pepper for example". C₂₂ mentioned his personal experience as follows:

I went to our village last summer. I picked up apples from the tree and some green beans. Trees and even green beans are standing on the soil. My mother told me that soil provides water for trees and plants. It circulates water via the roots of plants.

Moreover, of 23 participants, nine children identified farms, six children stated the bazaars and five children mentioned the supermarkets as the source of food. Related to the supermarket, the conversation between C₁₅ and the researcher is presented below:

R: you told me about your favorite fruits and some healthy vegetables. Right? Actually, I am wondering about where all these fruits and vegetables grow.

C₁₅: The people working in supermarkets grow them for us.

R: Have you ever seen such an area in a supermarket to grow fresh fruits and vegetables?

C₁₅: No, I didn't.

R: So, how do you know that

C₁₅: I think the workers at aisles in the market grow them for the customers. Sometimes, I have observed that they watered the vegetables. That is the reason why I told you that supermarkets are where our food grows.

Sub-Theme2: I Eat Fruits and Vegetables to be a Healthy, Strong, and Smart Child

Participant children were also invited to share eating habits in pre-interviews. The majority of the respondents (91%) declared that they prefer to eat something healthy. All of those children specifically associated healthy nutrition with being strong ($n=20$), increasing in length ($n=19$), and being a smart child ($n=9$). As a transition question to boost children's thinking on organic waste, the interviewees were asked to express their eating habits. In response to this question,

8 children also mentioned that junk foods are unhealthy. More specifically, considering Figure 4.5, orange ($n=12$), banana ($n=12$), apple ($n=10$), kiwi ($n=6$), spinach ($n=6$), carrot ($n=5$), broccoli ($n=5$) and potato ($n=5$) were identified as the most favorite fruits and vegetables, respectively.

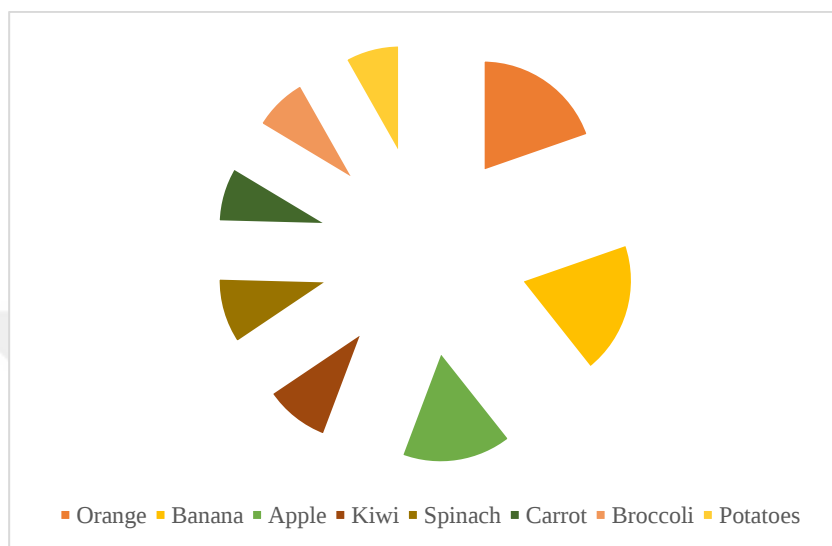


Figure 4.5 *Favorite Fruits and Vegetables Participant Children Mentioned in the Pre-Interview*

Concerns regarding children's daily eating habits, the minority of participant children reported that egg ($n=17$), milk ($n=16$), cheese ($n=16$), tomatoes ($n=11$), and cucumber ($n=10$) were preferred for breakfast. Meatballs ($n=19$), chickens ($n=14$), and pasta ($n=13$) were also favored in lunch and dinner times (Figure 4.6).

When asked about the leftovers on plates, C₇ stated that "Mom and dad warn us about leftovers. If there are any remaining food on my and my brother's plate, they tell me to please eat all of them" and another participant child (C₂₃) commented, "We throw away all leftovers to the garbage bin". Whilst a minority of the respondents mentioned that their family members are sensitive about not throwing away the leftovers, all agreed that leftovers from meals or while cooking are all thrown away as rubbish. Following this question, the respondents were questioned about any alternative management strategy for the leftovers. The researcher asked the children; "I was wondering what can we do with onion skins or spinach scraps left over

from cooking, for example? How can we recycle these wastes?''. None of the children suggested any management strategy or idea to reuse or recycle leftovers.

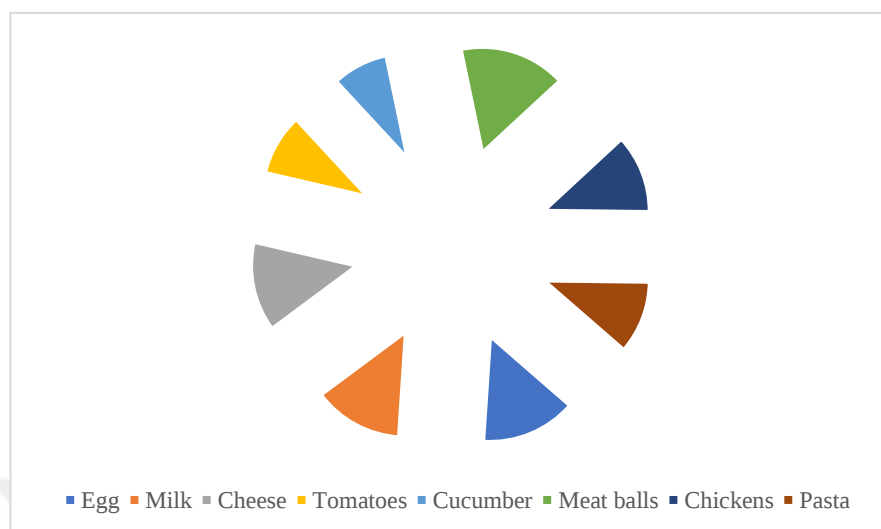


Figure 4.6 Participant Children's Food Choices for Breakfast and Dinner

To reveal children's prior knowledge about composting, the participating children were also asked about the word(s) "compost" and "composting". Again, none of the children were able to make an explanation of compost or composting and answered this question with "I do not know" and/or "I have not heard about it before" Therefore, the participant children could not give answers about how organic wastes can be recycled, which organic wastes can be recycled, which materials are needed and about how the process should be.

4.4.1.3 Children's Self-Reported Knowledge on Earth Worms

Since earthworms have a remarkable role in the decomposing process of organic materials, focusing on earthworms and learning about their physical and physiological characteristics and their role is one of the central tenets of the current study. Earthworms are well-known as the farmers' friends and contributors to soil health. They intensively interact with the micro- and macro-organisms under the soil as a very hardworking family of the decomposer community. What is interesting about composting with earthworms is that the decomposition of materials is processed by the digestive systems of earthworms. As a way to make good use of garbage, composting with earthworms can be considered as an efficient learning tool to learn about the cycles in nature and the fundamental role of living organisms in the composting closed loop system.

Subtheme₁: Earthworms that Sleep Under the Soil are Dark Brown in Color

In regard to participant children's initial knowledge of earthworms, the researcher asked a general question, which was: *"Have you ever seen an earthworm in your life? Can you tell me what it looked like?"*. Almost two-thirds of the respondents ($n=17$) reported that they saw an earthworm at least once in their life. This theme came up for example in discussions of the physical characteristics of earthworms. When children were asked about the colors of the worms, C₅ said: "I think it was pink" and another one indicated that "When I saw the earthworm in our backyard, it seemed to have a dark brown color". Other responses to these questions were also overlapping as "Dark brown" ($n=12$), "Red" ($n=5$), "Light red" ($n=3$), and even also "Pink" ($n=2$). Following the conversations about the colors, the participant children further mentioned the movement of the worms they observed. Of the participants, 9 children stated that worms have circular movements. Related to this response, C₁₂ elaborated as such: *"I saw their rings on their body."* Likewise, C₁₈ linked the circular movement of the worms with their physical appearance; "Once I observed a big earthworm. They have circles on it. There are many circles that help worms to go somewhere".

Further content analysis of children's self-reported knowledge and experiences on earthworms showed that there was a common sense about the living place of earthworms amongst interviews. The majority of the children ($n=21$) declared that earthworms live under the soil. Related to this response, one of the participants (C₃) said: *"We do not always see them. They are living under the soil. If they lived on the ground, we would see them, right?"*, and C₁₇ agreed with their friend, saying; *"I know where they are. They are hiding under the soil"*. Complementary to those responses, the conversation between the researcher and the C₁₁ is as follows;

R: Where do earthworms live? Do you have any idea?

C₁₁: They are living under the soil.

R: Why did you think like that? Have you ever seen an earthworm under the soil?

C₁₁: Actually, not under the soil, but I have recognized that they start to climb up from the ground. Whenever it rains, there are lots of worms everywhere. I mean, they are coming under the soil.

R: A-ha. Okay.

Subtheme₂: Earthworms Eat Mud and Bugs.

To elaborate, the child respondents were also questioned about earthworms' role under the soil. As mentioned above, a common view amongst children was that the underground was the place where the earthworms lived. At this point, the researcher elaborated on the previous questions, saying; *"So, how do they live under the soil?"*. Half of the participating children suggested that

earthworms are eating bugs and mud ($n=11$). One participant (C_1) commented that *“they are looking for something to eat”* and another respondent child (C_{14}) said; *“they are interested in other bugs. So, they are looking to be friends with other bugs”*. The bug issue was highlighted by C_{23} who said; *“They live under the soil since they eat bugs to survive”* and one interviewee (C_{17}) added; *“They like the mud and bugs”*.

Only a small number of children ($n=6$) indicated that they dig tunnels to create spaces for air and make the soil “breathe”. Related to this point, the conversation between the researcher and C_{10} was as follows;

R: You said that earthworms live under the soil.

C₁₀: [Uh-huh]

R: Okay. Then, what do you think they are doing there? Why are they underground? Could you tell me, please?

C₁₀: They are walking there, I think [giggling]. They are wriggling along the soil and I know that this is important for the soil.

R: How so?

C₁₀: I mean, while they are wriggling, they are digging the tunnels.

R: Are the tunnels important for the earthworms?

C₁₀: Actually, not for the earthworms but they are important for the soil. The tunnels make the soil breathe which is good for the plants, grass, trees, and even also snails.

The last question of the pre-interview sessions of participant children was about the importance of earthworms for Earth. The participant children were asked; *“Do you think worms are important to our planet? How do they matter?”*. The overall response to this question was *“Yes, they are important”*. On the other hand, when respondents were asked to represent more details, they did not elaborate on their initial answers. C_2 stated *“I think they are important, but I do not know why”*, and C_4 declared; *“Of course, they are important. Because they are a living thing”*. C_{13} also noted; *“Earthworms are also a part of nature. I like them. That is the reason why I said they are important for us.”* The findings in this section unfold children’s initial knowledge and previous experiences about waste, recycling as a waste management strategy, recyclables, food choices and food waste management, and earthworms. The next two sections will be concerned with the self-reported knowledge of respondents stemming from post- and follow-up interviews conducted after 2 days and 3 weeks following their participation in the composting learning activities.

4.4.2 Post-Findings Related to Children’s Knowledge of Recycling Organic Wastes

For the current study, one of the main target groups was 60 to 72 months old preschool children who engaged in the designed learning activities. In view of this, preschool children were considered essential subjects who jointly participated in the learning activities with their

mothers to explore a sustainable practice; that is, recycling organic waste. 2 days after the completion of the learning activities, each child participated in post-interview sessions in order to acknowledge the potential of the learning activities on participant children's knowledge on waste and waste management, food waste management and the notable roles of earthworms in the decomposition of organic materials. The first question of the post-interview protocol was particularly designed as a leading question to capture children's first-sight notions about the composting learning activities. Whilst pre-interviews were designed to figure out children's initial perspectives and the knowledge they already possessed; the post-interviews aimed to emphasize to what extent composting learning activities enable children's existing knowledge. Therefore, the post-interview questions typically served the purpose of unfolding children's further knowledge. To elucidate, the post findings are discussed under three main themes in the next sections. Unlike the sub-themes that emerged from pre-interviews, further analysis showed that sub-themes in post-interviews were profoundly specialized in the topic of recycling organic waste (Table 4.3)

Table 4.3 Themes and Sub-Themes that Emerged from the Post-Interviews of Children
($N_{post}=23$)

Themes	Sub-themes
Children's self-reported knowledge on waste and recycling	- Not everything is garbage ($n=18$) - There are recyclables: [paper ($n=18$), plastic ($n=17$), glass ($n=14$), and metals ($n=12$) and recyclable organic wastes as banana peels ($n=11$), apple scraps ($n=8$), dry leaves ($n=8$), watermelon peels ($n=5$), spinach scraps ($n=4$), tangerine peels ($n=3$), grass ($n=3$), pine cones ($n=3$), tree barks ($n=3$), tea pulps ($n=2$), coffee pulps ($n=2$), tomatoes peels ($n=2$)
Children's self-reported knowledge on organic waste and organic waste management	- There are biodegradables and non-biodegradables ($n=13$) - Hot composting; The dance of microorganisms ($n=17$) - Earthworm facts: No eyes, ears, nose and no legs and arms ($n=20$) - Vermicomposting; The dance of earthworms ($n=16$) - Composting is a daily sustainable practice; "I can do it" ($n=14$)
Children's self-reported knowledge on the value of organic waste management	- Composting as a waste management strategy has multiple aspects; environmental ($n=17$), economic ($n=7$) and social ($n=2$) - Being a <i>Compost Star</i>: Let's talk about composting! ($n=19$) - Composting could be a common shared activity ($n=12$)

4.4.2.1 Highlights Emerging from Children's Post Interviews

As mentioned above, the post-interview session started with a general leading memory question: *“Do you remember that we did some activities related to recycling organic waste last week? Could you tell me please which of the activities you remember most/enjoyed the most?”*. These questions were asked in order to stretch out children's general reappraisal of their participation. This initial question potentially served as a reminder of particular tasks and activities that children enjoyed and found worthy of remembering and talking. The analysis of the data in regard to this question showed that over half of the children ($n=13$) pointed to the fourth day of the learning activities in which mother-child dyads constructed their own worm farms. More specifically, children mentioned encountering real worms and depicted this activity as the most exciting and attractive learning process. Related to this question, participant children's responses were as follows:

C₁₃: It was amazing for me to encounter real earthworms. Firstly, they were very dirty. We bathed them in white bowls. The soil on them was cleared... Ta-taaa. We have seen their dark brown color.

C₂₁: When you told us to bring real earthworms, actually, I did not believe you. But you really brought them to us. We examined them with a magnifying glass. I have learned that they like wet and dark places. This is the first thing that came to my mind when you asked me about what we did last week.

C₂: The most memorable activity was encountering the friends of *Soso*. They seemed very small and wiggling, but I think, they were friendly. Something very surprising happened while my mom and I were observing them with the magnifying glass. My baby worm pooped [giggling]. Can you believe it?

C₈: ... Would you like to tell us where you found these worms? They were very beautiful. I named mine 'Sunflower'. It was moving by curling up. We prepared him a bed with my mom and gave him rocket waste and melon shells. I hope he enjoyed his food.

C₁₆: ... of course, I remember the activity in which we examined the red earthworms the most. My worm was running into the dark all the time. When I put it in a dry place for a short while, he did not feel well. They are very sensitive, I think.

Following this abovementioned popular answer, of the 23 participants, eight children particularly pinpointed to the play activities. Related to this, C₆ reported that “I liked the game we played in the first day, *Meyve Sepeti*, the most” and C₁₄ commented “*Meyve Sepeti* was so attractive for me. I became an orange and I was excitedly waiting for someone to say orange to change my place. I enjoyed this game the most”. C₅ also depicted another play activity in which children categorized waste as biodegradables and non-biodegradables.



Figure 4.7 *Play Cards on Which the Visuals of Biodegradables and Nonbiodegradables are Illustrated*

The conversation between the researcher and C₅ was as follows:

R: Do you remember that last week you participated in some activities in the school garden with your mother? Could you tell me please, which of these activities you remembered and/or enjoyed the most?

C₅: I remembered the competition we made the most. It was so exciting. We were pulling cards that had pictures on them from the pegs. (Figure 4.7)

R: For what?

C₅: After pulling the cards, we quickly ran towards the red and green boxes standing a little further away. If the picture on the card we took was a biodegradable, we put it into the green bin. If not, we put it into the red bin. That was the rule.

R: How nice of an explanation you made. Thank you.

Another memorable play activity among the participant children was held on the first day of the composting learning activities. Four children specifically reported the *Meyve Sepeti* game in which children and mothers jointly participated in. C₂₁ said, “I remember the game *Meyve Sepeti*, because it was too much fun for me. I was representing the banana and my mom was an apple (Figure 4.8). The funny part of the game was shouting “All the fruits” and mixing them [all mother and child participants] in the circle” and C₅ commented:

.... I remember the game we played on the first day. It was so exciting. I also remember that I was so surprised after the “*Meyve Sepeti*” game. Because you brought us real fruits like a banana, apple, and tangerine for the picnic. These fruits are the same as the fruit visuals on the play cards we used for the game *Meyve Sepeti*. You also made us curious about the waste of fruits such as the peels of

bananas, apples, and tangerines, because instead of throwing them into the garbage, you gathered them and asked; “Do you think these wastes can be recycled?”



Figure 4.8 *A Snapshot of a Participant Child Standing at the Center of the Circle to Give Play Instructions During the “Meyve Sepeti” Game*

Besides, for the rest of the children, the hot composting activity which was held on the third day of the composting learning activities ($n=4$), and encountering a *Garbage Witch* ($n=4$) were mentioned as the most memorable times of the learning activities. *The Garbage Witch* activity was the first-day activity particularly designed to direct children’s attention to the organic waste concept. In post-interviews, children referred to the *Garbage Witch* and the products she carried in their responses. Of all the participants, 12 children reported that the products in the bag she brought and the waste on the black cloak were not identified as garbage or trash. Reflections on encountering the *Garbage Witch* can be seen in C₁₉’s descriptions:

R: Do you remember that we did some activities related to recycling organic waste last week?

C₁₉: Yes, I remember.

R: Okay. Would you please let me know which activity you thought of the most? Which activity was the most memorable for you?

C₁₉: *The Garbage Witch*.

R: Really? Who was this *Garbage Witch*? Can you tell me a little bit about her?

C₁₉: She had a black cloak, yellow hair, and a witch hat. She had come with a bag in her hand. (Figure 4.9)

R: What was in her bag?

C₁₉: The bag contained cardboard, a milk carton, a bottle of soda, an egg carton, and a can.

R: How about her clothes?

C₁₉: In her clothing, a pet bottle, a tangerine peel, and a banana peel were hanging.

R: Ok. Then, what was her problem? Why did she visit you? And why did she wear such clothes?

C₁₉: Because the Garbage Witch had a problem. She did not know what to do with the waste on her. Actually, she did not want to throw it away. “*Because these are not garbage*”, she said. She also did not want to throw them away into nature. “*If I throw it into nature, they won't be lost for a long time,*” she said. So, she had come to ask for help.

R: Did you help her?

C₁₉: Yes, we did. We told her that she could throw it into the recycling bins.

R: Why did you suggest her to put the waste into recycling bins?

C₁₉: Because there were recyclables on her cloak. For example, there was a plastic bottle. There was also a tangerine peel hanging down. They are all recyclables. If she put the bottle into the box for plastics, it can be recycled to a new bottle, maybe. Also, she can use the tangerines for composting.

R: Okay.



Figure 4.9 *The Garbage Witch Visited Participants with Her Black Cloak, Black Hat and Bag Filled with Solid and Organic Waste Products*

4.4.2.2 Children's Self-Reported Knowledge of Waste and Recycling

Sub-Theme₁: Not Everything is Garbage

All participant children mentioned that the materials that the *Garbage Witch* carried were all waste –not garbage- which can all be recycled. Given this perspective, C₈ said: “.... *either garbage or waste are the threats to our environment. Hence, we should not leave them in the*

natural environment". Unlike the pre-interview, the majority of the children ($n=18$) were able to differentiate between what is waste and what is garbage in the post-interviews. Accordingly, garbage was defined by the respondents with the word "*useless*" materials. On the other hand, waste was defined as materials that could be reutilized/recovered. The shift in children's reports on the difference between garbage and waste was expressed ($n=13$) as wastes could be recycled and reused over and over again, but garbage could not. Some of the examples of children's responses were given below;

C₉: For example, you cannot directly throw a glass bottle in the trash. When my mom throws by accident, my dad gently warns her. Then my mom takes it and throws it in the recycling bin. It can be recycled in factories. I mean they are not garbage. They are something that can be recycled.

C₁₉: We throw the waste into large buckets. We accumulate there. We protect nature by recycling. Because if we throw it into nature, it may take many years to disappear. For example, it takes 4000 years. Recycling is important for nature.

C₇: We use different boxes to recycle. For example, you will throw the plastics into a box, the bags into a box, and the glass into a box. When you see the "paper sign", you will throw the papers there. They will turn into materials and items that we can reuse.

Contrary to pre-interviews, in post-conversations, children ($n=7$) stated that when they put something old or not used anymore into recycling bins, it turned into a new product. On this ground, recycling was also associated with getting new materials and products from old ones, as C₄ expressed: "By recycling, we can turn plastic materials into new items. Thus, we will not leave it to nature. We will produce other bottles that we can reuse." C₁₈ reported that: "I think it means producing new toys from old toys. I mean if we don't want to play with a toy anymore, we can put it in the recycling bin instead of throwing it in the trash. So, they can make a new toy out of the old. The conversation between the researcher and the C₅ also supported this notion;

R: What materials did the *Garbage Witch* carry? Do you remember?

C₅: She carried a can, an egg cardboard, milk boxes, banana peel, and even also tangerine peel was hanging from her cloak.

R: So, what would you do if you were the Garbage Witch?

C₅: If I were the Garbage Witch, I would put all those materials into the recycling bins.

R: Recycling bins or garbage bins?

C₅: No. Recycling bins.

R: Then, why the recycling bin?

C₅: Because egg cardboard and milk boxes and even also the banana peel can be recycled.

R: How can we recycle them?

C₅: I have already told you. We can put them in separate boxes which are designed for paper, glass, metals, and also for composting.

R: Okay. So, can you tell me what is recycling?

C₅: Recycling is producing new materials from old ones. So, we can use a toy, paper, and even also a banana peel, or a tangerine peel over and over again.

Sub-theme₂: There are Recyclable Organic Wastes

Shifts in children's knowledge of the definition of recycling can also be seen in the examples of recyclables. Contrary to pre-interviews, in post-interviews the majority of participant children highlighted that there are organic wastes and they are also recyclable. The question on identifying recyclables enriched when compared to pre-interviews. The salient difference revealed in post-interviews was that children were able to list organic wastes which were decomposable, that is, recyclables. Paper ($n=18$), plastic ($n=17$), glass ($n=14$), and metals ($n=12$) were still indicated as recyclable solid wastes, and even also, banana peels ($n=11$), apple scraps ($n=8$), dry leaves ($n=8$), watermelon peels ($n=5$), spinach scraps ($n=4$), tangerine peels ($n=3$) and tree barks ($n=3$) were pinpointed as recyclable organic materials by participant children. Figure 4.10 displays a bar graph to make a clear snapshot of children's extended knowledge of recyclables after participating in the learning activities.

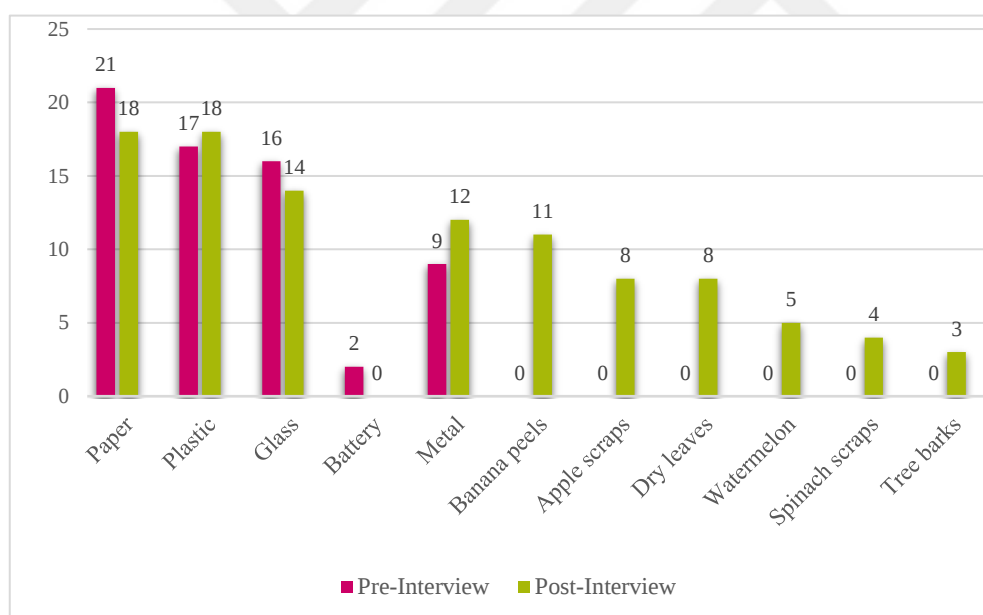


Figure 4.10 *Recyclables Mentioned in Children's Pre- and Post-interviews*

Of particular interest, 11 children mentioned organic waste to explain recycling. C₁₉ conveyed what he had learned as “tomatoes peel and an already eaten apple can be recycled to get compost” and C₁₈ explained, “as you taught us, tangerine peels and fall leaves can be recycled.

They are delicious food for earthworms, snails, and caterpillars living under the soil. C₂₀ extended her understanding of recycling as getting something new from old and/or unused materials by illustrating the decomposition of organic wastes. She depicted recycling as “before last week, we put the fruit and vegetable waste into the trash in our home. However, now, I am warning my mother, because they are also recyclable. We can recycle food scraps on our balcony and turn them into compost. Then, we take the compost to put in flower pots.”



Furthermore, in post-interviews, Figure 4.2 () was offered again and discussed with each individual. Children’s expanded knowledge of recyclables was clearly identified in their post-responses. Contrary to pre-interviews, banana peel, an eaten apple, and dry leaves was declared by the majority of children as recyclable. Paper, metal cans, and plastic bottles were still mentioned as recyclables. On the other hand, out of the 23 children, the majority of respondents indicated meat ($n=20$), ice cream ($n=17$), and metal cans ($n=17$) particularly as non-biodegradable materials, so they are not decomposable. Considering Figure 4.2, participant children preferred to give solid examples by mentioning the storytelling activity. Since the earthworm character *Soso* specifically highlighted the decomposable materials, a common expression among interviewees focused on what the puppet *Soso* told them. Furthermore, nearly half of those children were able to identify banana peel ($n=16$) was the most common and favorite response as decomposable organic waste. Following this, apple core ($n=15$), dry leaf ($n=13$), tangerine peel ($n=13$), grass ($n=10$), tomatoes peel ($n=10$), egg shells ($n=9$), and lettuce ($n=6$) were expressed as organic waste and biodegradables which can be recycled. Then, children stated waste products that cannot be decomposable. Children mentioned decomposable materials as what *Soso* does not like to eat. Meat and cheese were the most salient responses that children illustrated. Plus, ice cream, glass, plastics, fish, milk, and yogurt were depicted as materials that are not decomposable. Related to this, the dialogue between C₄ and the researcher is as follows;

R: Please look at these visuals. Do you remember them? Just tell me. Which ones are recyclable?

C₄: I know them now.

R: Okay. Tell me what you think about them.

C₄: Banana peel, apple scraps, and dry leaf are all recyclable. They are decomposed as *Soso* said.

R: Could you explain to me what *Soso* said about those materials?

C₄: Since *Soso* was already living under the soil, he informed me that there are some biodegradable and even also non-biodegradable materials. He likes banana peel, apple scraps, dry leaves, and paper. Because he can eat and fertilize them in the soil which is good for the soil.

R: Okay. Then, how about others?

C4: Hmm. For example, milk, ice cream, and even also plastic bottles are not appropriate to decompose. So, the worm warns us, saying, “Please do not throw those materials into the soil. It destroys my living area, my home.”

R: So how about milk, ice cream, metal cans, and plastic bottles; are they recyclables or not?

C4: Of course, they are not!

4.4.2.3 Children’s Self-Reported Knowledge of Organic Waste Management

Activities on recycling organic waste provided mother-child dyads with a vast array of hands-on learning opportunities to learn about the decomposition of organic waste as a waste management technique. Herein, the overall purpose of the composting learning activities was to encourage participants to recognize their own potential and develop a sense of responsibility for waste management of organic wastes which is an everyday problem. On these grounds, the designed learning activities were presented to children so as to particularly focus on the elements of decomposition of organics in terms of materials, organic wastes categorized as degradable and nondegradable, and the need for the decomposition process. Contrary to pre-interviews, in post-interviews children identified food scraps and garden waste as waste – not garbage- that could be tackled through recycling.

Sub-Theme₁: There are Biodegradables and Non-Biodegradables

In line with the content of the learning activities, children were asked about the meaning of organic waste. Regarding organic waste, five children were exemplified with watermelon, banana, walnut shell, and small tree branches. In the post-interviews, children’s views on the value of those fruits and even also vegetables were asked again. The majority of children re-emphasized that they consume those foods to be healthy individuals. C₁₁ stated, “I like tangerines so much. They consist of vitamin C which prevents us from the flu”, C₂₃ expressed, “Hmm, if we eat junk foods, we cannot grow. However, healthy foods make us strong”. C₁ stated that “eating healthy foods is important for being healthy and strong. Children’s further understanding of how those healthy foods are cultivated and where they come from were also in parallel with their common reports in pre-interviews. More than half of the children ($n=17$) highlight the soil, the farm, and villages as the source of those healthy foods. Contrary to pre-findings, none of the children mentioned supermarkets as the source of the foods that they eat in everyday life. Eight children particularly indicate the need for eating healthy food rather than junk food. Moreover, in post findings, children still listed tangerines, bananas, and kiwis as their favorite food. For the lunch and dinner times, they indicated that they prefer broccoli, spinach, pasta, chicken, and meatballs. Talking about this issue, C₉ and C₁₉ said;

C₉: I like broccoli, spinach, and apple so much. They make me strong. I have also learned that *Soso* likes those foods as well. Broccoli is good both for me, *Soso*, and the soil where *Soso* and his friends live and work.

C₁₉: I like tangerines. I like bananas. I like kiwis. The farmers cultivate those foods for us. Earthworms help farmers. Farmers plant something in the soil and then the soil gives fruits and vegetables.

In line with their expanded knowledge of organic wastes, and in order to reveal participant children's self-reported knowledge of biodegradable and nonbiodegradable organic wastes, the post-interview session included questions that stemmed from the storytelling activity held on Day 2. The following question was considered functional to start up the conversation in order to reveal how children conceptualized organic waste in line with biodegradables and non-biodegradables; "On the second day, I came to the schoolyard with a puppet. Do you remember this puppet?". All children correctly responded with the name of the remarkable visitor which was *Soso* from "*Soso'nun Kompost Kitabı*" which was introduced in order to deliver the concept of recycling organic waste with an earthworm character called *Soso*. This earthworm in the book particularly mentioned his life, his friends, where he is living, his favorite foods, and the food he does not eat. Responses to this question included:

C₄: Yes, I remember *Soso*; the earthworm puppet. He lives under the soil. He has a large saloon, and also a bedroom under the soil. He likes wet places. Also, he is not alone. His friends include a snail and a caterpillar. Also, a ground beetle. They are all very hardworking. They eat food wastes and make soil.

C₁₁: Ah, *Soso* is an earthworm. You made a sock puppet, did you not? It was really fun. *Soso* is living under the soil. He has a friend. Her name is Nil. Nil brings *Soso* banana peels, green tangerines, and even also celery sticks. *Soso* likes them very much. *Soso* eats all of those organic wastes and makes the soil brighter.

C₁₉: I remember your puppet. He was *Soso*. He has friends under the soil. They are digging the soil to make small tunnels. *Soso* likes eating dry leaves, pine cones, egg shells, and lettuce. *Soso* and his friends help nature. They help with recycling. Actually, he is very cute and hardworking.

C₂₃: *Soso* is a very hardworking and very hungry earthworm. There are many things he likes to eat. And also, there are many things that he does not like. We should give them what he likes to make them decompose. We should give them organic foods. For example, banana peels, egg shells, coffee beans and also potato peels.

Starting discussions with the book reading activity and the puppet served the purpose of unfolding children's expanded knowledge about organic waste. Participant children seemed quite enthusiastic to talk about what this little earthworm *does like* and *does not like* and even also how it contributes to the decomposition of organic wastes. After talking about *Soso* and the responses of children on their first experiences with the puppet, children were served more

deep and embellished questions. Initially, children were asked about organic waste. Of the 23 participants, 13 children were able to categorize organic waste as biodegradables and non-biodegradables. The primary notion behind this categorization relied on what *Soso* does like and does not like to eat. Related answers are given below:

C₇: I have already learned that earthworms are very hardworking living things. I respect them because they are walking under the soil and they make the soil airy with small tunnels. But they do not eat everything. I know there are many organic wastes in our home and school, but we cannot give all of them to *Soso* and his friend, the little snail. They cannot eat meat for example, but they like dry leaves.

C₂₀: *Soso* and his friends were really hungry. They like eating food. They eat them and make compost for the soil. They like grass, eggshells, tree bark, and paper. Those foods are easy for them to eat. But they do not prefer to eat milk and milk products. For example, cheese. They do not like cheese. We should not give it to them.

C₄: It was surprising for me that *Soso* does not like ice cream. For example, it does not eat strawberry ice cream. Ice cream, meat, meat products, plastics, and metals are not biodegradable in the soil. children

Sub-Theme₂: Hot Composting; The Dance of Microorganisms

The learning activities in the current study were particularly designed as a five-day process by means of focusing on recycling organic waste that can be categorized as household and garden waste. Here, composting was considered a practical and hands-on sustainable practice that mother-child dyads jointly experience. The third and fourth days of the learning activities specifically included activities focusing on building hot composting and worm composting piles. The day before building a compost pile to explore hot composting, all mother-child dyads were asked to bring some organic waste from home. Thus, the initial discussion of the day was about household waste. Before starting to build the compost pile, each mother-child dyad explained what kind of organic waste they brought from home, and then the compared the weight of the wastes by utilizing simple weighing utensils (Figure 4.11). Children were asked to share what types of organics they brought and the stories behind how they decided to bring appropriate green and brown materials that emerged the from home environment. Children's experiences are presented in the excerpts as follows:

C₁: My mom made a salad for dinner yesterday. We segregated the peels of tomatoes and the rockets' sticks. We talked about how they are greens. Thus, we brought them to school. But only green waste is not enough. We also collected brown waste from the school garden. We had two bins of brown and one bin of green waste.



Figure 4.11 *Two Participant Children Compare the Weight of the Organic Waste They Brought From Home and Discuss About What Kind of Leftover Food Scraps They Brought*

C₈: I brought walnut shells. As I have learned, *Soso* likes them very much. My mom and I broke them into very small pieces for microorganisms and worms. So, they can decompose faster. Or the worms can eat faster and poop faster.

C₂₃: Before cooking for dinner, we discussed which materials are green organics and which materials were brown organics. Then, my mother told me we could cook Eggplant with ground Meat. While peeling and chopping the vegetables, we thought about which of the ingredients were compostable and which were not. We separated the eggplant and tomato peels and onion skins. Contrarily, we did not bring the meat. Meat is not compostable. So, I brought eggplant and tomato peels as well as onion skins to the schoolyard.

Intriguingly, several children highlighted that they segregated the food scraps they brought to school since they were not garbage anymore.

C₁₃: That morning we ate a potato omelet. Thus, I put aside egg shells and potato peels to bring to school. Beforehand, we threw them into the garbage bin, but this time, we did not. They are not garbage. They can be recycled.

C₁₃: My mom and I collected the fruit scraps. Tangerines and peer peels were the organic materials that we brought to school for our activity.

R: How did you decide on those materials as organic materials or not?

C₁₃: We remembered *Soso* (giggling). We rethought what *Soso* liked and did not like. He liked to eat all of those foods, we know.

R: Okay. Then, what were you doing before you encountered *Soso* and learned about composting?

C₁₃: I guess we threw them into the garbage bin located in our kitchen. However, they are not garbage anymore. They are waste. I have already learned about it.

R: Is there anything else *Soso* like to eat?

C₁₃: It likes peels of fruits, for example.

R: For example?

C₁₃: Banana, apple, watermelon. That's all.

Bringing organic waste from home was considered a bountiful point among participants to make them recognize that organic waste has a fundamental place in daily life. Related to this, C₄ expressed her ideas as follows:

My mom and I tried to separate organic waste during preparing dinner yesterday evening. I have realized that there was too much organic waste that we typically throw in our garbage bin. However, this time we collected them separately because we already know that they are not garbage anymore. We know that they can be recycled. Earthworms and snails are able to eat them and turn them into valuable material for the soil. In addition, there is just one point that I want to mention that it was surprising for me that there are too many leftovers while preparing a meal. Last night we made a salad and there are leftover lettuce, onion, tomato, and cucumber. What is more, my mom peeled the potatoes and there were leftovers of potato peels. I mean, wastes [organic] are everywhere. I never noticed that before.

In post-interviews, considerable interest of children was caught compost ingredients as browns and greens. The storytelling activity which was held on the second day already informed participants that there are two main ingredients to maintain a perfect compost pile which are carbon-rich ingredients and nitrogen-rich ingredients. Nitrogen-rich ingredients are known as greens which could be grass clippings, fresh fruits and vegetable scraps, and green leaves. Carbon-rich ingredients were identified as dried leaves, cardboard, pine cones, etc. In post-interviews, none of the participant children indicated organic waste as either carbon-rich or nitrogen-rich. On the other hand, children categorized compostable waste as greens and browns. Each child addressed at least one green and brown organic waste. What is more, the majority of children described how a successful compost pile is maintained with correct ratios. 16 children stressed that two cups of brown and one cup of green is the ratio to get a healthy compost pile. As C₁₈ indicated "... we need three small bins. One of those bins for the greens and the rest of the two bins for the browns" and C₉ mentioned the ratios as "we have three small bins. We filled them with dry leaves and vegetable scraps. We filled two bins with leaves from the schoolyard and one bin with vegetable scraps". C₁₈ and C₄ also depicted how brown and green organics were designed into a compost bin as follows:

C₁₈... after collecting dried leaves, pine cones, and tree branches from the schoolyard, we put them into two small bins. We made them into smaller pieces and filled the two bins. Also, one bin was filled with the fruit and vegetable scraps that we brought from our home. Firstly, we put one measure of waste from the brown bin. They seem very fluffy. Then we put one measure of waste from the green bin. In the end, we put another bin which was filled with browns. Actually, it looks like a sandwich (giggling).

C₄: Preparing a compost pile requires food scraps and dry leaves. We brought food scraps from home. We selected the appropriate food scraps with my mom, because earthworms, snails, and some little bugs do not prefer to eat all kinds of food scraps. Therefore, we selected cucumber and potato peels. My mom and I think that they

would be really delicious for them. Cucumbers are the greens for Soso, right? We also need brown food. We found the browns in our schoolyard (Figure 4.12). My mom and I collected the dry leaves, slim sticks, and little tree shells. I also found pine cones.

C10: When preparing our small compost buckets, we put both brown and green wastes. Before preparing the compost pile, we cut the brown leaves we collected from the garden into small pieces. Then we shredded the banana peels, apple peels and tangerine peels we brought from home. In the end, we had two buckets of brown and one bucket of green organic waste.

C4:my mom and I collected dry leaves. There were many dry leaves in our school garden. Then we put the dry leaves into a bucket. Before putting them, we broke them into the small pieces, because it speeds up the composting process for microorganisms, doesn't it?



Figure 4.12 *A Mother-Child is Collecting Dry Leaves to Add to the Compost Pile*

Another promising finding that emerged from children's post-interviews was that children were able to talk about the need for organic wastes which are categorized as green and brown. Related to this, there is a good match between what the story of *Soso* already told children the day before and children's depictions of building a compost pile. Herein, green organics are rich in nitrogen, whilst browns are carbon or carbohydrate materials. Such technical knowledge was specifically shared with the participants' mothers, not with the children. On the other hand, children were informed about microorganisms as "very tiny living things that are found all around us and it is not possible to see them, since they are too small to be seen by the naked eye". The researcher also added that "...they are pivotally important to support the life of living things. For a compost pile, microorganisms have an important duty. They are the dancers of the compost pile. They love dancing so much. They dance very fast and then increase the temperature of the pile which is needed to break down the organic materials that we added, ok?". It has been found that "the dancing microorganisms" metaphor emerged as a novel finding in the post-interviews. Almost two-thirds of the participants ($n=17$) mention the microorganisms as the great dancers of the compost pile as heat boosters once green and brown materials are truly mixed up in a compost bin. The statements of the interviewees are illustrated as follows:

C₅: There are tiny things in a compost pile. They are on green materials. You told us that they are dancers. They dance so fast that they sweat. It means the heat increases. High temperature is needed for a compost pile. I mean those tiny things help us to get compost from the waste.

C₁₁: I do not remember the name, but there are very small living things. Actually, they are everywhere. They are responsible for hot composting. I think the hot composting name comes from those little things because they dance too much and so fast in the compost bin that it becomes hot. They are breaking down the waste.

C₂₃: I remember the microorganisms. We cannot see them, but they are everywhere. They are responsible for hot composting. They love dancing. They are fast dancers. They are dancing and increasing the temperature of the compost pile. This is what they do.

The conversation between the C₁₀ and the researcher also supports his friends' statements:

R: What do we need to build a compost pile?

C₁₀: We need a compost bin, water, and waste.

R: Could you please tell me what kind of waste we need?

C₁₀: Hmm. Green organic waste and brown organic waste. There are two types. We need two buckets of brown waste such as dry leaves and one bucket of green waste such as grass and banana peels.

R: Okay. Anything else you remember about building a compost pile in a compost bin?

C₁₀: Hmm [thinking for a while]. Okay. We also need a thermometer.

R: Why do we need a thermometer?

C₁₀: Because a compost pile needs a hot temperature.

R: Do you remember who enables hot temperatures?
C₁₀: Yes, I remember. There are very tiny creatures. You said their name was microorganisms. They are so small that we cannot see them. They are living on many things, even on green materials. They are hardworking. They work to make the compost bin hotter and hotter to help the organic waste decompose.
R: Okay.

Contrary to pre-interviews, further analysis indicates that all children were able to give at least one example of green and brown organic waste in post-interviews. The majority of the children exemplified grass clippings ($n=14$) for green materials. Following grass clippings, banana peels ($n=13$), cucumbers ($n=11$), and spinach sticks ($n=8$) were mentioned as green materials. Plus, dry leaves ($n=17$), pine needles ($n=11$), nutshells ($n=10$), and cardboard ($n=7$) were stated as brown materials. This is illustrated in Figure 4.13.

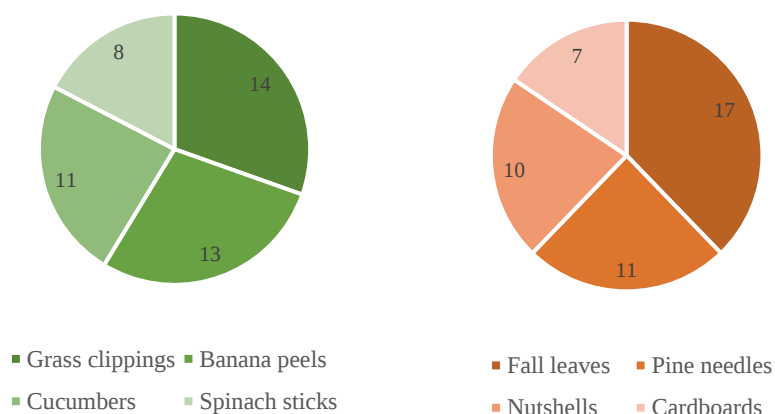


Figure 4.13 *Children’s examples of green and brown organic materials in post interviews*

To some extent, children’s reports on identifying green and brown materials were linked with the play activity in which mother-child dyads were jointly encountered. On the second day of the learning activities, after exploring composting with *Soso* in line with the storytelling activity, mother-child dyads were invited to the playground to participate in a play activity which was designed as a small competition to strengthen what they have already learned about what is needed to build a compost pile. Participant children and mothers jointly participated in that play activity and tried to take the play cards and then categorize the visuals as appropriate and inappropriate for a healthy compost pile (Figure 4.14 and Figure 4.15). Children’s statements on play activity are given below;

C₆: We can put paper, dry leaves, grass, pine cones, tea bags, and potato peels. However, a compost pile does not like cheese, red meat, glass, and bread. While playing with compost cards, I selected cheese and grass cards. I put the cheese in the red bucket which was the bucket that demonstrated the materials compost does not like and put the grass card into a green bucket which included appropriate materials for a compost pile.

C₁₄: The play activity in which we were participating with our moms was really exciting. We picked the cards hanging with the pins and tried to decide about the materials that would be appropriate to be included/needed for a compost pile or not. I remember that I picked a microorganism card. I put it in the green bucket since microorganisms are essential for a compost pile.

C₂: of course, I remember the play activity. We were two groups. We were trying to take a play card and categorize them as appropriate or not appropriate for composting. Our team won the competition because we run so fast and categorized the visuals on the play cards correctly. Once I selected a play card that illustrated a metal can and then put it in the red bucket which means a compost pile does not include metal. In another round, I took a thermometer visual and I put it in the green bucket, because we need a thermometer to measure the temperature of a compost pile.



Figure 4.14 *Each play card represents appropriate or inappropriate items for a compost pile*

The play cards and the play activity were also evoked in the conversation between C₂₂ and the researcher;

C22: Plastic bottles, glass, meat, and yogurt are not convenient materials for a compost pile. I put the card that illustrated a plastic bottle into the red bucket.

R: Why?

C22: Because microorganisms and even also earthworms do not decompose plastics.

R: Do you remember any other materials which are not appropriate for a compost pile?

C22: Umm. I remembered the game we played all together last week.

R: Okay then, would you like to tell me about this play activity? You pick up the cards hanging from the rope. Right?

C22: Uh-huh. We were grouped into two. There were also two buckets for each group. One bucket is red and the other bucket is green.

R: Yes. What did we do in the activity?

C22: You told us that children and mothers will pick up one card one by one. The person who took a card will decide whether the material is appropriate for a compost pile or not. If the material is appropriate, then it should be put into the green bucket. However, if it is not a decomposable material, then it should be put into the red bucket. That was the rule, right?

R: Well, thank you. You explained it very well to me. Well, which visuals were on the cards?

C22: For example, green grass, a thermometer, banana peel, and a coffee bean; these are all good for composting. I mean they are needed. But there were also cat and dog poops which is not compostable, for example. But there was also cow manure. Cow manure is compostable, but cat and dog poops are not, because they feed with meat.

R: Okay, you are right.



Figure 4.15 *Children and Mothers Jointly Participated in the Play Activity*

Since the third day of the learning activities serves a specific purpose on how a compost pile can be built, waste brought from home was gathered in a bin. Children's depictions of the hot composting process mostly included information on the physical features of the compost bin, the ratio of *green* and *brown* organic materials, and the materials utilized to measure the initial

temperature of the bin and watering pot. About half of the children ($n=13$) indicated the color and the holes in the compost bin. With regard to the questions “Would you tell me about the hot composting activity? What do you remember about it?”, the statements of C₁₈, C₁, and C₁₇ and the dialogue between C₄ and the researcher are given below:

C₁₈: I remember the hot composting activity. You brought us a big blue bin. There were also lots of holes in it. We put the waste in it. Two buckets of brown and one bucket of green. We helped microorganisms break down the waste. We also used gloves (Figure 4.16 and Figure 4.17).

C₁: We used a blue bin to mix our green and brown wastes. There were tiny holes in it. We built a compost pile. We mixed up the green and brown waste. I broke down a pine cone and put it in it.

C₁₇: I remember our compost bin. Before building the pile for composting, my mom and I collected fallen leaves from the schoolyard. We also brought some onion peels and nut shells from home. A-ha. I also remember the cook (Figure 4.18). She brought the food scraps. They were the leftovers from lunchtime. She brought us potato peels. It was very nice to see her.



Figure 4.16 Participant Children are Breaking Green Organic Waste that was Brought From Home and Brown Waste Collected From the Schoolyard into Pieces for the Compost Pile

R: How did we start our new compost pile?

C₄: We had a big blue bin in the garden.

R: Yes. Then, what did we put in that blue compost bin?

C₄: Green and brown organic waste.

R: Ok. Would you like to tell me how we put them into the bin?

C₄: First of all, we took one of the buckets filled with browns. I mean dried leaves and pine cones from the school garden.

R: Ok. And then?

C₄: Then we poured all the green waste into the compost bin.

R: What were they?

C₄: They were vegetable scraps. For example, potatoes peels, tangerine, and banana peels. At last, we poured one bin of browns. The arrangement was browns, greens, and then browns. That is, two browns and one green.



Figure 4.17 *Two Buckets of Brown and One Bucket of Green Waste are Ready to be Added to the Compost Pile*

Towards the end of the third event day, the kitchen cook came to visit the participating children and mothers with the organic waste left over from the lunch preparation process (Figure 4.18)

Firstly, the cook chatted about green and brown wastes and showed the children the green wastes she brought from the kitchen. She mentioned that a lot of organic waste comes out of the school kitchen every day. Together with the children, the cook shredded the organic waste and added it to the compost pile.



Figure 4.18 *The School Cook Visited Participants with Food Scraps Generated While Preparing School Lunch*

Of all the participants, 12 children also put emphasis on the need for water for a healthy compost pile. Those children mentioned that after putting the green and brown organic waste, they also watered the compost pile. According to respondents, microorganisms also needed water in order to work on decomposition. C₁₂ explained that “.... we held a watering pot and watered the compost piles one by one.”, C₈ added “we should also add water. We poured some water in our activity. We waited our turn and then each of my friends watered the bins”, and C₉ stressed that “we should be careful to add water to our compost pile. It should not be not too wet but also not too dry”. (Figure 4.19)

In addition, seven children particularly put emphasis on the reason for holes in the composting bin. Children reported that holes in the compost bin are for air which is important and quite necessary for microorganisms. The conversation between C₇ and the researcher is as follows:

R: I brought a bin on the third day. Do you remember?

C₇: Yes, I remember that bin.
R: Could you please tell me about that?
C₇: It was the blue bin.
R: Why did I bring it to you?
C₇: To put waste in it.
R: What kind of waste?
C₇: We brought green organic waste from home. Also, we collected brown leaves from the schoolyard. We put them in the bin.
R: And, then? Is there anything else you want to say?
C₇: We mixed our waste in the blue compost bin. Then, we added some water with a watering pot. There were also holes in the bin.
R: Why were there holes? What do you think about that?
C₇: Umm. If we give too much water, it runs off from the holes. Microorganisms do not need too much water. Plus, holes are necessary for air.
R: For the air? What does it mean?
C₇: In order to dance fast and decompose our waste mix, microorganisms also need air. So, you made tiny holes in the blue bin, didn't you?
R: Yes, I did, you are right.



Figure 4.19 *Participating Children are Hydrating the Compost Piles*

As this part of the instruction ended, a few children connected the role of temperature on the decomposition of organic waste. A compost thermometer was introduced to children in the activity process in order to measure the initial temperature of the compost pile (Figure 4.20). Of the total participants, nine children mentioned the thermometer, yet only four of them reported the need for a high temperature to decompose the organic waste. The dialogue between C₂₃ and the researcher illustrates how those children conceptualize the need for the compost thermometer;

R: ... how do we measure the temperature of the compost pile?

C₂₃: Umm, I guess we used a stick.

R: A stick? What kind of a stick was that?

C₂₃: There were numbers on it.

R: So? What was the first measurement number?

C₂₃: Umm. Could it be 40 degrees? Umm. I do not know.

R: Ok. Then, could you tell me what will be the temperature of the box four days later?

C₂₃: I guess, it will increase.

R: Why did you think like that?

C₂₃: You told me us about microorganisms. They are working hard to decompose the materials. Also, you told us that while working and even also dancing fast, they sweat. So, I think the temperature will increase.



Figure 4.20 *Participating Children are Exploring the Initial Temperature of the Compost Pile*

Sub-Theme3: Worm Composting; The Dance of Earthworms

Post-interviews included particular questions to evaluate children's deconstructed knowledge of earthworms. While children's pre-knowledge of earthworms already was revealed through pre-findings, the post-findings particularly indicated how children reconceptualize earthworms and their profound roles in the vermicomposting process.

The Worm Farm activity was launched on the fourth day of the learning activities in order to encourage participants to explore how a worm composting process is started. The day started with a play activity in which participant children and mothers were lined up and wriggling as an earthworm (Figure 4.21). The rule of the game was that the head of the worm tried to catch its tail. The play activity was considered as a transition to attract children's attention to the main -*Worm Farm*- activity.



Figure 4.21 *Participant Children and Mothers are Lined up and Wriggling as a Huge Earthworm*

After the play activity, each mother-child dyad was invited to tables located in the schoolyard to investigate real earthworms (red worms) collaboratively. At first sight, some of the participant mothers and the children reacted to worms as “ıyk”, “ugh”, yet after time passing, they enjoyed closely observing them with magnifying glasses (Figure 4.22) and the two small experiments that were jointly performed. Before the close investigation, a caution was shared with all participants which was, “Please be gentle. The earthworms you will explore a little later are very sensitive living things. You should behave gently towards them.” *The Worm*

Farm activity was started with a close observation of worms by utilizing magnifying glasses. Each mother-child dyad observed whether earthworms have eyes, ears, noses, mouths, and even also how they appear. A further analysis of children's responses in the post findings indicated that nearly all participants ($n=20$) stated that earthworms have no ears, no eyes, and no nose. On the other hand, participant children were aware that they have a mouth since one of their main responsibilities is to eat organic waste ($n=17$). Related to physical characteristics, 13 children reported that earthworms are slimy, pinky, and wriggly living things. To illustrate:

C₈: It was so funny to see the real earthworms. I couldn't believe it at first, but then I observed it with my mom. My earthworm was not so big. I mean it was a baby worm. It seemed to be pinky and wriggly.

C₃: My earthworm was pink. I looked through a magnifying glass. My mom and I tried to find her eyes, ears, and even nose, but we couldn't see anything. She did not have an eye, ear, or nose, but she had a mouth.

C₁₆: The earthworm that I observed with my mom is so slimy and wriggly. At first, it was not making me feel good, but then I liked to explore his body. Our earthworm is dark red, it seemed to be slimy and wriggly. I have also realized its rings. There are many rings on its body. Actually, it looked like a very hungry caterpillar, doesn't it?



Figure 4.22 *A Mother-Child Dyad is Exploring the Earthworm with a Magnifying Glass*

The mother-child dyads also participated in two experiments to investigate earthworm responses to the dark and light and to the wet and dry (Figure 4.23 and 4.24). To observe earthworm preferences, in the first place, each mother-child dyad was given a black cartoon and even a flashlight. Participants were also instructed to, “Hold the light on one side of the worm and the black paper on the other and observe what happens”. In response to this experiment, a novel finding in post-interviews emerged. Accordingly, 18 participants depicted their experiences that earthworms preferred to wriggle into the dark when the flashlights were shined. The highlights from children’s depictions are given below:

C₁₃: You gave us a flashlight and black cardboard. When my mom held the flashlight to the earthworm, it ran away toward the light. I think the flashlight disturbed him. He ran away toward the black card.

C₉: That day I felt like a scientist since we observed earthworms with magnifying glasses. Also, we did two experiments to explore earthworms’ responses toward light and dry places. In the light and dark experiment, my earthworm preferred to go toward the cardboard. I mean the dark place. It hates the light side and the shine of the flashlight.

C₂₃: ... the earthworm you gave me was so smart. He was able to recognize where it was dark and where it was light. When we shined the flashlight, he already understood what was happening, so it changed its direction and went to the black cardboard. It was so amazing for me to see it.



Figure 4.23 *A Mother-Child Dyad is Observing the Earthworm and Whether it Moves Toward the Dark or Light*

In order to explore whether earthworms like wet or dry places, participant mothers and children participated in one more activity. In this activity, each dyad was provided with two pieces of paper towels and a spray. Each dyad wet one side of the towel by spraying one piece of the paper towel. Then, participants were instructed as follows: “Please put the dry and wet papers side by side. Then place your earthworm gently in the middle of the dry and wet papers where they intersect. Then, observe the movement of your earthworm”. In post-interview sessions, all participant children consistently stated that earthworms love wet places. Children’s embellished responses are given below:

C₁₂: Does earthworms like dry or wet places? [Hmm] I think they love wet places. I dropped my earthworm at the center of the dry and wet part of my paper towel. Then, my mom and I started to wait. And my earthworm moved to the wet part of the paper. I think they have a strong sense and felt the wet part of the paper.

C₃: I remember the wet and dry experiment. My mom and I put the earthworm in the middle of the paper towel. The earthworm preferred to move towards the wet side. She was so smart. She likes wet things. I mean, she likes wet places such as under the soil.

C₁₆: ...my earthworm likes wet places. Once I put it on dry paper, my mom and I observed that he feels so uncomfortable that he tried to reach the wet side of the paper towel. It was good for me to observe the preference of an earthworm.

C₉: The wet and dry experiment was amazing because it showed me the preference of the earthworm. I generally encounter an earthworm on rainy days. If it is a rainy day, many earthworms are coming out from the soil and they are wiggling on the ground. It means they love rainy days. They love water. They like something wet. My mom and I saw that our earthworm started to move toward the wet side of the paper. My earthworm was so smart.

C₁₀ brought to light why earthworms prefer to live under the soil:

R: Well, do you remember the experiments you made with your mother? You did two different experiments and observed the earthworm.

C₁₀: Yes. I remember. I remember my earthworm. She was so fragile. Wasn’t she?

R: Yes, she was. You’re right. Earthworms are very sensitive living things. We need to behave gently. Could you please tell me about the experiments you did with your mom?

C₁₀: At first, we observed the earthworm with a magnifying glass. She had no eyes, no ears, and no nose. She just had a mouth to eat something. For example, organic waste.

R: Okay. Anything else you want to tell me?

C₁₀: My earthworm also had rings in her body. I simply recognized them by looking over from a magnifying glass. She seems as if she was made up of many rings.

R: Yes, there are ring-like structure segments in the skin of the worms to make worms move. It is very nice of you to pay careful attention during your observation. Well, how about the experiments you did with your mom? Do you remember them?

C₁₀: Of course, I remember.

R: Okay. Could you please share your exploration with me?

C₁₀: We did two experiments. First of all, we explored my earthworm's preference for the dark and light.

R: What happened?

C₁₀: She preferred the dark side. When we open the flashlight, she immediately moved toward the black cardboard. I mean she seems to not like dark places.

R: Okay. How about the second one?

C₁₀: After that, my mom and I placed two pieces of paper towels on the table. Then, we got one wet by spraying water. When we drop the earthworm in the middle of the wet and dry papers, the worm tried to reach the wet part. She did not like the dry part.

R: So?

C₁₀: I mean earthworms like dark and wet places. I think that is the reason why they live under the soil. Isn't it? For example, once we dug the ground, we could see them and they rose above the ground not on sunny days, but on rainy days. That's why we put water in the compost bin and spray water for earthworms and close the lid of the bin to make it inside dark.

R: Yes, you are right. Thanks for your explanation.



Figure 4.24 *Mother-Child Dyads are Exploring Whether the Earthworms Choose the Wet or Dry Side.*

Encountering real earthworms and exploring some earthworm facts fascinated children's attention to think about their critical role in the environment. *The Worm Farm* activity was also held on the fourth day and was considered an essential tool to immerse children in exploring how worm composting can be practically constructed. In this activity, mother-child dyads worked together and explored the steps of creating a worm composting bin. In the first step, slim cardboard and newspaper were used to make a bed to absorb the moisture (Figure 4.25). Children and mothers tore the newspaper and cardboard and then gently moistened them. After

making the bed, food scraps were broken down into small pieces by hand and added to feed the worms. Lastly, the worms were added to the mixture. After the addition of the worms, the mother-child duo moistened the worms and the prepared bed for the last time and prepared a suitable environment.



Figure 4.25 *Mother-Child Dyads Preparing the Bed for Earthworms as a First Step for Worm Composting*

Of all the participants, 14 children explained the reason why a bed is needed for earthworms while designing a compost. Those children suggested that a bed constructed with newspaper and cardboard is good enough to hold the water for a longer time. Related to this, C₉ suggested: “We used newspapers and cardboard to create moist conditions” and C₂₃ expressed, “My mom and I made a bed for worms. We used cardboard because they are good at holding water. In this way, worms continue to live in the moistened living environment”. Moreover, 8 children mentioned that newspapers and cardboard were also organic materials that could be easily decomposed by earthworms. C₁₅ and C₇ go on to conclude that:

C₁₅: First of all, we made a bed for the worm farm. We used cardboard and newspapers. My mom and I tore them up and placed them in the bin gently. Then, we sprayed the water because earthworms like moistened living environments. Plus, cardboard and newspapers can be also categorized as brown materials. I mean they

are organic materials that can be decomposed. My mom told me that my earthworm can easily eat them to make fertilizer which is good for the soil.

C7: You gave us a small bin to establish a farm for earthworms. My mom and I worked together. We made them a very comfortable bed with newspaper. We tore the newspapers up and put them at the bottom of the bin. We kindly moistened them. Then, we added lettuce. I mean we mixed both green and brown waste. While cardboard was the brown material, lettuce was the green one (Figure 4.26).

By extension, 13 participants highlighted the holes in the compost bin in post-interviews. Accordingly, the unction of holes was identified as squeezing the excessive water and ventilating. About this, participant children stressed that:

C20: Our bin also had lots of small holes. I think it is important for worms because they need air to live. Air is needed for good composting.

C4: I remember that there were lots of holes in my pinky composting bin. My mom told me that those bins were very functional to get air into the bin for earthworms. Since earthworms are working so fast with sufficient air, those holes are located on them.

C19: I saw holes in my bin. You told us that those holes are needed since they are used to drill if we spray excessive water for worms. I mean worms like wet and moist places, but too much could be inappropriate for earthworms.



Figure 4.26 *Food Scraps Prepared by Mother-Child Dyads for Worm Composting*

In post-interviews, children mentioned earthworms as hardworking living creatures playing a critical role in breaking down organic matter and fertilizing the soil. Of all the participants, 11 children mentioned that earthworms were responsible for recycling organic materials while 9

children highlighted how earthworms alter the physical structure of the soil and also increase nutrient availability.

C₁... I remember the Worm Farm we built with my mother. We put newspaper and lettuce in it for the earthworms. They ate the organic materials and then they pooped. [Giggling] His poop seemed like soil. I mean it seemed dark and soil-colored and not that smelly. Actually, it was very rich in nutrients.

C₈: I was curious about what was going on in my Worm Farm. My mom and I placed the waste and earthworms in a bin. I knew that *Soso* and his friends were working so much to break down the leftovers.

C₁₇: ...like microorganisms, earthworms are great decomposers of nature. They help nature. They recycle organic wastes such as paper, banana peel, lettuce, and apple peel. They produce something similar to the soil which is used as fertilizer. Fertilizer is good for plants, apple trees, and grass.

C₅: I remember that earthworms produce soil-like material. I mean they poop and it looks like mud. They are responsible to break down the organic waste by digesting them. Earthworms transform waste into perfect fertilization that helps our plants to grow.

C₂₀: I guess there are lots of earthworm poo in my Worm Farm. The earthworms in the bin are eating the waste. They eat and they poop. Earthworm poo makes the Earth a better place. They are decomposing the vegetable waste and bedding materials and producing fertilization for the soil.

Besides, 16 children metaphorically depicted worm composting as the dance of earthworms.

The related responses are given below:

C₁₄: Earthworms are great living things. They constantly eat and poop. They like eating strawberry and tomatoes and decomposing them. I guess the earthworms in my Worm Farm are dancing in it. They eat, digest, and poop. They work so hard and they have fun.

C₈: My mom and I build a compost bin together. I tore up the cardboard and prepared a comfortable living environment for the earthworms. We also put in melon peels. You told me that they like melon peels so much. Like microorganisms, earthworms also dance in the bin, don't they? They work hard to eat all the leftovers and produce poop to help fruit trees grow healthy. I mean earthworms will do a good thing. A good thing for our environment. A good thing for living things such as trees, grass and flowers.

C₂₃: ...My mom and I designed a Worm Farm for earthworms. I guess they are swirling, dancing, and eating in it. We fed them with newspaper and rocket leftovers and they help plants and soil through breaking down the waste. I mean they produce vermicompost. They produce it for the soil. When the earthworms produce their poops, we put them in our flower pots. It will be pretty good for our flowers, because the poop of worms feed my flower. It will look healthy and bright. It will smell really nice. Right?

Sub-theme₄: Composting is a Daily Sustainable Practice; “I Can Do It”

For the current study, composting was considered an essential tool for participants to explore what is sustainable and what is unsustainable. Children participated in a series of activities to experience the rituals of composting such as collecting food and garden scraps, sorting biodegradable and non-biodegradable materials, observing earthworms, and see them as great decomposers of the natural environment. Since composting is considered one of the best and most feasible ways to recycle organic waste and benefit the environment by reducing the burden on landfills. Plus, children’s depictions pointed out that they need to do composting to enrich the soil with rich nutrient-filled material. There were not any children to assert that composting can be done only in the garden; on the other hand, children expressed that the home balcony is quite an essential place to create a compost bin and follow the progress of the decomposition process.

In post-interview sessions, the majority of the children identified composting as a way they can reduce their waste. Of the participants, 14 children stressed that composting can simply be integrated into their daily routine as a fundamental part of life. Children’s responses were stated below:

C₁₃: ...of course, I can do composting. I just need some materials such as a bin, a thermometer, a water spray, dry leaves, and food scraps. I can get the kitchen scraps easily. I can also collect the leaves from the garden. Then I mix them. 2 cups of brown and one cup of green organic waste. That’s all.

C₂₀: I think that it is [composting] feasible to create a compost bin on our balcony. For that, I need a container and I need to fill it up with compostable materials. I mean, I will put dry leaves, pine cones, bananas, apple peels, and even also lettuce. Then I keep the bin and the organic waste moist to help the microorganisms. Since moisture is important for microorganisms, I will regularly spray water and blend the green and brown mixture to make them dance fast.

C₅: of course, I can do composting. It is quite simple. Actually, I need to do it. There could be different organic materials such as food scraps in our kitchen. My mom and I have already realized that organic waste is recyclable and we can also separate them to recycle them into fertilizer. Then, fertilizer makes the soil productive which in turn has a profound impact on vegetables, fruits, and plants. They help them to grow.

C₁₁: I think that we all need to learn about composting so as to reduce the amount of garbage left in the natural environment. My mom and I talked about this. We are not alone on Planet Earth. There are also animals, flowers, and cows. There are also many other people living in different countries. That is why we need to do composting. I can do it. I can separate the household waste and collect the organic materials. I also need a compost bin to fill with vegetable scraps, cardboard, eggshells, wood chips, and dry leaves to create the layers. In order to get the balance

right, I need two layers of brown and one layer of green materials. Moreover, I need to moisturize and mix the materials to promote air circulation. As you see, it is simple and I can do it at home.

C₂: Since organic waste is everywhere, we need to separate the food scraps to recycle them. As you taught us, we just need a bin with holes for air circulation, a water spray, cardboard, fruit and vegetable scraps, and earthworms. Worm composting is quite feasible and I can create a bin on our balcony. My mom told me that it will be my responsibility. I mean I will follow the progress; I will give enough water to earthworms. In this way, I am going to help the soil. If we do not contribute to composting, then nature does it. I mean when we produce waste all the time, this makes nature so tired because it is a natural process.

C₁₉: Hmm, I think it is easy and it is also important for nature. Instead of throwing kitchen waste into the garbage, we can turn them into fertilizer with the help of microorganisms and even also earthworms. Herein, we should know which items are compostable, since we can't recycle every kitchen waste. For instance, we cannot recycle bread, milk, cheese, meat, and cat and dog poops.

C₂₃:it was so exciting for me to learn about composting and observe the red worms. We can do worm composting anywhere. We are living in an apartment, but I can do it on our balcony. All we need is materials such as food scraps, garden waste such as dry leaves and a drilled small compost bin, and earthworms.

4.4.2.4 Children's Self-Reported Knowledge of the Value of Organic Waste Management

Sub-Theme1: Recycling as a Waste Management Strategy has Multi-Aspects; Environmental, Economic, and Social

Having identified the concerns of recycling, children were asked about the absence of the recycling process. By asking such a reverse question, it was aimed to make children think hypothetically on the question, *what would you think if we couldn't recycle?* It was found in the analysis of this question that environmental protection was identified as the most salient factor when it came to the motivation to support recycling.

Children ($n=14$) still thought that through recycling the natural environment was eliminated from garbage and the landfills seemed cleaner. Plus, children associated the absence of the recycling process with desertification and the loss of biological diversity. Related to this, C₁₃ stated that "... to my knowledge, the paper that we use for art activities and drawing is produced from tree. So, if we do not recycle the already used paper, it means we can lose more trees". And C₂₂ highlighted that "if we could not recycle the products that we have already used, we have to leave them to nature. I think this would be very bad for trees, flowers, and grass. Most probably, they would not be able to breathe." Children ($n=3$) who mentioned the adverse impacts of the absence of the recycling process on biological diversity are as follows:

C₆: I think we should do recycling. If we would not do it, the pupils have to cut trees, since the source of the paper that we use in everyday life is trees. If trees are destroyed, the birds, squirrels, and owls could not find a home for themselves. Maybe, they would become extinct.

C₇: You told me that it took such a long time for plastics to disappear in the natural environment. If we could not recycle plastics, then plastic bottles, bags, and toys would accumulate day by day. Then, they would turn into a huge plastic tower. Isn't it?

C₁₈: I know about sea turtles and whales. I watched a documentary with my dad. The documentary showed us that those animals have been negatively affected by plastic waste. These animals, who could not distinguish plastic waste from food, were eating them. Isn't it sad?

Moreover, seven children expressed that recycling has also economic benefits in conserving natural resources and energy conservation. Its tangible impact on the economic dimension was illustrated as follows:

C₁₀: My mom told me that Earth has limited resources. I mean they are finite. Some of those natural sources are in very short supply. Recycling helps the Earth. When we separate the waste and put them into separate bins, we help create fewer new plastics. It means we help to use less energy to produce something new. Right?

C₉: If we couldn't recycle, we would always have to produce. We would have had to use resources more. But resources may run out. We may not always find sources in nature. We may run out of water. Electricity may run out. Paper may run out. We need to know how to use it again. For example, I use both sides of the paper when I'm drawing. I make toys for myself with my plastic bottles.

Even though a small number of child participants suggested that recycling has a social dimension, this finding is worth mentioning. When asked about the above-mentioned hypothetical question, two children commented on the social value of recycling as follows:

C₁₄: If we couldn't recycle, it means we cannot talk about the recycling bins and waste types in my home. One of my pleasure activities at home is separating paper and metals with my mom, dad, and little brother. While separating waste, we discuss on it. If there are a lot of glass bottles accumulated, sometimes my mother prepares a game for us. The one who separates it the fastest and puts it in the recycling bin wins the game.

C₁: I learned about recycling at school. After I have learned about it, I told my dad. For example, I didn't know how to make compost before. I have already learned about it. Now I know how to make compost and what to feed the worms with. I know that worms will make fertilizer for us. I told that to my grandparents. My mom also told her colleagues. They've already learned what compost is. That is the reason why it is important to talk with others. Now, the others also know about composting and maybe they can do it in their kitchen balcony or maybe they can do it in their village garden. I do not know.

Sub-theme₁: Being a Compost Star: Let's Talk About Composting!

In post-interviews, participant children were asked about their feelings when they took the shiny stars at the end of the composting learning activities. On the last day, the researcher arranged a small ceremony to congratulate the participants for their participation in the learning activities. Children and mothers were presented with a star-shaped necklace (Figure 4.27) indicated that they actively participate in all of the stages of the composting learning activities and showed their enthusiasm to explore recycling organic waste.



Figure 4.27 *Star-Shaped Necklaces were Presented to Children and Mothers to Celebrate Their Participation.*

The researcher presents the compost star to participants, saying, “from now on you are compost stars. Your job as a compost star is to share with others what you’ve learned, to talk about composting”. While participant children can perform home and school composting, they also have the potential to bring about change by influencing peers, family, and the wider community. In post-interviews, all participant children mentioned that they communicate with their parents, siblings, peers, and even also neighbors to share what they have learned in composting learning activities. Of the participants, 19 children stated that they wanted to share why we need to compost with others to foster knowledge and encourage them to start up home composting. Children’s responses were given below:

C₅: I like my pinky compost star necklace. I wore it all day. My mother also wore it and her friends asked her “What is it?”. I also told my friends about composting, because I am a compost star, my responsibility is to share with others so as to encourage them to do composting. I think it is important. The more people we tell, the more we help nature.

C₁₆: I remember the last day. That day, you gave me and my mom a compost star necklace. My name was written on it. I felt good about it. It was a black and gleaming star. I wore it. I had the chance to share what I have learned with my cousin. I have told her that we do not have to throw our kitchen waste away. It is possible to recycle them. By recycling, a watermelon peel can be turned into fertilizer which will be a good source for the soil. Thus, we can prevent the garbage from piling up.

One further point that children made in post-interviews is that clear communication about the importance of composting with family members is an essential starting point to start up home composting;

C₁: ... yes, I have been a compost star. You gave me and my mother a star-shaped necklace and you thanked me for my participation. I have also told what I have learned to my dad. I mentioned earthworms and their decomposer role. Then, my dad offered me to have separate bins in our kitchen to separate food scraps and garbage. We will do it.

C₁₄: My star necklace was shining so brightly that my grandparents were curious about it and asked me what it was for. Then, I explained to them about composting. I explained what I have learned about earthworms and how they eat potato and banana peels to produce poop as a rich-nutrient material for the benefit of the soil.

The conversation between the researcher and C₁₅ is located below:

R: ... do you remember the star I gave you?

C₁₅: Yes, I remember. My star was yellow and my mom had a red one.

R: Okay. Can you please remind me why I gave you a star-shaped necklace? What did that mean?

C₁₅: You gave it to me because I have learned about composting. I participated in games, observed the earthworms, collected the organic materials, and helped you to create a compost bin in our school garden.

R: Yes, you are right. But I am curious about what does it mean to be a compost star?

C₁₅: It shows that I know about composting. I know about compostables. For instance, I know about what *Soso* likes and what he does not like.

R: So, what does a *Compost Star* do?

C₁₅: Hmm. I talked about what composting is and why we need to do composting with my friends and my brother.

R: Hmm. Why did you tell them?

C₁₅: Because I am a Compost Star and I think it is important to tell other people. My mom and I learned about that, but it is vital to talk with others. Composting helps to cut down the amount of trash in the landfill. Also, through composting, we have a chance to transform garbage into valuable nutrient-rich soil which feeds the plants and makes them grow. It is easy and one of the best ways to recycle. That's why, I tell people so as to encourage and inspire them.

R: Okay. Thank you.

Subtheme₂: Composting Could Be a Common Shared Activity

For the current study, exploring the recycling of organic waste as an everyday sustainable practice is considered a great way to make children learn about the environment by researching and experimenting with the hot and vermicomposting processes. In order to reveal how children conceptualize composting after participating in learning activities, the value of recycling organic waste was asked in the post-interview. All respondents agreed with the notion that composting was pivotally important for the natural environment. Related to this; C₈ said, “I think it is important. We have to do this for the natural environment”, C₁₁ said, “Composting saves the landfills. If all wastes and garbage are released into the environment, the landfills become stuck. Composting makes the organic waste break up and feed the soil” and C₁₄ said, “We discussed it with my mum. Home composting helps the environment. It reduces the amount of waste, so landfills have more space. This is important” and C₃, “Composting is good for earthworms”. The conversation about the need for composting between C₄ and the researcher is as follows:

R: What do you think about composting? Actually, what do you think about the value of composting?

C₄: Composting is important for the soil. It is useful for the soil.

R: How does it benefit the soil?

C₄: It feeds the soil. For example, when we separate organic waste to make compost instead of throwing it in the trash, they turn into a useful substance that nourishes the soil. You told us it was called black gold.

R: Yes, I did. So, what is the function of it [Black Gold]?

C₄: There are minerals and vitamins in it. This means that we will eat healthier fruits. Besides, it will not accumulate in nature because we recycle our waste. So, nature will continue to breathe.

R: Okay.

Other responses to this question pointed out that contributing to composting can easily turn into a common shared activity. A further novel finding is that just over half of those ($n=12$) who answered about the value of organic waste management reported that composting can create consciousness and simply encourage families, friends, and neighborhoods to build a more sustainable society. Children agreed that when they care for the environment by supporting composting activities in their community, this can create a new perspective of care, respect, and sustainability of life on the planet. Related responses of interviewees are located below:

C₈: While chatting with my mother, we actually talked about how much organic waste there is in our daily lives. We have it at home and at school. There are parks and gardens. So, this is a situation that is relevant to everyone. Everyone can be a part of composting. I can tell them how to do it. Thus, we will protect nature together.

C₁: We can carry out the recycling of organic waste in the garden of our apartment building together with our neighbors. Some of us bring green waste, while some children can collect brown waste. If we make worm compost, we can feed the worms all together. It would have been so easy then.

C₉: Organic waste doesn't just come out of our homes. For example, there is waste also at our neighbor's house. I have it at my friends' house too. It is also in the kitchen of our school. Therefore, we can create a large compost bucket altogether and do hot composting in it. Wouldn't that be nice?

C₂₂: Everyone should compost, not just me and my mother. I think it's everyone's responsibility. Organic waste is found in many places. That's why we should definitely place a compost bucket in our school and in the garden of our apartment building. So, everyone who sees can bring their waste. They can be encouraged about this. This would be very nice.

C₁₃: I know the importance of composting. I have already learned about it. So is my mom. When making salads, we store the arugula shells and onion peels in a separate place instead of throwing them in the trash. Our next-door neighbor, who saw this, was curious. I also told her why we did this. She was also very impressed and said "I will do it" too. I will also teach worm compost to my friends later. If everyone learns, we will stop leaving our waste to nature as garbage. If we do it together, we will bring more compost to the soil.

4.4.3 Follow-Up Findings Related to Children's Knowledge on Recycling Organic Waste

A follow-up study was conducted with participating children three weeks after the learning activities in order to figure out what they still knew and remembered regarding the learning experiences they had participated in. All of the children who participated in the post-interviews also participated in the follow-up interviews.

Within the scope of the follow-up study, all questions asked to participating children in the post-interview protocol were utilized again. As in the post-interviews, the participating children shared their expanded knowledge about organic waste recycling and shared what they had learned about the importance of organic waste management and composting in follow-up sessions. When the follow-up interviews were analyzed, children's responses were categorized into three themes, namely, i) children's self-reported knowledge of waste and recycling, ii) children's self-reported knowledge of organic waste management, and iii) children's self-reported knowledge of the value of organic waste management (Table 4.4). This section presents prominent findings that emerged from the follow-up interviews. Conducted with participating children.

Table 4.4 Themes and Sub-Themes that Emerged From the Follow-Up Interviews of Children ($N_{follow-up}=23$)

Themes	Sub-themes
Children's self-reported knowledge on waste and recycling	- Not everything is garbage ($n=18$) - There are recyclables, such as paper ($n=19$), plastic ($n=14$), glass ($n=7$), and metals ($n=12$), and recyclable organic wastes such as banana peels ($n=13$), apple scraps ($n=6$), dry leaves ($n=9$), tree barks ($n=7$), egg shells ($n=3$) and walnut shells ($n=3$)
Children's self-reported knowledge on organic waste management	- There are biodegradables and non-biodegradables ($n=13$) - Hot composting; The dance of microorganisms ($n=15$) - Earthworm facts: No eyes, ears, nose and no legs and arms ($n=17$) - Worm composting; The dance of earthworms ($n=12$) - Composting is a daily sustainable practice; "I can do it" ($n=13$)
Children's self-reported knowledge on the value of organic waste management	- Composting as a waste management strategy has environmental impacts ($n=11$) - Being a <i>Compost Star</i>: Let's talk about composting! ($n=18$) - Composting could be a common shared activity ($n=12$)

4.4.3.1 Highlights Emerging from Children's Follow-Up Interviews

The follow-up interviews started with a general question as in the post-interviews. Participant children were asked what they remembered the most about the learning activities they participated in with their mothers, and/or what came first to mind when they thought about the learning activities. Of 23 participants, 11 children mentioned the visit of *the Garbage Witch*, while 10 children talked about the "*Meyve Sepeti*" game. Besides, the worm farm activity carried out on the fourth day was quite memorable for 8 children while 4 children expressed the book reading activity in which the puppet *Soso* was included. The comments below illustrate children's initial answers in the follow-up interviews:

C₈: When I think about activities, the *Garbage Witch* comes to my mind. She came to visit us. She had a black cloak and a black witchy hat. There was waste on her cloak. There was a plastic bottle, a metal box, a chocolate package, and a banana peel. *The Garbage Witch* had asked us; "I am a Garbage Witch and I don't know how to deal with this waste. Could you help me?" ... We helped her. We showed her the place of recycling bins.

C₁₅: ... You've read a storybook. It was *Soso's* story. The earthworm puppet had met us before the story. It had red and black rings on it. *Soso* mentioned the foods he liked and did not like throughout the story. He was pooping after eating the food he liked. That's what was called compost. Right?

C₂: I remember the story of *Soso* and the story cards. We saw *Soso's* house on those cards. It is living under the ground. Snails and insects were *Soso's* friends. They were all very hardworking. They were crawling under the ground. *Soso* was digging tunnels under the ground.

C₂₃: Hmm.. I remember the *Meyve Sepeti* game we played with our mothers. We have all been a fruit in this game. We had fruit cards. I became a mandarin. When the midwife said the name of a fruit, those fruits were changing places. When "all fruits" was mentioned, everyone was mixing in the basket. It was very enjoyable.

C₁₀: Of the activities, I remember the time when we observed the earthworms the most. We observed it with magnifying glasses. My mother and I were very kind to them. ...the worm we observed liked the dark side more.

C₅: I remember the activity where real earthworms visited us. My mom and I put on our gloves and discovered the worms. We examined a baby worm. They had tiny rings. He had no eyes, nose, or ears. We moistened our worm from time to time. Later, we prepared a farm for them from melon peels, tea leaves, and newspapers.

C₁: Hmm... When I think about activities, the first thing that comes to mind is the puppet. The puppet had come to visit us. His name was *Soso*. *Soso* told us about where he lives under the ground, his favorite foods, and his best friend, the snail. *Soso* liked to live in wet places, but he avoided dry places, didn't he? There were rings on it.

4.4.3.2 Children's Self-Reported Knowledge on Waste and Recycling*Sub-Theme₁: Not Everything Is Garbage*

Following the initial question, children were asked about the difference between waste and garbage. The overall response to this question pointed out that 18 children stated that garbage and waste are not the same thing; waste can be reused or recycled, unlike garbage. While the children continued to define garbage as "*useless*", they expressed the concept of waste as "recyclable". As one interviewee (C₇) said, "Waste and garbage are not the same things. We can decompose our waste and send it to recycling. I mean waste can be re-evaluated, but garbage cannot" and one child (C₆) commented, "What we call garbage is materials that no longer is "in use", but we can re-evaluate waste. We can reuse it without needing to buy anything else." The dialogue between the researcher and C₃ is as following:

R: ... so what do you think garbage is, what is waste?

C₃: Garbage is things that can no longer be used. Things that are thrown in the trash. But when we say waste, we should think of things that can be recycled. Those that are recycled are waste.

R: Can you give an example?

C₃: Paper is a type of waste. Plastics are also going to factories to be recycled. *Sosos* can recycle melon peels, teas, and banana peels. They make fertilizer. We should not throw away banana peels and tea pulp in the trash.

Sub-Theme₂: There are Recyclable Organic Wastes

Following children's depiction of waste and garbage, they stated paper ($n=19$), plastic ($n=14$), glass ($n=7$), and metal ($n=12$) as recyclable wastes once more. Taken together, when asked which of the recycled materials do you know, all of the children stated that organic waste is also recyclable and provided the examples of banana peels ($n=13$), apple scraps ($n=6$), dry leaves ($n=9$), tree barks ($n=7$), egg shells ($n=3$), and walnut shells ($n=3$) (Figure 4.30).



Furthermore, in follow-up interviews, Figure 4.2 () was offered once again, and the visuals were discussed with each participating child. Children's expanded knowledge of recyclables was clearly identified in their follow-up responses. Similar to post-interviews, children described apple waste ($n=12$), dry leaves ($n=14$), and banana peel ($n=18$) as biodegradable wastes, while meat ($n=9$), ice cream ($n=17$) and cheese ($n=12$) were expressed as non-biodegradable. Regarding this, the children stressed that meat, cheese, and ice cream will not get into a compost bucket, since earthworms do not like these foods. When Figure 4.2 was shown, only two children defined cheese as biodegradable, but the remaining children did not put it in this category. What is more, ice cream, milk, and plastics were identified as decomposable. Related to this, the conversation between C₁₂ and the researcher is given below:

R: Please look at those visuals once more. Just tell me. Which ones are recyclable?

C₁₂: Okay. Banana peel, dry leaf, and apple scrap are all recyclable.

R: Can you put these in the compost heap?

C₁₂: Of course. I put it in pieces so that it turns into fertilizer faster.

R: Can you put the ice cream in the compost pile?

C₁₂: No. *Soso* wasn't eating ice cream. That's why I won't put it in.

R: What about the plastic bottle?

C₁₂: No, I wouldn't put that either.

R: Then, what do you think about tea pulps?

C₁₂: Hmm, I think it is delicious for *Sosos*.

R: Okay.

4.4.3.3 Children's Self-Reported Knowledge of Organic Waste Management

Sub-Theme₁: There are Biodegradables and Non-Biodegradables

One of the highlights of the follow-up interviews was that the participating children talked about biodegradables and nonbiodegradables to get healthy and qualified compost. The

majority of respondents ($n=13$) stated that not every type of waste can be put in the compost bin during the recycling process of organic waste; there are degradable and nondegradable that need to be distinguished. In this context, they mentioned *Greens* and *Browns* as biodegradables, while they described those that should not go into a compost bin as nonbiodegradables. For example, a participating child (C_{17}) said, "We can put dry leaves and apple peel in the compost bucket, but we can't put bones". In addition, C_1 said, "We should add one bucket of Greens and two buckets of Browns to build a compost pile to get healthy compost" and C_9 agreed, "There are some wastes that we should never put in a compost bucket. That is, there are some wastes that worms do not eat, or microorganisms do not like. For example, cheese, ice cream, cat and dog poops, meat, etc."

Sub-Theme2: Hot Composting; The Dance of Microorganisms

Considering children's thoughts on hot composting, in the follow-up interviews, participating children particularly put emphasis on the blue compost bucket to describe how to create a compost pile. Of 23 children, 15 children mentioned how the composting process was started on the third day of the composting learning activities. About this, one informant (C_{11}) reported, "We used a blue bucket to start hot composting. There were a lot of holes in this bucket for the compost to get air," and another interviewee (C_6) expressed; "We had put two buckets of *Brown* and one bucket of *Green* organic waste for the blue compost bucket. Then we watered it to moisten it". Commenting on hot composting, 12 participating children emphasized the role of microorganisms in the hot composting process. Regarding this, one participant (C_9) reported, "the microorganisms were dancing so fast that they rotted the leaves and melon peels," while M_{12} captured the issue "as the microorganisms dance, they increase the temperature inside the compost bucket. Thus, Green and Brown waste begins to turn into compost." The conversation between C_{15} and the researcher provided an embellished dialogue on getting started on hot composting:

R: I would like to talk a little about our activity on the third day. We started the hot composting process that day. Do you remember?

C_{15} : Yes, I remember

R: Would you mind giving me a little detail? What did we do?

C_{15} : We brought organic waste from home that day. We used this waste.

R: Yes, that's right. What kind of waste did you bring?

C_{15} : My mother and I brought eggshells, arugula leaves, and tangerine peels. My friends brought it too. Then we collected dry leaves and pine cones from the schoolyard.

R: Why?

C_{15} : Because we needed two buckets of brown waste.

R: Okay. Then what did you do?

C_{15} : We put on our gloves and tore up the waste together with our mothers.

R: Why?

C₁₅: So that micro-organisms can make fertilizer faster.
 R: What are microorganisms?
 C₁₅: We cannot see microorganisms with the eye. They are very, very small, but they move very quickly. They rot away waste.
 R: Okay. So how did we prepare the compost heap?
 C₁₅: We put the green and brown waste respectively and we moistened it.
 R: What else?
 C₁₅: We also measured the temperature with a thermometer stick.
 R: How many degrees was it?
 C₁₅: Hmm. I don't remember.
 R: Okay. And after a few days, did the temperature increase or decrease?
 C₁₅: It increased. My mother told me that there might already be some fertilizer because the temperature has increased.
 R: Yes, that's true.

Sub-Theme₃: Earthworm Facts: No Eyes, Ears, Nose, and No Legs or Arms

Concerns regarding earthworm facts were also widespread in children's statements in follow-up interview sessions. When asked how they observed earthworms and what they have explored about them, about two-thirds of the participants ($n=17$) mentioned the physical characteristics of the worms. While 14 children agreed that red worms do not have ears, noses, or eyes, only 3 children stated that worms also have eyes and so they can move. In addition, the vast majority of children stated that they had observed in their experiment that worms preferred the dark side, not the light side. As one interviewee (C₁₁) put it:

My mom and I conducted an experiment using a flashlight and a small black cardboard. We realized that the worm was turning to the dark side intentionally. It didn't like the light. It ran away from the light. I mean worms love dark places.

And C₃ added, "My worm was a very mobile worm. But when I shined light on it, it didn't like it at all and turned to the dark side. I wanted to turn off the light when it felt uncomfortable." To elaborate, participating children also talked about their experiments on whether worms liked wet or dry environments during the follow-up interviews. Almost half of the children ($n=14$) who participated in the follow-up interviews stated that their worms wanted to stay on the wet side of the paper towel. One respondent (C₂) highlighted that "When I put my worm in the middle of the dry and wet area of the paper towel, I saw that it was heading towards the wet side. My worms started to curl up in an uncomfortable way in the dry side" and C₅ commented:

It was quite interesting to see that the worm had a preference. It did not want to go to the dry side. The worm directed its body toward the wet area. That's why they come out to the top of the ground in rainy weather. Right?

The conversation between the researcher and C₂ about the two experiments with earthworms is as follows:

R: ...can you tell me how you conducted the experiments?

C₂: We did two experiments with my mother. In one of them, we shone a light on our worm.

R: And then what happened?

C₂: When we turned on the light, the worm went towards the black carton. So, he had escaped the light. Because worms like to live in dark places.

R: Ok. And what did you discover in the other experiment?

C₂: In the second experiment, we put our worm in the middle of a wet and dry napkin. He started moving towards the wet side. The dry side bothered it. So, we wanted him to go to the wet side right away.

Sub-Theme₄: Worm Composting; The Dance of Earthworms

Another promising finding of the follow-up interview focused on worm composting. Although it was three weeks after the completion of the learning activities, the participating children ($n=19$) were able to remember the details about worm composting and describe the process.

Children's comments is given below:

C₁₀: I remember the worm farming activity. My mother and I named our worm *Sunflower*. Later we built a house for it. We first placed pieces of cardboard and newspapers inside the home. Then we put some green organic waste. We put tea leaves and melon shells. Then we gently put our worms into the small bin and closed the lid of the bins. Because it was supposed to be dark inside.

C₉: Earthworms are very hardworking and are able to convert fruit peels to compost. What we call worm compost is actually the worm's poop. My mother and I prepared a nice bed for him. We moistened this bed a little. Because worms don't like dry places. Then we gave green-colored delicious food by breaking it up. So, they can eat easily.

C₁₄: We used a small compost bin with drill holes for worm compost. This was because it was very important for worms to get air. Later, we made a bed for them with brown cardboard. On top of the beds, we put green organic waste. For example, lettuce scraps, celery scraps, and tea leaves. And on top of all this, we put our worms. Worms love tea leaves. They're going to eat it all and compost it for us.

C₂: I really liked the activity where the real earthworms visited us. I've never seen so many worms in my life. Although I was nervous at first, I later built a very nice house for the worms. I put green waste in it and I gave it water.

As in post-interviews, participating children depicted earthworms as wiggly living creatures working hard to transfer organic waste into fertilizer. In this respect, 14 children expressed the profound role of earthworms to increase the quality of soil through composting:

C₄: Worms are really hardworking. They can consume organic waste and recycle it quickly. The compost they make looks like soil. It's like a slightly darker-colored earth. When they make compost, the soil gives better fruits. Trees grow healthier.

C₇: My mother and I were surprised to see how hardworking earthworms are. When we were doing the worm farm, we gave a lot of tea pulp and melon skins to the worms. I really wonder how they're going to eat all of them and then how they're going to poop. How hardworking they are!

C₁₇:the worm that I observed with my mother was quite mobile. He was moving with a curl. This is how it moves under the ground and opens tunnels. It aerates the soil. Right? He also eats organic waste. He gets hungry, eats melon peels, and turns them into fertilizer.

Taken together, 12 children metaphorically depicted worm composting as the dance of earthworms. The related responses are as follows:

C₈: The worms in the worm farms are dancing there now. So, they work side by side. They consume the organic waste we give to them. After making fertilizer, we will put it in pots.

C₂₃: Worms actually have a very important role. They create fertilizer for nature. They turn waste into fertilizer. In other words, waste is thus not accumulated in nature. They are beneficial to the soil by turning waste into fertilizer. The worms are doing this by working fast under the ground in compost buckets with worms, that is, dancing [giggling]

Sub-Theme₃: Composting is a Daily Sustainable Practice; “I Can Do It”

Analysis of follow-up interviews demonstrated that over half the children's responses ($n=13$) stated that composting can be integrated into everyday life as a sustainable practice. Accordingly, since organic waste is generated in home and school kitchen every day, children indicated that they can simply do composting in their kitchen balcony and apartment garden. The following excerpts outline children's perspectives:

C₅: I can do composting. I have already learned about it. I need a compost bin for that. Then I collect organic waste. I collect banana peels, apple scraps, and walnut shells. I also need tea peels, because earthworms like them very much. I can do worm composting on our kitchen balcony. First of all, I can prepare a bed for the earthworms. The bed is made of newspapers. Then, I put the green organic waste. In the end, I add lots of earthworms. That is all.

C₁₀.... yes, I can do it! It is so easy to build a compost pile. Nature gives us brown organic materials such as tree shells, cones, etc. There is also green organic waste that emerges from dinner time. For example, when my mom makes a salad, I collect tomatoes, onions, and cucumber peels to use in my compost pile. I need two cups of brown waste and one cup of green waste.

C₁₃: It is my plan to do composting in my house. It is simple and fun. My plan is to do worm composting. I need a small compost bin, a favorite food of earthworms such as watermelon peels, apple scraps, banana peels, tea pulps, and dry leaves. I

also need a water spray to keep my earthworms wet. I break down organic waste to help my earthworms to eat faster and then poop.

4.4.3.4 Children's Self-Reported Knowledge on the Value of Organic Waste Management

Sub-Theme₁: Composting as a Waste Management Strategy Has Environmental Impacts

Follow-up interviews with the participant children three weeks after the completion of the composting learning activities revealed that children ($n=11$) associated the recycling process of organic waste with environmental benefits. Accordingly, the children emphasized that composting would reduce the amount of organic waste accumulated at home and at school, and underlined the benefit of the compost obtained at the end of the composting process to the soil. In this regard, C₆ said "If we compost in compost buckets, we do not throw waste into nature. Nature remains clean", while C₉ said "by composting, we reduce the amount of waste accumulated in nature. Instead of throwing it away, we can turn it into a more useful material, namely compost. C₁₄ added "...by composting, we help nature".

The dialogue between C₁ and the researcher about this sub-theme is as follows:

R: Well, I wonder, why we should compost? Why do we need to compost?

C₁: To manage waste.

R: What do you mean?

C₁: For example, we can compost the peels of fruits and vegetables instead of throwing them away and sending them to nature.

R: What happens then?

C₁: If we leave it in nature, it could damage the soil. There could be an unpleasant smell.

R: How does it damage the soil?

C₁: What I mean is that we should not leave organic waste directly into the nature. We should mix green waste and brown waste together.

Sub-Theme₃: Being a Compost Star: Let's Talk About Composting!

In the follow-up interviews, participating children were asked about their feelings and thoughts when they took their shiny stars at the end of the composting learning activities. Of all the participants, 18 children talked about being a *Compost Star* and explained why they and their mother were given a star-shaped necklace. Regarding this, C₄ said, "My mother and I became *Compost Stars*. You gave us a necklace because we attended the composting learning activities and were informed about compost". C₈ added, "My star-shaped necklace was shining. It had my name on it. I had become a *Compost Star* now." We can exemplify the answers of other children about the *Compost Star* activity as follows:

C₁₀: Being a *Compost Star* means sharing what you know with others. I mean, with your friends, with your grandmother, with your neighbors. If we tell others, everyone will know. They will also love worms and understand the favorite fruit peels of earthworms.

C₂₃: The day I became a *Compost Star*, I told my friends what I had learned. Then I told a neighbor of ours. They were very interested. They said if you teach us, we can do it all together. I will tell them what I have learned. I will also say that we need worms.

C₁₁: My mother and I shared what we knew with everyone when we became *Compost Stars*. Because the more people know, the less waste accumulates in nature, as my mom told me. *Compost Stars* can accumulate and recycle organic waste at home and at school. Anyone can do it.

C₇: Dad was curious when he saw our star-shaped necklaces. Mom and I told him about it. Now my dad knows too. My mother had told her colleagues what compost was. Because she was a shining *Compost Star*. I am also a *Compost Star*. I will tell all the things I learnt to my friends.

Sub-Theme₂: Composting Could Be a Common Shared Activity

As in post-interviews, children ($n=12$) stated in the follow-interviews that they should share about composting with other stakeholders such as families, friends, and grandparents to make them conscious about recycling organic waste. Accordingly:

C₁₂: I think organic waste is everywhere. My mom told me about how much organic waste comes out of the house. Not all waste that comes out when making salads, preparing breakfast, and cooking is garbage. It's the same at my grandparents' house. For this reason, everyone should know about how to make compost. If people know and do it, the waste will be reduced so that our environment will be able to breathe.

C₁₆: I think everyone should know. Everyone should learn. Because everyone can have organic waste in their home. Everyone is eating and cooking. We can turn tomatoes, potato peels, onion peels, and fruit peels into fertilizer instead of throwing them in the trash. We can do this if we take care of our compost bucket nicely, and moisturize it. If everyone does this, we will not leave our waste to nature. We will turn it into fertilizer and give it to the trees in the garden of our apartment. We can also use the fertilizer for the flowers we look after in our home.

4.5 Executive Summary of the Findings That Emerged from Children's Interviews

One of the research goals of this study is to reveal participating children's self-reported knowledge about recycling organic waste before and after participating in the composting learning activities. For this purpose, semi-structured interview questions before and after the 5-day learning activities were useful to capture the change in children's self-reported knowledge.

Consider Table 4.5, which plots the comparison of findings that emerged from children’s pre-, post, and follow-up interviews. Correspondingly, prior to participating in learning activities, waste, and garbage were stated as synonyms by the majority of the child respondents. Children associated recycling with waste and garbage. Accordingly, recycling was linked with reusing and reevaluating something. In this vein, while plastic, glass, metal, paper, and batteries were exemplified as waste which was defined as recyclables, kitchen scraps were categorized as garbage which is sent to the garbage bin in their everyday lives. On the other hand, children’s extended knowledge evident in post and follow-up findings showed that all participating children stated at least one organic waste as a recyclable matter. As can be seen from Figure 4.28, the majority of child participants identified paper, plastics, glass, metal, and battery as recyclables, yet in post and follow-up interviews, children also touched upon organic waste and exemplified apple scraps, banana peels, dry leaves, watermelon, spinach scraps, tree barks, etc. as recyclable organic waste.

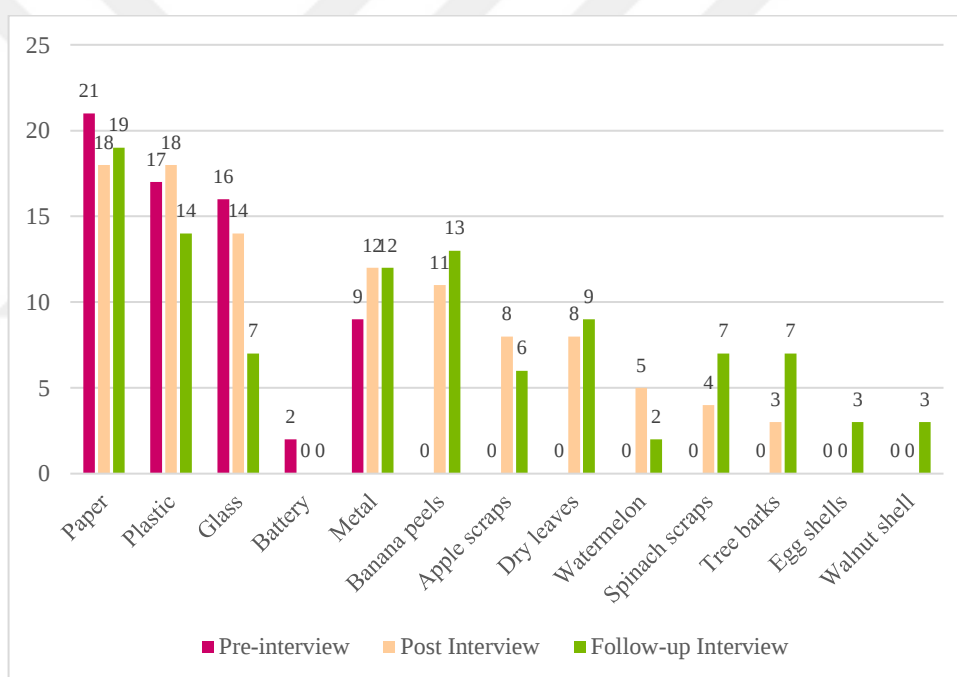


Figure 4.28 *Recyclables Mentioned in Children’s Post, and Follow-Up Interviews*

It has been found in post and follow-up interviews that the visit of the *Garbage Witch*, participating in play activities with mothers, and observing real earthworms were highlighted as the most memorable learning experiences throughout composting learning activities. Children particularly touched upon the embellished details of why the *Garbage Witch* visited them and what she needed. The materials on her cloak were depicted by the majority of

children in both post and follow-up interviews. Along with this, play activities in which children jointly participated with their mothers were reported as one of the most memorable learning moments. Plus, meeting and observing real earthworms was identified as one of the most memorable learning activities.

One of the prominent findings that emerged in post and follow-up interviews of children was that the majority of children recognized that organic waste is a part of their everyday life. Accordingly, since organic waste is everywhere such as in the home and school kitchen, they stated that exploring composting is a critical and daily-life related practice to manage organic waste. In pre-interviews, children did not know what organic waste was and how kitchen scraps and park and garden waste can be recycled. On the contrary, in post and follow-up interviews, the majority of children agreed that recycling organic waste is a daily life practice and they can simply do it in their kitchen balconies or in the garden of their apartments.

By extension, post-findings were elaborated through details embellished by participating children. Accordingly, in post- and follow-up interviews, children placed emphasis on biodegradables and non-biodegradables. As children differentiated them, it is eligible to use biodegradable waste for compost piles. On the other hand, nonbiodegradable materials such as milk and dairy products, meat and meat products, plastics, glass, and metals were outlined as inappropriate materials that cannot be included in a compost pile. Interviews conducted after the completion of the composting learning activities demonstrated that participating children's knowledge of recycling organic waste is enlarged when it came to how composting process is started, as well. Typically, the majority of child respondents mentioned *green* and *brown* biodegradables, and the need for regular aeration and moistening of the compost pile for the hot composting process. Taken together, in post and follow-up interviews, the majority of children justified the function and the critical role of microorganisms and described the hot composting process with the metaphor of the dance of microorganisms.

Accordingly, in the post and follow-up interviews, the participant children particularly emphasized the role of microorganisms in increasing the temperature of the compost heap in the hot composting process. They also said that sufficient humidity and ventilation would allow microorganisms to work effectively and accelerate the decomposition process of waste. In a similar vein, children mentioned about the profound role of the earthworms in decomposition of organic waste after participating in composting learning activities. It was also placed by majority of children that earthworms have an important role for insects, bugs, trees and flowers.

Table 4.5 Comparison of the Pre-, Post and Follow-Up Interview Findings of Children

Pre-findings	Post-findings	Follow-up findings
• Waste as synonymous with garbage • Kitchen scraps are garbage • There are recyclables such as plastics, glass, metals, paper, and battery • Recycling is for preserving the environment to prevent lands to fill with garbage • The source of food is the soil • Earthworms are sleeping under the ground. They come to the ground in rainy weather • Earthworms are in dark brown color. • They eat mud and bugs	• The <i>Garbage Witch</i>, play activities, and observing real earthworms were the most memorable learning experiences. • Waste and garbage are different things • There are organic waste such as apple scraps, banana peels, spinach scraps, watermelon, tree bark, dry leaves, etc., and also recyclables such as plastics, glass, metals, and paper • Organic waste is everywhere in everyday life. • <i>Green</i> and <i>Brown</i> biodegradables are needed to start the composting process. • Microorganisms, aeration, and mixing the compost pile are critical for hot composting • Earthworms are wiggly and hardworking living creatures. • Earthworms have no ears, no noses, and no eyes. They have a mouth. • Earthworms like dark and wet places. They live under the ground. • Earthworms have a critical role in the compost cycle. They eat organic waste and turn them into fertilizer. • Earthworms, organic waste, and aeration are critical for worm composting. • I can do composting in my kitchen balcony and apartment garden. It is a simple daily life practice. • Composting as a waste management strategy has multiple aspects: environmental, economic and social • Composting is related to the consumption and production patterns in everyday lives. • As a <i>Compost Star</i>, I share about composting with others to make composting a common activity.	• The <i>Garbage Witch</i>, play activities, and observing real earthworms were the most memorable learning experiences. • Waste and garbage are different things • There are organic waste as apple scraps, banana peels, spinach scraps, watermelon, tree bark, dry leaves, egg shells, and walnut shells, etc. and also recyclables such as plastics, glass, metals, and paper • Organic waste is everywhere in everyday life. • <i>Green</i> and <i>Brown</i> biodegradables are needed to start the composting process. • Microorganisms, aeration, and mixing the compost pile are critical for hot composting • Earthworms are wiggly and hardworking living creatures. • Earthworms have no ears, no noses, and no eyes. They have a mouth. • Earthworms like dark and wet places. They live under the ground. • Earthworms have a critical role in the compost cycle. They eat organic waste and turn them into fertilizer. • Earthworms, organic waste, and aeration are critical for worm composting. • I can do composting in my kitchen balcony and apartment garden. It is a simple daily life practice. • As a <i>Compost Star</i>, I share about composting with others to make composting a common activity. •

Analysis of children's interviews also suggested children's changed knowledge of the physical characteristics of earthworms. Accordingly, in pre-interviews, participating children depicted earthworms as dark brown creatures living under the soil. In this essence, children who had a chance to explore real earthworms on the fourth day of the learning activities stated that earthworms have no eyes, no ears, and no noses, but they have a mouth and rings on their bodies. Plus, experiments conducted on the preference of earthworms for moist and dark places helped children recognize why earthworms are living under the ground. Most importantly, children who participated in composting learning activities emphasized the critical role of earthworms in the compost cycle. It has been found that children mentioned earthworms as hardworking living creatures which are able to eat biodegradables and turn them into fertilizer. Children already recognized in post-findings that earthworms have a profound role in one of the cycles of Earth, thus worm composting is so valuable in increasing the quality of the soil. In this respect, a further novel finding emerged in post and follow-up interviews that the majority of children stated that worm composting is a convenient practice that they can simply do in their everyday life.

When it comes to the value of recycling organic waste, participating children associated the function of recycling with the well-being of the environment in pre-interviews. Accordingly, recycling was identified as a significant practice to preserve the environment. On the contrary, in post-interviews, children were able to associate the role of recycling organic waste with multiple aspects. Considering this, participating children linked composting with environmental, economic, and social aspects. Children suggested composting as one of the feasible and convenient solutions to managing organic waste generated in everyday life. Children's further explanations about the value of composting were related to its economic aspect. In this essence, children associated recycling organic waste with preserving natural sources and energy conservation. On the other hand, children only touched upon the environmental aspect in follow-up interviews. In regard to children's responses about the value of recycling organic waste, children's further statements about being a *Compost Star* in the post, and follow-up interviews highlighted the importance of sharing how organic waste can be recycled with grandparents, neighbors, and friends that potentially encourage other stakeholders to do composting and support community involvement which makes composting a shared practice.

The next section provides the findings that emerged from the learning outcome rubric designed for the current study. In this essence, the rubric was utilized as an assessment tool in order to

unfold to what extent children's self-reported knowledge is expanded after participating in composting learning activities

4.6 Results that Emerged From the *Learning Outcomes Rubric for Composting Learning Activities*

In the present study, the learning objectives and specific targets for each SDG were quite helpful not only for designing the learning activities but also in guiding the researcher in assessing and monitoring the quality of the learning activities and their impact on children's self-reported knowledge. Thus, for the purpose of the current research *Learning Outcomes Rubrics for Composting Learning Activities* (see section 3.6.2) was developed. To flesh out children's expanded knowledge, the rubric served as an analytical tool with four levels. The rubric enabled the researcher to analyze participating children's responses qualitatively in order to examine their expanded knowledge within the framework of learning objectives that played a vital role in visible learning and measuring the impact of the learning activities. Since one of the main aims was to reveal the difference between children's self-reported knowledge among pre-, post-, and follow-up interviews, children's responses were analyzed according to rubric items, and the scores for pre-, post, and follow-up responses were calculated for each child. The average of the mean scores derived from children's responses from the pre-assessment is quite low ($M=5.22$) when compared to post ($M=19.13$) and follow-up assessments ($M=17.48$) (Table 4.4). Consider Figure 4.29, which plots pre-, post, and follow-up scores for each child. To test the statistical significance of the difference in scores gained from the pre- and post-assessments, pre- and follow-up assessments, and post- and follow-up assessments, a paired-sample t-test¹ was conducted.

Table 4.6 Means, Standard Deviations, and Ranges of the Scores Derived from pre-, post, and Follow-up Assessments

	<i>N</i>	<i>Min.</i>	<i>Max.</i>	<i>M</i>	<i>SD</i>
Pre-scores	23	3,00	7,00	5,22	1,17
Post-scores	23	16,00	24,00	19,13	2,56
Follow-up scores	23	14,00	22,00	17,48	2,39

¹ Since the sample size is less than 30, assumptions for normality were already checked and none of them were violated except randomization. While the histogram of the sample data shows a normal probability curve, the point in the Q-Q plot stands fairly closed on a straight line. Also, as recommended by Tabachnick and Fidell (2007), skewness and kurtosis values were examined which should be stand between -1.5 and +1.5. For the score differences of paired values *pre-scores and post-scores*, the skewness and kurtosis of the scores were found to be 0,15 and -0,60 respectively and for the score differences of paired values *pre-scores and follow-up scores*, the skewness and kurtosis of the scores was found to be 0,12 and 0,26 respectively.

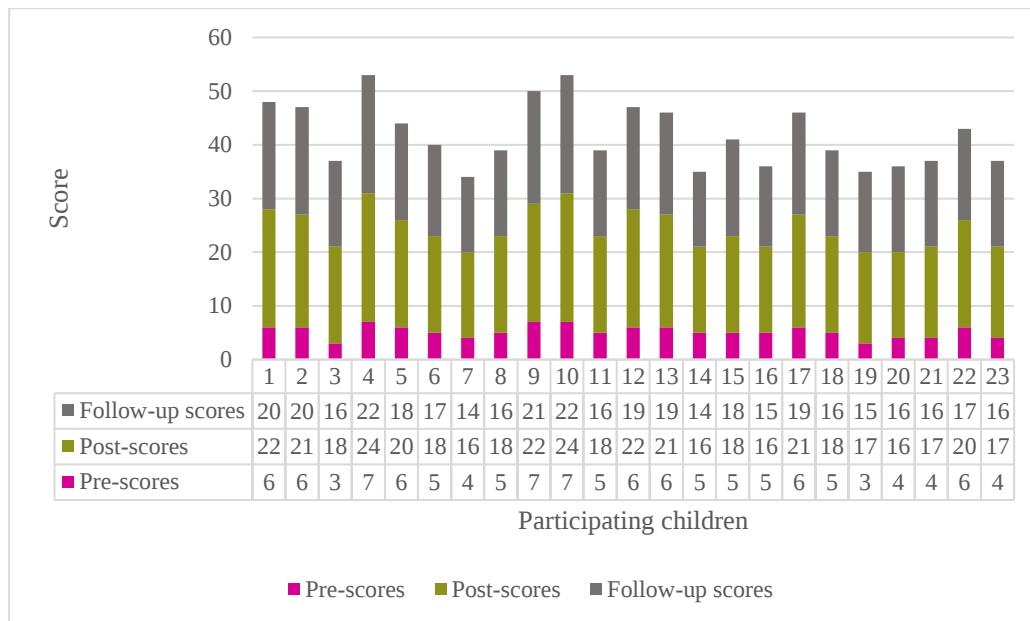


Figure 4.29 *Participating Children's Scores Derived from Pre-, Post, and Follow-Up Assessments*

Table 4.7 illustrates the paired sample statistics. If it is looked at the row tables, the column headed *M* indicated the paired differences. Accordingly, the mean of Pair 1 (the value was calculated by subtracting the mean of post-scores from pre-scores) has the highest value. Given this, there was a statistically significant increase in rubric scores from pre-scores ($M=5.22$, $SD=2.56$) to post-scores ($M=19.13$, $SD=2.56$), $t(22)=39.17$, $p<.001$ (two-tailed).

Table 4.7 Paired Sample Statistics

		<i>M</i>	<i>N</i>	<i>SD</i>	<i>SE</i>
Pair 1	Pre-scores - Post-scores	13.91	23	1.79	.38
Pair 2	Pre-scores - Follow-up scores	12.26	23	1.95	.41
Pair 3	Post-scores - Follow-up scores	-1.65	23	1.08	.23

The mean increased by 13.91 with a 95% confidence interval ranging from 13.18 to 14.65. The eta square statistic (.11) indicated a large effect size. Besides, there was a statistically significant increase in rubric scores from pre-scores ($M=5.22$, $SD=2.56$) to follow-up scores ($M=17.48$, $SD=2.39$), $t(22)=37.38$, $p<.001$ (two-tailed). The mean increased by 12.26 with a

95% confidence interval ranging from 11,58 to 12,94. The eta square statistic (.10) indicated a large effect size. Together, there was no significant difference between post-scores ($M=19,13$, $SD=2,56$) and follow-up scores ($M=17,48$, $SD=2,39$), $t(22)=2,12$, $p=.06$.

Planned comparisons among pre-, post, and follow-up rubric assessments revealed that in pre-interviews, children's responses were scored by means of their self-reported knowledge of recycling. Since recycling organic waste was a novel practice for participating children at the beginning of the learning activities, children had no or limited information on what organic waste was and how it could be recycled. The majority of respondents mentioned recycling and reusing as a waste management strategy and gave several examples of recyclables. Further explanations of children on consumption habits were also scored for the pre-interviews, yet there was no sufficient connection between organic waste generation and daily life routines. Further analysis indicated that there was a considerable improvement in post and follow-up assessments.

With the greatest mean at the post-assessment level, children's self-reported knowledge increased with elaborations and examples on what composting is, how composting can be handled in daily life, and the need for communicating with others about recycling organic waste after the implementation of learning activities. Mean differences between pre- and post-assessments are indicators of the raw change of children's self-reported knowledge and the mean differences between pre- and follow-up assessments were responsive toward the effectiveness of the composting learning activities on children's elaborated self-reported knowledge, as well. On the other hand, mean differences between post and follow-up assessments posited that there is no meaningful change in children's self-reported knowledge between post and follow-up assessments.

4.7 Mothers' Self-Reported Knowledge of Recycling Organic Waste

With respect to the third research question, participant mothers' self-reported knowledge was revealed through pre- and post-interviews. Twenty-three mothers who jointly participated in the learning activities with their preschool children were asked about their already existing knowledge of waste and waste management strategies, their individual consumption patterns, and more specifically their further knowledge of composting before participating in the composting learning activities. In this section, data that emerged from pre- and post-interviews is presented through descriptives, and the descriptive data is provided with participating mothers' excerpts and researcher-mother dialogues.

4.7.1 Pre-Findings Related to Mothers' Self-Reported Knowledge of Recycling Organic Waste

Since composting is a novel concept for the participants at the beginning of the study, the pre-interview protocol for mothers was typically designed to reveal how participant mothers conceptualize waste and waste management strategies as a sustainable practice. Thus, initial questions in the pre-interview protocol particularly focused on mothers' self-reported knowledge and practices about household waste management strategies and their own individual consumption patterns. On the other hand, the focal point of the last questions of the pre-interview sessions was formed to reveal what mothers could know about the elements of composting and even also earthworms as an essential part of the worm composting process. Three main themes emerged from the inductive content analysis of pre-interviews conducted with participating mothers, as can be seen in Table 4.8.

Table 4.8 Themes and Sub-Themes that Emerged From the Pre-Interviews of Mothers
($N_{pre}=23$)

Themes	Sub-themes
Mothers' self-reported knowledge on waste and waste management	• Reusing ($n=15$) and recycling ($n=18$) are the two strategies for waste management • Reusing and recycling is important for the well-being of the natural environment ($n=13$), preventing depletion of natural resources ($n=9$) and maintaining raw materials ($n=7$) • Lack of space ($n=18$) and time issues ($n=13$) and lack of sufficient knowledge ($n=8$) are the barriers to household waste management • Municipalities are responsible for waste management ($n=16$)
Mothers' self-reported knowledge on individual consumption patterns	• Consumption decisions are shaped by children ($n=8$) • Good consumption patterns are shaped by <i>wants/wishes</i> ($n=18$) • Food consumption patterns are shaped by <i>needs</i> ($n=14$)
Mothers' self-reported knowledge on composting	• "I do not know about composting": No valid recognition of composting as a sustainable waste management strategy ($n=23$) • "Earthworms are for underground tunnels" ($n=11$)

4.7.1.1 Mothers' Self-Reported Knowledge on Waste and Waste management

Subtheme₁: Reusing and Recycling are the Two Strategies for Waste Management

Pre-interviews conducted with participating mothers started with a general question about waste management strategies. When mothers were asked about what they already knew about waste and waste management, all mothers mentioned recycling in general as a well-known waste management strategy. Of the 23 participants, 18 mothers defined recycling as *reevaluating* already existing materials to get something newer and/or something better. To elaborate on this view, participant mothers emphasized the recyclables as paper ($n=18$), plastics ($n=18$), glass ($n=14$), metal ($n=11$), battery ($n=7$), and cotton ($n=4$). The response of M19 on separating wastes for recycling is as follows:

...I try to collect waste separately in my home. For example, when I drink water from a plastic bottle, I shrink it completely and throw it into the appropriate recycling box. If it is plastic, I throw it into the box for plastic or paper. I take the work papers which were already used at home and bring them to recycling bins. I also bring all the books and notebooks that we do not use in this way. I mean I sort the materials in my home.

Just over half of those mothers ($n=15$) reported that recycling is a waste management strategy which means *reusing materials* or using an item or a material over and over again for another purpose. To illustrate, M₁₈ highlighted recycling as a waste management strategy, "... we are making small activities with empty milk boxes with my child" and M₁₇ explained, "I think recycling means utilizing stuff over and over again. I use the plastic bottles over and over again, for example." This common view was also expressed by M₂₃:

..... I'm not a person who likes to throw away things. Before I throw it away, I always think about how I can use it for another purpose. For example, I collect paper towel rolls and we do funny robots with my little daughter. Also, I do not throw away the walnut shells. We use them as material for art activities. In the same way, I reuse the cans as flower pots"

At the beginning of the pre-interviews, the mothers were also asked about the difference between garbage and waste. The researcher presented the question as "*What do you think garbage is? What is waste? If you think they are different, how are they different?*". These questions were considered as a key tenet to reveal how participant mothers conceptualize garbage and waste. Whilst a minority of the participants ($n=9$) commented that both concepts are the same, the rest of all participating mothers agreed that garbage and waste are different things. Further discussions were also conducted on in which ways they are different.

Of all the participants, 13 mothers defined garbage as something “useless”, having a “lack of utility”, “discarded by the humans” and “leftovers are not eaten”. Those mothers, on the other hand, depicted waste as “recyclables”. Mothers’ ideas on the difference between garbage and waste were captured through their comments given below:

M₇: When we say waste, we know that it is recyclable. When we say garbage, we understand that it is no longer useful. For example, in line with the Zero Waste Project, people are talking about the fact that even leftover food in the kitchen can be recycled. But I don't know how it can happen.

M₁₉: When we think of garbage, we think of things that cannot be reused. Garbage can be thrown away. But waste is not like that. We can reuse waste. We can reuse waste without the need for a new raw material. For example, paper and plastics are recyclable. We cannot call these materials garbage.

M₉: of course, garbage and waste are not the same thing. They are different. Garbage is what is no longer usable, whereas waste is what can be recycled or reused. I think it is very important to make these two distinctions. Can we call glass and plastic bottles garbage? No, we can't. We can call these materials “waste” because they can be recycled.

Sub-Theme₂: Reusing and Recycling is Important for the Well-Being of the Natural Environment, Preventing the Depletion of Natural Resources, and Maintaining Raw Materials

According to respondent mothers, recycling is an effective waste management strategy to save the Planet. Typically, 13 mothers highlighted the function of recycling as preserving the environment. M₈ explained that “.... through recycling, we prevent the lands to fill with garbage”. M₁₃ supported this statement through; “when we do recycling, we do not need to throw away garbage. Thus, we preserve the environment”. Another interviewee (M₁₁) touched upon this issue as follows:

When you asked me about waste management, the first thing that came to my mind is recycling. Recycling is for the benefit of our natural environment since it is about reevaluating and reutilizing something old. Think about it. If we always produce garbage, most probably the trash dumps could be everywhere which is so unhealthy for animals, trees, forests, and our children. On the other hand, recycling is an effective alternative to managing our waste.

Of the participants, a small number of mothers ($n=7$) put emphasis on the potential of recycling on economic development in pre-interviews. In line with the economic development, two aspects were typically highlighted by the participant which are keeping raw materials and increasing the national income. About keeping the raw materials, four mothers indicated that

recycling is one good possibility to preserve raw materials and even also the natural sources of the planet. Related to this, M₁₁ declared:

One of the benefits of recycling is maintaining raw materials. What I am trying to say is that when we put a plastic bottle into the recycling box, a new plastic bottle will be produced from this old bottle. I mean there is no need for raw material to produce a new plastic bottle.

M₁₅ agreed with the idea that recycling maintains raw materials with the following statement:

This cycling system is good for our economy. Let me give an example. Through recycling, we would use what we have as raw material again and bring it back to the economy. By contributing to recycling, we actually save money.

For a small number of participants ($n=4$), recycling should be supported to increase the national income. Accordingly, recycling is a sustainable waste management strategy that supports national income and economic growth. It was suggested by M₁ that, “one of the major contributions of recycling of wastes is increasing the national income. Since the raw materials are preserved through recycling, our economic growth is affected favorably”. M₅ touches upon this issue:

It is important for the national economy to collect and recycle materials such as plastic, paper, and glass leftovers from consumption. Thus, a new production can be made by preserving the raw material. In this way, we can also save energy.

As in the pre-interviews of children, participating mothers were also asked the hypothetical question of “*What would happen if we did not recycle?*” in the pre-interview session. Within this regard, the majority of the mothers ($n=16$) associated the absence of recycling with environmental pollution. Accordingly, mothers reported that if recycling is not possible, the waste would accumulate over time and would take up a large space in nature. The comments of respondents are listed below;

M₆: If we could not recycle, nature would have to struggle with waste. Garbage and waste would accumulate. It would cause nature pollution. Because we consume unconsciously and because we consume too much, we do not think about what will happen to the waste left behind. We should think about consuming less and in a responsible way.

M₁₄: We think that we can recycle as much as we consume. This is not true. We take more from nature than we give back. We consume much more. If there was no recycling at all, natural areas would be full of garbage and waste. It would be a more polluted environment.

M₁: I care about recycling as a waste management strategy, because it protects the environment as well as raw materials. Let’s think about it. Without recycling

there would probably be areas full of accumulated waste. This would affect all living things. It would affect Earth's cycles. The water cycle would be affected. It could cause water pollution. I mean, by recycling, we are actually preventing the accumulation of waste in nature. We prevent nature from being lost in waste.

Moreover, 9 participating mothers associated the absence of recycling with the depletion of natural resources. Related responses are given below;

M₁₀: If we were unable to manage the waste we produced, it means the depletion of natural resources. Consuming, of course, means that natural resources such as water and energy will diminish and disappear after a while.

M₂₃: If we do not apply effective waste management strategies, we would only be consuming. It means we -as human beings- would be consuming natural resources but not giving back to nature which means that natural resources would be depleted after a while. I don't even want to think about what life would be like on Earth then. It would not be good for our children.

A notable dialogue between the researcher and one interviewee (M₅) is as follows:

R: What would happen if we couldn't recycle?

M₅: Hmm. Actually, I watched a very nice animation about it.

R: What was it like?

M₅: In that animation, the world turned into a garbage heap and people became unable to breathe. The garbage was like a mountain, and nothing was planted in the world, and in a place like a space base, people were obese and living dependent on machines. I think that we will probably end up wearing masks, forgetting the taste of fruits and vegetables, and coming to the point of exhaustion. Simply put, even fish are made of marine waste and plastic products, which is why I don't even think about eating fish anymore. The scenes I saw were so interesting to me.

R: So?

M₅: My point is that it means the depletion of resources on Earth and damaging the natural environment.

R: Okay.

On the one hand, only one respondent M₂ depicted recycling as a system to keep the sustainability of the life cycle in nature in pre-interviews. Her perspective is:

I see recycling and reusing materials as a system. It is a functional system to regain what we consume. We should use this system for the sustainability of the cycles in nature. Otherwise, as those who constantly consume and even consume unconsciously, we can disrupt the sustainability of nature. We are not the only ones living on this earth. There are many living things other than humans. I think we have a responsibility towards them and we also have responsibilities towards our children. For this reason, I argue that we should act more consciously instead of constantly consuming.

Sub-Theme3: Lack of Space, Time Issues and a Lack of Sufficient Knowledge are Barriers to Household Waste Management

With respect to mothers' self-reported knowledge of strategies and practices of waste and waste management, even though the majority of mothers emphasized recycling and even also reusing as a waste management strategy, only a small number of respondents ($n=7$) mentioned their household waste management strategies. When asked "*How many buckets do you have in your house for your waste?*", almost two-thirds of the participant mothers ($n=17$) indicated that there is just one bucket in which everything is collected in. Talking about the issue, M₆ reported that "We put all the waste in one bin located in our kitchen" and other responses to this question included; "Unfortunately, we have just one bin for the garbage" (M₁₆) and "A bucket located in the balcony is for collecting the garbage" (M₁₄).

Following the responses to this question, the participant mothers were further asked about the discrepancies between their ideas on the potential of recycling which was discussed at the beginning of the interview, and the practices in their home environment. The overall response indicated that according to the majority of the mothers ($n=18$), there is not enough space to collect and separate waste in their home environment whilst 13 mothers expressed that lack of enough time is a barrier for them. Related to this, the respondents' explanations are as follows;

M₁₉: Even though I know the benefits of recycling for the environment in which we live, waste sorting in the home environment needs adequate space to categorize the waste into different bins. To put it another way, I live in a small house. I have a small balcony. Even if I want to keep them there separately, what do I do afterward? Lack of space is a barrier for me to collect and organize household waste.

M₁₅: No matter how much I am interested in waste management, I do not have space at home for it. My daughter and I sometimes separate papers to send for recycling, but that's it. When I want to separate glass waste, metals, and especially plastics, it is not sustainable. I have a hard time finding a place to collect items and I don't know where to take them afterward.

M₂₀: You need both space and time for waste management. Effective waste management requires a culture. It needs to be done in every household, and it needs to be provided with the appropriate materials and supplies. When we started doing it in our own homes, we had a hard time finding space to accumulate it. We have a small balcony and small rooms. However, it would be motivating for us if there were recycling bins in the apartment building where we live if every household left their waste there if we cooperated, and if these wastes were regularly collected by the municipalities.

M₇: yes, I see recycling as a waste management strategy, but if you ask me, I can't contribute to it. Why? Because I don't have enough space to accumulate waste in my own home. Even if I do, I don't know where there is a recycling center where I can take this waste.

This view was echoed by another informant (M₁₂) who commented about the space issue as a challenge for organizing and managing household waste;

...Of course, it is best to collect waste separately at home. I know that it is important for waste pickers and even also the workers who are trying to separate the waste materials in recycling centers. On the other hand, it can be difficult for me to store them in the home environment. I'm trying to separate the plastics as much as I can, but that's it.

Not only the space issue but also time management to organizing household waste was mentioned by the participating mothers as another barrier. Commenting on the lack of time to manage household waste, M₁₇ said; “We just have a bucket in our kitchen for all wastes. We do not collect them separately. Pretty time-consuming, isn’t it?” and M₃ put it, “...different types of waste are produced every day. Plastics, packaging waste, glass bottles and so forth. It takes time to deal with all of them, so we do not separately collect them”. Concerns regarding sorting household waste also include a lack of opportunities of collecting the separated waste materials. Of the participants, 6 mothers specifically addressed that they actually do not know what they will do after collecting and sorting all the waste in the home environment. M₁₂ indicated as follows:

We try to collect glass and paper separately. I put a box in my daughter’s room. We collect the waste paper in it. To add, we never throw away soda bottles. All glass bottles are collected in another bin located on our kitchen balcony. After the boxes are full, we bring them to the campus and throw them in the recycling bins. But not everyone has such an opportunity. Even if people want to save by separating, where will they throw it later?

This view was emphasized by another mother (M₂₁):

You just asked me about the importance and the need for waste management. I told you that it is important to prevent increasing landfill waste sites. Solid wastes such as plastic, glass, and metal cannot be lost in nature in a long time. I know this fact, but when you ask me about our household waste management strategies, I cannot give you the same positive answer. This is a contradiction, I know it! What I am trying to say is that I am aware of the need for waste management, but I have not taken action on it. There are several reasons for this. First of all, even if we separate our waste at home with all family members and accumulate it that way, I don't know what to do with it afterward. In the neighborhood where we live, waste is not collected regularly by the municipalities. There is no incentive mechanism for us to group waste. In such a situation, I cannot convince myself as to why I should group waste separately and take the time to do so.

This theme came up for example in the discussion with M₁ in the pre-interview:

Obviously, we try to collect plastic packaging separately, but there are no separate containers in our neighborhood. Glass waste is not separated from plastic waste, there is only one container. My brothers have set up this arrangement in Germany for years, they are definitely throwing them in separate containers. But since it's not in our area, I usually don't bend the plastic like that because I know they collect them, but the glass and stuff can stay in the bag.

Talking about the ineffective household waste management practices, 8 mothers particularly emphasized the lack of sufficient knowledge and awareness as a reason. The excerpts of M₁₆ and M₈ is given below:

M₁₆: We are living in a consumer society. We are in a culture of consumption. Kitchen waste, plastics, glass bottles, packaging waste, clothes we don't wear... Since there is no sanction to separate these wastes, I think we collect them all in one place. I try as much as possible not to put plastics and glass together with kitchen waste, but I cannot always find the time to do so. I think it's about our habits. Such habits should be formed from early childhood. The impact of recycling on the environment and the economy should be taught from an early age. Unfortunately, since we don't know, we don't know why we should contribute to recycling.

M₈: As long as we consume, waste is generated. At this point, perhaps we should reevaluate our consumption habits. Before we think about recycling, we need to think about how we can produce less waste. We also need to deliver this perspective to our children. We consume irresponsibly because we do not have enough information and awareness. ...I listened to a broadcast about hidden water consumption on a television show. It was very impressive. It mentioned how much water was spent in the process from the production stage of a T-shirt we bought until it came to our wardrobe. My point is that the impact of our lifestyle on the natural environment and resources must be questioned. We need to think more deeply about our own actions. We need to know more about a human being's impact on nature. As our knowledge and awareness increase, our waste management culture in the household will develop.

Sub-Theme 4: Municipalities are Responsible for Waste Management

After getting participant mothers' self-reported knowledge on waste and waste management strategies and sustainable production, all participating mothers were asked about whose responsibility it was to organize and manage waste that emerged in schools, homes, etc. on a daily basis. The majority of the participants ($n=16$) reported that municipalities should be responsible to collect the waste generated on a daily basis, should carry out waste management tasks, and encourage the community about the importance of sorting waste which can be easily recycled in recycling centers. The responses to this question included:

M₃: I think waste management is the responsibility of municipalities. Municipalities put recycling bins in shopping malls or some neighborhoods, but they do not systematically monitor and control them. In the first place, the public should be informed about the purpose of those recycling bins. People don't use recycling bins, because they don't know for what purpose those bins were placed there.....municipalities can cooperate with educators and schools.

M₁: I think, first of all, there will be areas under the responsibility of the municipalities. After collecting and sorting waste, we can bring them to the recycling site, but unfortunately, even if I collect and sort it at home, there is no recycling site near my house that I can bring it to.

M₂₃: It should be under the responsibility of the state and municipalities. First of all, they should raise public awareness about effective waste management policies. Increasing knowledge and awareness is very important. Furthermore, municipalities should collect waste in a regular way. Municipal officials should check whether the waste has been properly separated or not.

M₈: I think waste management is the responsibility of municipalities. Municipalities can inform the public about waste management. They can put waste collection bins in every neighborhood. They can organize trainings for children in schools. Children can teach their parents at home.

The dialogue between the researcher and M₁₂ also illustrates the common view of respondents:

R:who do you think is responsible for waste management?

M₁₂: Everyone should take part in the process, but I think it is basically the responsibility of the municipalities and the state.

R: Why?

M₁₂: Because just the fact that I organize and sort my household waste doesn't mean anything, since other people don't do it.

R: What could the municipalities have done to make the waste management process more effective in your opinion?

M₁₂: For example, it is very important to inform society about waste management processes. There are multiple types of waste. I -as a citizen- need to know how to collect and why I need to categorize them. Even if everyone collects their waste by separating it at home, I need to know how this waste is recycled afterward. I think municipalities can take this responsibility. Each municipality can develop waste management policies in its own region and inform the people living in that region. This is the only way to achieve a waste management culture.

Commenting on the responsibility issue, six mothers argued that every individual is responsible. M₁₅ argued that “I think all of us, everyone should do it consciously. I think it starts with the person.” And M₁₈ supported this statement with, “People, I think. So, it can start at home with individuals.” Some of the responses are presented below;

M₄: I think everyone. Everyone living in the world. Maybe we can't do anything to the country's administration. But of course, it is a very good idea to use the bags less and charge for it. But it should start with us. In the family. The child does what they see from the family.

M₁₅: ... I mean, if I am using a glass bottle, it is my responsibility as an individual. ...of course, the factory or recycling companies that will recover it is at a later stage, but in the first place, I have to know the importance of recycling, organizing, sorting, and delivering them to the recycling bins. It is my responsibility first.

M₉: since every individual consumes according to their own wishes and needs, I think everyone should take their own responsibility for recycling as much waste as we consume.

By this extension, just over half of the mothers ($n=14$) emphasized that since waste generation is an integral part of our everyday life, the necessary legal steps should be urgently taken. Considering the daily life routines, several mothers pointed out that as long as human being consumes, there will also be waste generation. Related statements are listed below:

M₇: talking about waste and waste management reminded me that waste generation is actually a part of our daily life. It should be a part of our daily routine. We need to think about this and make effective and practical decisions to deal with waste disposal.

M₈: Just as there is waste coming out of the house, there is also waste coming out of schools and hospitals. Factories also create waste. As part of our daily lifestyles, some of us create waste on a small scale, and some of us on a large scale, because we are consumers.

M₂₀: Waste is of course part of the daily routine of life. We often encounter plastics and packaging materials in our daily practices. What we do in this situation is important. We mostly treat all waste as "garbage" and collect it in one place and send it to the trash. Maybe we need more creative and effective solutions to strategically sort and collect waste disposal. state and municipalities should work with other stakeholders to inform and encourage citizens to learn about the value of waste management.

M₁₆: The legal regulations developed by municipalities related to waste management can also be a guide for us in our daily life. In many European countries, people are being taught how to sort and collect household waste by legal regulations. Thus, waste management is becoming a routine of daily life.

4.7.1.2 Self-Reported Knowledge on Individual Consumption Pattern

Sub-Theme1: Consumption Decisions are Shaped by Children

In pre-interviews, mothers were asked about how they make their consumption decisions. The majority of the participating mothers ($n=18$) agreed that good consumption choices were shaped by their *wants/wishes*. In this respect, 8 mothers reported that children nowadays grow up surrounded by screen-based technologies such as television and the internet which has a great impact on children's desires and consumption choices. Related to this, M₂₁ expressed, "Our children are bombarded with the information and advertisement of different products. Children become familiar and knowledgeable about the usage of products which turn into an influential tool to convince us about their needs, wishes and desires". The comments below outline the mothers' responses:

M₁₃: my consumption patterns are also shaped by the goods. Sometimes we buy shoes, clothes, etc. even if it is not essential and it is not really needed. I mean, we buy something even though we don't need it. Let me give you an example. There are times when I don't mind buying my child a second or even a third pair of shoes, even though

he doesn't need them. Although I know that this is an extra consumption, I can't stop myself.

M₁: I can say that our household habits are mostly determined by our needs. We are trying to buy as many goods or clothes as we need. However, this situation changes a little when it comes to children. When my son wants a toy, even if he has a similar one, sometimes I buy the second one. It's hard to stop it because I can't say no because she sees it in her friends and wants it. On the other hand, when I want to buy a new mobile phone for myself, I can wait for months. So, we even determine consumption habits according to our children.

Another response to this question was related to decision-making on the consumption process while grocery shopping and even also buying a toy car, storybook, or a puzzle which was found to be generally a joint process. In line with this perspective, children also have a role in the decision-making process. As mothers reported, specifically when it comes to grocery items, joint conversations between children and the parents have the potential to decide on buying healthy food items, instead of unhealthy ones. This view can be echoed in the following dialogue between the researcher and M₅:

R: Okay, let's talk about your consumption habits. What kind of consumer are you? Do your needs drive you or do you consume according to your wishes?

M₅: My consumption habits are guided by my needs. I definitely think twice before buying something. I ask myself; do you really need it or not?

R: What do you consider during the decision-making process? What would be your motivation? Is it the budget, the quality, or the impact on the environment? Or is there anything else you pay attention?

M₅: I take into account my budget.

R: Do you, as a parent, decide on home consumption patterns? Could you please tell me about that?

M₅: Actually, we make joint decisions. We also get the children's opinions. For example, during grocery shopping, we make purchases in accordance with the needs and wishes of our children. In fact, even at a young age, children can also develop their own consumption habits over time. They become aware of their own wants and needs. For this reason, they also speak their mind during family decision-making processes. For example, when it comes to consumption related to an item, we discuss it with our children. We always question together whether we really need it or whether we buy it because we want it.

R: Okay.

Sub-Theme₂: Food Consumption Patterns Are Shaped By Needs

In pre-interviews, a common view amongst respondents was that consumption decisions are shaped by *needs*. Of all the participants, 14 mothers declared that their food consumption decision was shaped by the needs of the family. Since all of them have children, eating healthy food to foster children's development was mentioned as the main factor that directed their food consumption decisions. Since eating fresh and healthy food is important for children, it is a need. Several mothers ($n=7$) expressed that milk and milk products and meat and meat product

were the main food sources. They reported that those products are necessarily required for the healthy growth of their children. What is more, for a small number of participants, they preferred eating vegetables regularly during the week. One interviewee (M₇) claimed that "Milk and dairy products are definitely consumed on a daily basis in our home", M₁₁ added, "Milk, yogurt, and vegetables are definitely consumed. I make sure to make vegetable food in the evening."

When asked about the household consumption choices, the response of M₁₄ was given below:

R: What kind of consumer are you? Do wants or needs guide your consumption habits?

M₁₄: Actually, it depends. When it comes to food, we take into account our needs. We are trying to eat healthy. Vegetables and fruits are our predominant preferences. We also try to eat meat and meat products at least three or four days a week. When it comes to food consumption, what we care about is eating a balanced diet and being healthy.

R: What would you say about your general consumption habits?

M₁₄: Obviously, when I think about our general consumption habits, I sometimes see that our desires also have an impact on our consumption patterns. To illustrate, we can't say "no" especially to our children's desires. We can get whatever they want, regardless of whether they need it or not. This sometimes happens with food consumption as well. Sometimes we don't say no when they prefer to eat packaged food.

R: So, children also have a role in determining your consumption habits?

M₁₄: Certainly. They make their own decisions and wishes. As parents, we pay attention to these things.

4.7.1.3 Mothers' Self-Reported Knowledge of Composting

Sub-Theme1: "I Do Not Know About Composting": No Valid Recognition About Composting as a Waste Management Strategy

Since, composting was a novel topic for all participants at the beginning of the present study, the initial questions of the pre-interview protocol were typically designed to unfold participant mothers' already existing knowledge about waste and waste management. Previous sections typically placed emphasis on how participant mothers conceptualize waste, garbage, the waste management strategies they already knew and the how their household consumption choices were shaped. After a little talk on household consumption patterns, a transition question which was "So what do you do with the leftovers from your food consumption?" was asked to bring the issue of organic waste and organic waste management up. Of all the participants, 19 mothers reported that they threw away waste to the garbage bin/bucket in the kitchen. This is illustrated by the following statements and dialogues.

R: What do you do with your leftovers after consumption?

M₁₄: I throw them away.

R: Okay, you're throwing it away. Do you have any idea what you can do instead of throwing it in the trash?

M₁₄: I'm thinking about what I can do with orange or tangerine peels, but the most I can do is baking an orange cake. I mean, I have no idea.

M₆ expressed that kitchen leftovers were considered as garbage in their home:

R: well, you have leftovers from the kitchen after consumption. You just mentioned it. You cook and there can be leftovers such as onion skins, tomato skins, fruit skins, stems, etc. What do you do with them?

M₆: They're all trash in my home. We collect leftovers and send them to the garbage bin.

R: And you know what you can do instead of throwing it in there?

M₆: Actually, I don't know how to use the rest. I know about sending plastics, metals, and paper to the recycling bins, but I have no information about food waste. Those are just trash.

When asked about leftovers, M₁₇ stated that she tried to reevaluate food waste and not throw it away as much as possible:

R: What do you do with leftovers from meals?

M₁₇: Hmm. We throw them in the garbage bin.

R: What can you do instead of throwing it away?

M₁₇: Hmm. Actually, I already put the stems in salads, but the rest goes to the garbage bin. But I've heard that food waste is fertilizer. Is that what you're asking?

R: What have you heard about this? How do they do it?

M₁₇: I don't know how they do it. I just heard about it. I've heard that they also collect food waste and recycle it to get fertilizer. But I don't know how it happens.

Consistent with other mothers, M₁₉ noted that food waste is sent to the trash in their everyday routines. The dialogue between the researcher and the participant is given below:

R: ... so, what do you do with the leftovers after dinner or breakfast?

M₁₉: Hmm. For example, I don't throw away apple peels. I save them to brew herbal tea. Also, I love the head of eggplant. I add it to meals and create perfect meals for children. Hmm... and what's more I don't peel the tomato skins and throw them away. But potato and onion skins are the ones I throw away the most as garbage of course.

R: Do you have any idea how you can recycle it?

M₁₉: I mean, I never really thought about it that way. If I can't reevaluate food waste, of course, I throw it in the trash.

R: Okay.

After getting self-reported practices on leftovers from the meals, the respondents were presented the designed visual which included recyclable and non-recyclable materials (Figure

4.2 ). The participant mothers were asked to categorize the visuals as recyclables and

non-recyclable materials same as in children's interview sessions. There was a common view among the interviewee that paper ($n=23$), plastic bottles ($n=23$), and metal cans ($n=19$) were identified as recyclable materials. On the one hand, 7 mothers pointed to the dry leaf as recyclable, yet they did not offer an explanation on how dry leaves can be recycled. Further, in response to this question, there were five mothers that posited the apple and banana peel as recyclable materials. Following the mothers' answers, the researcher elaborated the discussion with the following probe question, "*How can we recycle apple litter and banana peel?*". Three mothers said that "I do not know, but I think, it can be recycled". And the remaining two mothers (M_{13} & M_{15}) had little to talk about it saying; "I have heard that food waste can also be recycled. But I cannot suggest an explanation if you ask me how."

The next question was about dry leaves and apples that fall on the ground in autumn. Similar to the children's pre-interview session, a discussion on fallen autumn leaves and fallen apples was conducted with mothers. The majority of the mothers ($n=17$) indicated how interesting of a question it was, but they never thought about it before. Besides, 12 mothers reported that the leaves and the fallen apples disappeared under the ground. M_{19} expressed her thoughts by saying, "Since they fall to the ground, they go under the ground after a while." And M_{21} put forth such a comment, "I never thought about it before. What a nice question. I think they go under the ground and disappear there". The dialogue between the researcher and M_{21} about the autumn leaves is as follows:

R: ... My next question is actually about leaves. We are in the autumn season and incredible leaves have fallen in the classroom. But after a while, we can't see these leaves. What do you think about this?

M_{21} : I never thought about it.

R: Or there are fruit trees. Some fruits fall from the trees and after a while, we can't see them either.

M_{21} : It means it goes underground.

R: So, can I find it if I dig it up?

M_{21} : Uh-huh. No. Maybe it goes inside when it rains. I wonder if the wind blows the leaves too. But how far will it fly? I don't know the exact answer.

R: Okay.

Of all the participants, 10 mothers used the word "decomposition" or "decomposed" to bring an alternative explanation to the question of "*what happens to those fallen dry leaves and apples*". They acknowledged that most probably fallen leaves and apples were decomposed in nature, yet they did not offer an embellished explanation. The dialogue between the researcher and M_{10} illustrates the common view among respondents:

R: ... Now, it's autumn and there are amazing leaves everywhere. We observe this a lot at this campus. But if I look after a month or two, I can't see any of them. What happens to those leaves?

M₁₀: Isn't it soil?

R: I don't know, I'm just asking.

M₁₀: It becomes soil.

R: How so?

M₁₀: It rots. As it rots, it turns into soil.

R: How does it rot?

M₁₀: Once the leaf is removed from the tree, it dries up, because it no longer receives enough nutrients. It dries and crumbles. For example, apples rot and there are insects, bacteria, etc. It breaks down into small pieces and transforms with its help.

R: What does it turn into?

M₁₀: It turns into soil.

R: Okay.

Related to this question, only a small number of respondents ($n=5$) indicated autumn leaves are swept out by the staff or they are blown away: According to them, when autumn comes, the leaves leave the trees and fall to the ground. In order not to accumulate too much in the soil, workers come, collect the leaves and take them away.

R: ...my next question is actually about dry leaves. We are in the autumn season and incredible leaves have fallen on the ground. But after a while, we can't see those leaves anymore. What do you think of that?

M₄: Actually, I never thought about it.

R: Then, let's think about the fruit trees on campus. We clearly observe that some of the fruits fall down, but after a while, we can't see them either.

M₄: Hmm. They may go underground.

R: If so, can I find it if I dig it up?

M₄: Hmm. I do not think so. Maybe it goes inside when it rains. I am wondering if the wind blows the leaves too. But how far will it fly? Honestly, I do not know.

Only M₁₇ brought a more embellished explanation about the leaves and linked it to composting. The dialogue between the researcher and the mother is as follows:

R: Well, we are in the autumn season right now and you can see that there are a lot of leaves around, but after a while, we can't see those leaves. Where could they go? What's going on with them? Or think about an apple tree around here. Apples fall from that tree and disappear after a while. How can that happen?

M₁₇: Over time it becomes covered with snow and moisture. Then the leaves soften and turns into fertilizer.

R: Do you know this process; how does it work?

M₁₇: As far as I know, when it gets wet with rain and snow, it may mix with the soil and become a fertilizer in the soil. I know that microorganisms found in the soil also help this decay process. But that's just it.

The fallen leaves and fallen apples question was typically included in pre-interviews of mothers not only to unfold mothers' initial self-reported knowledge on the decomposition of organic waste but also to make a smooth transition to the concept of organic materials. In the

pre-interviews, a very small number of mothers put a touch that can be also some organic materials which are recyclables. However, when mothers were directly asked about what composting is, a majority of the participants answered, “I do not know”, “I have no idea”, and “Can it be about leaves and apples?”. Of 23 participants, 21 mothers had no idea about composting in pre-interviews. They stated that “they have never heard about it before”. Only two mothers reported that they have heard about composting, yet they did not make detailed explanations. The following dialogue between the researcher and M₉ depicts the situation as:

R: After talking about the autumn leaves, I want to ask you the following question; have you ever heard of compost or composting?

M₉: Uhh-uh. Actually, I haven't heard of it. But could this be related to the disappearance of dry leaves in nature that we just talked about?

R: Yes, I'm talking about the recycling of dry leaves and some food waste, which are actually organic materials.

M₉: I've heard the term compost before. Studies are being carried out on this on campus. But I don't know how it's done. I just heard that they accumulate waste.

R: What waste are they accumulating? And how?

M₉: I don't know how it happens. They were responsible for recycling organic waste on campus within the scope of the *Zero Waste* project. But as I said, I don't know how they do it.

R: Okay then.

Sub-Theme₂: “Earthworms Are For Underground Tunnels”: Surface Level Knowledge of the Role of Earthworms for Recycling Organic Waste.

Participating mothers who stated that they did not have any idea about the decomposing of dry leaves and composting were then asked questions about earthworms. Since the earthworms were the key point of the vermicomposting process, the last questions of the pre-interview session with mothers aimed to reveal mothers' pre-knowledge about earthworms. The researcher posed the question as; “Have you ever seen an earthworm? Can you explain? How did it look like?”. In response to this question, all mothers indicated that they have seen an earthworm at least once in their life. Of those participants, 11 mothers reported their childhood memories about how they observed an earthworm in their school or home garden once they were a small child and mentioned they are responsible to dig underground tunnels. The related answers were given below:

M₂₀: Of course, I know about worms. When I was little, because we lived in a small village, we didn't spend time at home all the time like kids do now. We used to play more in the garden and outdoor play areas. We used to make toys for ourselves using stones and natural materials. We used to play with soil. We used to observe the wriggling worms.

M₈: I remember worms more from my childhood years. They appear more often on rainy days. I remember when we collected worms and snails. They were coming out from under the ground. We used to play with them when we were little.

M₁₄: ... when I was little, there were a lot of worms in our schoolyard. They used to show up especially on rainy days. They would have a dark red color and a sticky texture. When I was little, I liked to collect and observe them. But I can't say the same thing right now [giggling]

M₆: I usually took it out in front of my grandmother's door when it rained. I saw it when I was little. They went out immediately when it rained. Its skin color was like a dry rose. they were moving not so fast by crawling. Worms are in the soil. they may be living on nutrients mixed into the soil. Sometimes the soil is also moist. So, they are under the ground.

After the conversation about earthworms, the participating mothers were asked about the role of earthworms on Earth. While the majority of mothers ($n=21$) said that worms have an "important" role, 9 mothers stressed that even being a part of nature makes worms important.

M₂: ...of course, they are very important for the faster growth of plants. I think that everything in nature has a role. Worms are moving around in the soil. They are useful for plants.

The dialogue between the researcher and M₁₂ offered the common view of participating mothers which is mentioned below:

R: Well, do you think worms are important?

M₁₂: I think they are important.

R: What are they important for?

M₁₂: So, they are also a part of nature. I'm sure they have an important role in nature.

R: What role do worms have?

M₁₂: I don't know exactly. But if they live in nature, I think they must have a purpose.

Besides, only one mother (M₄) reported that worms are responsible to decompose the organic substances under the soil. Accordingly, to them, these creatures were important for the balance of nature through decomposing dead plants in the soil:

R: Have you ever seen a red worm before?

M₄: Yes, I did.

R: Where did you see it?

M₄: When I was little, we used to go to the village on summer holidays. I've seen it a lot in the village.

R: How were they alive, can you tell me a little bit?

M₄: They appeared mostly in rainy weather. They are dark brown or dark red in color. Baby worms were lighter in color.

R: Do you know where the worms live?

M₄: Of course, under the ground.

M₄: I know that worms aerate the soil. By navigating under the ground and opening holes and tunnels in the soil, they actually provide air and water to the soil.

R: Do you think worms are important? If so, why do you think so?

M₄: I think there is a balance in nature. Worms are also part of this balance. They have an important task in the natural cycle to increase the yield of the soil. I know they make the soil healthier. When the soil is healthy, our food is also fertile and healthy. This is what I think.

R: Well, thanks.

4.7.2 Post-Findings Related to Mothers' Self-Reported Knowledge on Recycling Organic Waste

The post-interview session with mothers started with a question to reveal mothers' first insight toward composting learning activities in which they jointly participated with their children. In this essence, mothers were asked *"Last week, you participated in activities within the scope of the composting learning activities with your child and explored the recycling process of organic waste together. Could you please tell me about that? How was it for you?"*. The majority of the participating mothers ($n=19$) answered that they were happy to learn a practical waste management strategy together with their children to this question, which was also asked to remind participants about the learning activities before getting started with the post-interview session. Excerpts from some mothers about their general views on their participation are listed below:

M₁: First of all, I can say that I have learned a concept that I have never known before; "compost". It was quite informative for me to learn about composting with my son. We jointly participated, played together, discovered organic waste together, and started a *worm farm* together. I have already known about waste and waste management, but when you asked about organic waste in the pre-interviews, I answered "I don't know". I really did not know how to recycle kitchen waste that we constantly generate every day, but now, I know about it.

M₁₃: In our first meeting, I told you about plastics, paper, and glass related to waste management. So, I only knew about such kind of solid waste. Before participating in the learning activities, I had identified kitchen waste as garbage, but from now on, I can start the recycling process of organic waste at home... We have discovered a sustainable and practical strategy for everyday waste management.

M₉: One of the most remarkable things I learned last week was the role of worms in the recycling process of organic waste. I am someone who normally can't touch worms, but during the worm farm activity, I had no hesitation to explore these living things, which are very important for the natural cycle. At this point, it was also encouraging for me to participate in the learning activities together with my daughter. Since my daughter is a very curious child, we searched for answers to all the questions she asked related to earthworms, organic materials, and vermicomposting together. We remembered once again what we had learned through the conversations we had in the evening of every day.

M₂₁: One of the notable things I learned last week was that not everything is "garbage". In pre-interviews, I described the kitchen waste as garbage and sent the leftovers from the house to the trash every day. I can say that my perspective on these wastes has changed. Now I know that they are not garbage, but waste. I know that I can make compost by recycling even at home with a few simple and accessible tools. The learning activities I attended with my son last week encouraged me to take an active role in the composting process. My son also tells everyone that he can do worm composting. It is very valuable for children to access such information at an early age.

M₂₃: The best part of participating in activities related to composting was to explore it with the children. I don't know if it would have been so effective if it had been a learning process involving only mothers. I learned a lot as a mother from the questions asked by the children during the activities and the answers they gave. It was inspiring for me to see how my own daughter also discovered a waste management practice related to everyday life with stories, playing games, and also real earthworms. Besides, before joining the learning activities, as waste management, I was only telling you about the solid waste recycling process. However, after participating in learning activities and learning about composting, I have realized that organic waste is part of our everyday life. I have never known or questioned this until now. Actually, there is a lot of waste coming out of our kitchen every day, and I didn't know anything about the process of recycling this waste and gaining a valuable end-product; compost.

Of all the participants, 9 mothers particularly emphasized the potential of early childhood years to learn about composting as a waste management technique. Accordingly, mothers claimed that the knowledge acquired in early years will have a favorable impact on the development of skills and habits to sustain a more sustainable life. Taken together, dialogues and joint conversations they have with their children during and after learning activities were highlighted by the mothers in which they recognized their children's willingness and readiness to learn about environmental issues. Regarding this, M₉ agreed, "participating in activities with my daughter made me realize how eager she is to learn," while M₁₅ reported, "in the conversations we had after each learning day, I saw that she [her daughter] critically addressed composting activities with lots of 'why' and 'how' questions." M₁₈ also conveyed that, "we don't need to wait for people to become adults to learn about composting. It can be simply learned at an early age. Therefore, children may integrate it into their daily lives as soon as possible."

Taken together, 12 respondents mentioned about the joint conversations conducted with their children after each learning day. As fleshed out by M₁₀, "Conversations was quite teachable for both of us" while M₁₆ stated that, "my daughter reminded me of what I had forgotten about the activity process in the conversation we had every evening. I was also sharing what I learned with her. Our conversations have turned into times when we have mutual interaction and learn together." In this essence, the discourse expressed by M₂₃ is as follows:

...we discovered the process of recycling organic waste together with the children. Together we listened to stories, met *Soso*, played games, observed worms, and became *Compost Stars*. If I had received this education without the participation of the children, I am not sure if I would have learned in the same way. I realized that the questions the children were curious about and the answers they were looking for were also very inspiring for me. ...They seemed quite excited and eager about discovering compost.

What is also striking in post-interviews was that 14 mothers described the recycling process of organic waste as a "cyclical" process. During the pre-interviews; paper, metal, glass, etc. were associated with waste and waste management by participating mothers. On the other hand, contrary to pre-interviews, mothers preferred to talk about waste and waste management mostly with an emphasis on the composting cycle.

According to M₇ "After participating in activities related to composting, I have decided that the process of recycling organic waste is a cycle. I realized that I was actually a part of this cycle that nature has been sustaining for centuries" and M₃ reported "When we first met you, waste management meant just sorting the home waste and sending it to the recycling center for me. However, now I can conceptualize waste management by composting. Now, I can practically recycle my kitchen waste. I can simply observe the cyclical composting process and I can use the compost I make for my flowers and plants. This is a loop" and M₁₁ said, "... This issue was echoed in several mothers' statements given below;

M₁₄: ... It's a cyclical process. Let's think about that. You sit at home in the evening, you eat a delicious fruit and then you have breakfast in the morning and you eat a juicy orange. How about the leftovers? Then, you buy the leftovers and use them in composting to get compost which is a valuable substance. And then you can use compost for planting and it comes back to you as a more qualified tangerine and more juicy orange. This is the cycle!

M₁₆: you know the recycling sign. In the form of three arrows following each other. They follow each other and connect to each other. It actually shows a cycle. It is very possible to see this cycle in practice with the recycling of organic waste. You buy a tomato, peel the skins, compost the skins you peel, and use the mineral-rich substance you get to grow tomatoes again. Well, the result is; another delicious and healthy tomato. Here is the effective cycle of recycling.

Commenting on this, M₁₀ mentioned that recycling organic waste is a cyclical process from consumption to production:

The starting point of the composting process is the consumption we make. Waste occurs because we consume. When we recycle the resulting waste by composting, we get a structure similar to the soil and even more valuable. For this reason, there is a cycle from consumption to production.

Talking about the cyclical process of composting, M₁ also touched upon the role of human being in the cyclical process of composting:

R: If I asked you your ideas about waste management and recycling again, what would you say?

M₁: We discovered composting as a waste management strategy with our children. Now, I know composting is an effective waste management strategy.

R: What do you mean, can you tell me a little more?

M₁: ... We need to know our effective and sustainable waste management methods. We constantly consume. Not producing for the planet as much as we consume is not the solution. We need to be aware of this.

R: Why?

M₁: I have decided that we tire out nature more by just consuming. Consuming and causing unconscious waste generation means the accumulation of a lot of waste. My son asks about that, he says, "Won't *mother nature* be able to breathe?". He's quite right. But each individual can manage the recycling process by themselves. It's quite practical to make compost, isn't it?

R: Do you think so?

M₁: Yes. What is more, when you get started to do something to manage your waste, you are also thinking about this; how can I create less waste? And you also think about this; how environmentally friendly is my waste?

R: What does this mean? Can you explain a little more?

M₁: We have learned that not every waste can go into the compost bucket. Not all of them are degradable. It's not like earthworms can eat and form fertilizer from everything. Then you also start to question your consumption habits so that you become an effective part of the compost cycle.

R: Okay, I get it now.

Analysis of the post-interview data suggests that, mothers who now know the recycling process of organic waste after participating in learning activities expressed composting not only as a waste management strategy but also as a feasible and convenient practice for sustainable production. Besides, they emphasized that they have individual responsibilities with respect to waste generation and waste management in their everyday life.

Table 4.9 Themes and Sub-Themes that Emerged From Mothers' Post-Interviews

($N_{post}=23$)

Themes	Sub-themes
Mothers' self-reported knowledge on composting as a strategy and practice of responsible consumption and production	Composting as an organic waste management strategy ($n=19$)
	Composting is a sustainable practice for environmental well-being ($n=18$), circular economy ($n=13$), and the social aspect of sustainability ($n=5$)
	Organic waste generation is a part of everyday life ($n=19$)
	"I can do it": Composting as a practical way of sustainable production ($n=19$)

Table 4.9 (continued)	
Mothers' self-reported knowledge on individual responsibilities and duties in responsible consumption and production	"I am responsible for supporting the composting system (n=17) Composting is a feasible waste management strategy that individuals can do in everyday life. (n=16) Communicating with others is essential for participatory composting (n=15)

Unlike the statements depicted in pre-interviews, all participating mothers were able to talk about the details of recycling organic waste in the post-interviews. The facts indicated that the majority of mothers captured composting as a sustainable waste management strategy that contributes to the well-being of the environment and circular economy and supports community participation as a social practice (Table 4.9).

4.7.2.1 Mothers' Self-Reported Knowledge on Composting as a Strategy and Practice of Sustainable Production

Sub-Theme1: Composting as an Organic Waste Management Strategy

While the participating mothers mostly expressed their ideas about waste management through solid wastes such as plastic, glass, and metal before participating in the learning activities, the concept of recycling was mostly related to the recycling of organic waste in the post-interviews. When participating mothers were asked, *"What comes to your mind when you think about recycling? How would you describe it?"*, the majority of respondents (n=19) reported that recycling is about *reevaluating* organic waste materials. Related to this M₁ suggested, "Recycling, ensuring the reuse of recyclable waste materials." Commenting on this, M₁₃ stressed that "It is evaluating the leftovers after doing something in our kitchen, they can become reusable and valuable products for us," and M₁₇ mentioned, "It is regaining. ...It is a very nice kind of participation for the environment, regulating the balance of nature".

In contrast to the preliminary interviews, in response to the question *"Do you think there is a difference between waste and garbage?"*, all of the mothers said that garbage and waste are not the same thing. The most common answer given about this can be summarized by the following words M₁₅ expressed,

.... the two are different. While garbage refers the stuff which are worthless and in a state of disuse, recovery can be achieved by reusing and evaluating waste. When I say garbage, I think of a "lack of utility". Garbage is something that cannot be recycled.

But waste is not like that. We have a chance to recycle and recover waste. Waste is not like that. Waste can have a purpose of use again.

To elaborate the discussion and unfold mothers' expanded knowledge of recyclables, respondents were asked the following question, which is: "*So, what types of waste do you know?*". In contrast to the preliminary interviews, all participating mothers gave examples of many organic wastes in the post-interviews. Some of the statements of mothers are given below:

M₁₂: Banana peels, apple peels, potato peels, paper and cartons, straw, and dry leaves are all recyclable waste. They are recyclable organic materials. ...we can also send plastics and glasses to recycling centers.

M₁₀: Before I joined the activities, I was only talking about plastics and metals as examples of recyclable waste. But now I know that organic waste can also be recycled. I know that we can restore lettuce leaves, celery stalks, watermelon peels, coffee pulp, and eggshells as food waste instead of throwing them in the trash and we can give back to nature by converting them into compost.



When Figure 4.2 () was presented to mothers once again in post-interviews, it had already become a familiar visual for mothers this time. Similar to the pre-interviews, the majority of mothers pointed to paper ($n=21$), cans ($n=19$), and plastic bottles ($n=22$) as recyclable solid waste. On the other hand -in contrast to pre-interviews- banana peels, the eaten apple, and dry leaves were highlighted as recyclables by all participating mothers. Discussing the visuals, mothers categorized meat ($n=23$), ice cream ($n=23$), and cheese ($n=20$) as nonbiodegradable matters whilst dry leaves, the eaten apple, and banana peels were also categorized as biodegradable materials. The dialogue between the researcher and M₈ is shown below:

R: We have already talked about those visuals in our earlier conversation, but I want to ask you again. Which ones are recyclable?

M₈: Banana peels, apple peels, paper, dry leaves, plastic bottles, and can be recycled.

R: I think you gave a different answer from our earlier meeting.

M₈: Yes. Now, I know that organic waste can also be recycled.

R: So, all of the wastes you mentioned above can be converted in the same way?

M₈: No. Plastic bottles and metal cans are solid waste. It has nothing to do with composting. In fact, these are the wastes that we shouldn't put in the compost bucket.

R: What would you say for the rest?

M₈: Banana peels, leaves, and apple scraps. These are organic wastes. We can recycle these wastes by the composting method.

R: How about meat, cheese, and ice cream?

M₈: These can also be food waste, but not every food waste can go into composting. We can use biodegradable waste for compost. Meat, ice cream, and cheese are not

biodegradable waste, so if we put them in the compost pile, it will damage the nitrogen and carbon balance. Therefore, we cannot classify them as organic wastes.

R: Okay. Thanks for your explanation.

Sub-Theme₂: Composting is a Good Practice for Environmental Well-Being, Circular Economy and Social Sustainability

Parallel to pre-interviews, all participating mothers also emphasized the importance and necessity of waste management in their post-interviews. The vast majority of the participants argued that waste management should be done due to environmental and economic factors. Emphasizing environmental factors in particular, 18 respondents stated that waste management strategies such as "recycling" or "reusing" are pivotally critical to reducing landfill waste that takes up space in nature. For example, one interviewee (M₄) said, on a planet where waste is not re-evaluated and/or recycled and even accumulated constantly, the living spaces of living things will be negatively affected. This potentially causes a greater risk for the natural balance". This was also emphasized by M₁₁, "We know that waste takes up space in nature for many years without being lost. If we do not adopt an effective and sustainable waste management system, they will continue to accumulate in nature, mix into the air, water, and soil". M₂₃, on the other hand, has stated the following opinion regarding future generations:

...especially solid wastes take up a lot of space in nature. As long as we do not re-evaluate or achieve higher gains through recycling, waste will continue to accumulate in the natural environment. Therefore, we need to develop effective waste management strategies. ...At this point, the most vulnerable and disadvantaged group is children and young people. It seems that future generations will be most affected by the inability to manage the production of waste.

On the one hand, 13 mothers mentioned the impact of the effective evaluation and management of the waste generated on the circular economy, while 8 of these mothers emphasized that waste management is an effective start-up that ensures the protection of raw materials.

M₅: ...the re-evaluation of waste will undoubtedly protect raw materials. I think this is quite valid, especially in the industrial sectors that produce on a larger scale and cause waste generation.

M₃: Re-evaluation of waste will protect raw materials because it will prevent the use of new raw materials from scratch. This means protecting the country's economy.....I think composting is one of the easiest ways to obtain new material. Therefore, we don't have to pay for fertilizer and we feed our plants healthily.

M₁₉: by using the generated organic waste when composting, we actually get fertilizer. And then, we use that fertilizer to get more efficient, healthier food products. Thus, we do not have to buy fertilizers for our gardens and pots. We evaluate our waste individually and we do not have to bare any further expenses to grow healthier plants.

Remarkably, 4 mothers put an emphasis on the risk of waste generation for clean-up cost, transportation cost and loss of wasted resources has an impact on economic aspect. M₁₇ explained her ideas as follows:

M₁₇: Last week I observed how much waste can actually be generated from the home environment. Even a lot of organic waste came out of our kitchen in a short time. Larger-scale waste generation means the collection, transportation, and recycling of these wastes at the same time, all of which have a cost. This is why an effective waste management strategy is so important for economic development.

In addition, 5 mothers emphasized the social dimension of compost making. Mothers who stated that the composting process that will start at home or in community sites requires the cooperation of many participants who identify composting as an effective method that can initiate a sustainable waste management process in the community. Regarding this, M₁₀ and M₂₂ reported their points of view:

M₁₀: At the end of the activities, we all became *Compost Stars*. In other words, since we have explored and learned about the recycling process of organic waste, we can now take action. At this point, the first thing I did with my son as shining Compost Stars [giggling] was to share what we knew with others. I think the more people know, the more widespread it will become. It would be a nice social practice to do in the apartment gardens and residual sites.

M₂₂: Composting is a social practice that can be simply done with other community stakeholders. Composting practices carried out with neighbors and local resilience increase the knowledge of children and young people and trigger interest in sustainable lifestyles that potentially turns into a part of everyday life.

Subtheme₃: Organic Waste Generation is a Part of Everyday Life

Mothers who discovered the recycling of organic waste within the scope of the learning activities they jointly participated in with their children were also asked *whether the composting process they explored in post-interviews was related to everyday life routines or not*. In response to this question, 19 mothers stated that organic waste and the recycling process are directly related to their everyday life routines. Regarding this, M₁₂ indicated that "when we consider that we consume food every day, of course, it is related," while M₂₂ said, "of course, it is related when we think about how we cook and how we consume food every day. Another interviewee shed light on this issue as follows:

M₂₁: After participating in the composting learning activities, I have already realized that as consumers, we have a huge impact on organic waste generation. While I was exemplifying "recycling" or "reusing" as waste management strategies before participating in the learning activities, exploring the recycling process of organic waste made me realize that I was specifically informed about composting as an efficient and practical waste management method and I am already a part of it.

M₇: ...Since we consume, food waste is at the center of our daily life. I wasn't aware of this before, but now, I know that what is left over when making salads in the kitchen, cooking eggs in the morning, cracking walnuts, or peeling apples is not "garbage", but recyclable organic waste. Moreover, I am surprised to see how much waste is generated every day.

M₁: I have learned that it is an important part of everyday life. Considering that we cook and consume food every day, it is inevitable that organic waste will occur. Not only the leftovers from the kitchen but also garden waste should not be considered "garbage". Dry leaves in autumn are an important source of carbon for the soil. It's crucial to know this and not to sweep them away.

Subtheme₄: "I Can Do It": Composting as a Practical Way of Sustainable Production

One of the notable findings that emerged from the post-interviews was the mothers' expanded self-reported knowledge of how composting can be set up. In contrast to the pre-interviews, participating mothers indicated which organic wastes and which materials are needed to build a compost pile. In response to the question "How can we start the composting process? What do we need for that?", the majority of the mothers ($n=19$) anticipated that organic waste is essential for a compost pile. The following excerpts justified the respondents' perspectives:

M₂₂: ...we need organic waste first. The kitchen leftovers and/or dry leaves and tree bark from our gardens can be given as examples of organic waste. For example, potato and onion peels left over from preparing a dinner, and tomato and lettuce peels left over after making a salad can be easily recycled.

M₂:at first, we need to collect organic waste to make compost. Although we know that organic waste is leftovers from the kitchen, we cannot use all food waste for composting. Milk and dairy products as well as meat, and meat products cannot be recycled. More precisely, all kitchen leftovers cannot go into the compost bucket. We can only use biodegradable ones. If we put waste such as bones, fish bones, ice cream and cheese in the compost bucket, it will affect the balance of carbon and nitrogen needed for decomposition.

M₇: of course, we should have organic waste first. Since the composting process is about recycling organic waste into biofertilizers, we must first collect appropriate organic substances. for example, fruit peels can be decomposed and become compost. At this point, we can be careful not to put too many citrus peels, because we don't want it to be too acidic of an environment in the compost bucket. Other examples of organic waste that can be recycled are tea leaves, melon peels, cucumber peels, fruit leaves, and bark from the garden.

Complementary to this, the participant mothers ($n=19$) also provided the key aspects about the categories of organic waste and the need to put them into the compost pile in certain proportions to obtain healthy compost. With this in mind, participants particularly emphasized the nitrogen and carbon balance in their explanations on this issue. The following responses reflect the views of the mothers:

M₉: we need to put a certain amount of waste. As far as I remember, if we use two buckets of brown waste, we should use one bucket of green waste. I know it is important to strike this balance.

M₁₄: After determining the appropriate organic wastes for a healthy compost, if we have accumulated two buckets of brown waste for hot composting, i.e., dry leaves, cones, and bark, we should put one bucket of fruit and vegetable peels from the kitchen in order and combine them in a larger bucket for hot compost. I know that these ratios are actually to balance carbon and nitrogen, as nature always does. So, we are imitating nature.

M₁₃: ...we can think of hot composting as a chemical reaction. A kind of decomposition. In other words, the organic matter is transformed in the compost bucket by means of a hot composting process. Therefore, by putting in certain proportions of organic matter, we start the decomposition by balancing nitrogen and carbon. If we put a little too much green waste or a little too much brown waste, we will not get the healthy compost we want.

M₂₀: For hot composting, it is very important to have a balance of greens and browns in the compost bucket. So, before the hot composting activity, we collected two buckets of brown waste and one bucket of green waste. We broke down the waste well before putting it in the compost bucket so that we could speed up the process

By this extension, more details on hot composting were given by just over half of those ($n=12$) who focused on the effective role of microorganisms in hot composting. Respondents also argued that sufficient moisturizing and air holes must be essential to obtain a healthy compost:

M₁₁: of course, with the effect of temperature, the decomposition process will begin. You mentioned microorganisms that speed up the hot composting process. These invisible creatures accelerated the decomposition with the effect of heat.

M₁₆: You mentioned compost mixers during the events. It is important to stir the compost bucket regularly so that the compost pile can breathe.

M₄: ...we finally gave water to the compost heap during the hot composting activity held on the third day of the learning activities. We put enough water in the compost pile to moisten it. We also measured the first temperature with a thermometer. As the decomposition began, the temperature inside the compost bucket would also increase. Isn't that so?

Another essential point mentioned in post-interviews about the recycling of organic matter was related to worm composting. One of the most remarkable points for participating mothers ($n=20$) who emphasized the importance of observing real worms was about how earthworms, as tiny creatures, are so hardworking and an active part of the earth's compost cycle. Regarding this, the M₂₃ shared the following thoughts:

On the fourth day of the learning activities, we jointly created a worm farm with my daughter. We had the opportunity to examine the real worms that you brought us before the worm farm activity. I've never had the opportunity to examine it so closely

before. I have never thought before why worms do not have eyes, ears, or noses. But now, I know why they have just mouths. Even during our dark/light, dry/moist experiment with worms, we observed that it left his poop on our towel paper. I think it was a great moment. It was a moment we learned by doing. Of course, it is quite inspiring and instructive to learn how to make compost with worms. Besides, I'm actually thinking about how important a task they have for the earth. Probably billions of worms are digging tunnels under the soil, as well as increasing the yield of the soil, quickly recycling the remaining organic waste. It seems to me like a unique balance of nature.

4.7.2.2 Mothers' Self-Reported Knowledge on Individual Responsibilities and Duties in Production and Consumption

Subtheme₁: "I am Responsible for Supporting the Home Composting System"

One of the promising findings that emerged in post-interviews was related to the responsibilities and duties of waste management. As mentioned earlier, many of the mothers stated that waste management is the responsibility of the municipalities. After participating in the learning activities, mothers ($n=17$) particularly emphasized that each individual should take their own responsibility for waste management. However, almost half of the mothers emphasized that different stakeholders related to waste management should work together.

M₆: recycling of organic waste helps us to live in a more sustainable environment. We can simply do it on our own. If we do not address recycling timely, accumulated organic waste will turn into a bigger environmental crisis. Thus, we can think about the perspective that organic waste is not trash or garbage, they are resources.

M₁₂: ...as we discovered the process of recycling organic waste, we decided that in fact, every individual is a part of it. We all consume constantly. If we do not find a solution to the waste generated as we consume, organic waste management will become a global problem. At this point, I think of composting as a waste management strategy that anyone can simply do. Municipalities can continue to collect solid waste from homes, but the household and/or neighbors living together in the high-rise buildings and residents of the site can take their own action together regarding the decomposition of organic waste.

M₁₁: We can actually think of the waste left over from the kitchen as a kind of resource. Instead of just throwing away these resources, we can also contribute to the natural cycle that nature already offers and has been maintaining for many years. We can do this simply by ourselves. We must take responsibility for our own consumption habits.

M₈: Compost has become a good example of how to actually dispose of the recycling process. I think there is a social practice that re-evaluates from the "throw everything away" society and makes us think twice when consuming. Of course, municipalities can make compost areas and open up space to the public for the recycling of organic

waste in bulk. But I realized that in the simplest form, we can handle the recycling process of organic waste from our kitchen with family members.

M₁₅: I think this should be the people's responsibility. It starts with people. I think it should start with people and spread to everyone...it should be started from people and go up to people who consume organic wastes, who consume more food.

M₁₉: Waste generation should be considered as the individual's responsibility. First of all, this is my duty and I have to spread and apply it in my everyday life. ...I'm planning to put what I have learned in those five days into practice in my hobby garden.

Analysis of the data that emerged from post-interviews conducted with participating mothers demonstrated that after exploring composting as an organic waste management strategy, the majority of mothers indicated that their awareness of organic waste production was triggered, and they decided that organic waste is an important part of daily life. In connection with this, 15 mothers reported that they realized how much household waste comes out of the kitchen on a daily basis, and that learning how to compost made them question the amount of waste they actually produce and ponder on how to produce less waste. Regarding this issue, M₁₉ expressed:

... on the day we learned about hot composting as part of the learning activities, my daughter and I brought the organic waste from home to school for the activity. I had not realized that so much waste can only come out of the kitchen and that these wastes are actually recyclable organic wastes until then. On the other hand, it is not only what we use, there are dozens of food wastes that we buy to consume but throw away because we cannot consume them. At this point, I thought about how much waste we produce.

M₁₄ emphasized that household consumption habits can change with organic waste management:

... in our pre-interviews, I mentioned that our consumption habits are mostly guided by our needs. Regarding our household food consumption, I told you that we pay attention to buying healthy and nutritious foods. I explained that we consume without setting any limits on our food consumption. Although this thought is still true for me, I decided that our food consumption and the amount of waste we generate should be reviewed after I realized the amount of organic waste generated as a result of our household consumption patterns. Home composting is of course very effective as a sustainable waste management, but I think we need to make decisions about waste reduction before that.

However, more than half of the participating mothers stated that when they compared the recycling of organic waste with the recycling process of other solid wastes such as plastic, metal, glass, etc., they found composting to be a much easier and more feasible waste management strategy. With this in mind, mothers ($n=8$) stated that organic wastes that can

decompose in a shorter time, are more environmentally friendly and almost a valuable resource for the natural environment. Mothers mentioned that they have decided to restrict solid waste generation by changing consumption habits to decrease waste such as plastics, packaging packages, and glass disappearing in nature for a longer time and taking up space. Regarding this, M₉ argued, "a tomato peel or eggshells can decompose in several weeks and turn into biofertilizer which is also a valuable source. However, one plastic bottle remains in nature for centuries. This is a reason for me to make more environment-friendly choices,". This view was echoed by M₁₅, "I have decided that I no longer want packaged foods, but healthier, more environmentally friendly food products. Maybe we should limit our grocery shopping and buy our fruits and vegetables from the neighborhood market". To support this, M₅ indicated, "I have seen how much waste is generated when we consume packed food products. It both causes waste formation and is quite unhealthy. We should prefer foods that come from nature more, and it is more functional to return the waste that comes out to nature again as compost". Regarding this, the dialogue between M₄ and the researcher is given below:

R: We have talked to you about your household consumption habits before. Now I want to have a little talk and ask you again. What kind of consumer are you?

M₄: I told you at pre-interviews that our household consumption habits are guided by our needs. Of course, I have had changing thoughts.

R: What has changed?

M₄: I mentioned that we consume according to our needs without any limits related to our food consumption habits. However, after learning about the composting process, I saw how much higher the percentage of organic waste can be generated as a result of daily consumption.

R: How so?

M₄: I mean, the amount of waste generated from our kitchen every day is so much. There would be a lot of waste coming out of other residuals and even from environments where more people live and work, such as hospitals, factories, and schools. If it is not prevented, waste management will become a serious global problem.

R: What would your suggestion be?

M₄: I actually want to emphasize the quality of the waste produced. When we think about household consumption habits, the type and nature of the waste produced are also important. The fact that you have more plastic and glass waste and the fact that you have more organic waste are two different situations when it comes to waste management. I mean, it's also important what we consume and when we consume. I am questioning whether I should prefer products that will cause waste that disappears in nature for a longer time, or whether I should use more environmentally friendly products. That is the point.

Sub-Theme₂: Composting is a Feasible Waste Management Strategy That Individuals Can Do in Everyday Life.

In post-interviews, mothers (n=16) use the keywords "simple", "feasible" and "sustainable" while depicting the recycling of organic waste. Unlike the pre-interviews, respondent mothers

who shared details about hot composting and worm composting in the post-interviews gave embellished responses to the questions; "*So do you want to compost at home or where you live?*" and "*Are you planning to compost?*". All the participating mothers answered "Yes, I can", and "I plan to do it".

M₈ justified her idea with, "when I think about waste management strategies, home composting is quite feasible," while M₁₁ expressed, "of course, I can do it myself. It is a feasible method by which I can recycle the waste generated in my own house every day. I will get a valuable fertilizer for my pots,". For M₂₂ "As long as I have materials such as a compost bucket etc., I can do it," and M₁₀ touched upon this issue by saying, "Organic waste is already part of the daily routine. *Brown* waste is also already in the gardens. Of course, I can. This means using the fertilizer I obtained to grow basil again and getting healthy and high-quality plants again,". The response of M₁₆ to this question is also mentioned below:

Of course, I can do it. As long as there are enough space and materials to separate the waste, I can easily do it. ...now I know how to do it. I know why home composting is important. With a few materials, it is so easy to get compost. ...It is necessary to grow more qualified and high-quality food, which will improve the quality of the soil.it is also practical. I think everyone should do it at home. I don't think home composting requires so much effort. On the contrary, organic waste is already a part of everyday life. It can be easily done in a sustainable way both to reduce waste generation and even also to control waste management.

This issue was echoed in the dialogue between M₇ and the researcher, mentioned below:

R: I'm curious; you have learned about the recycling process of organic waste together with your child. So, what do you think? Could you recycle organic waste at home?

M₇: Yes, I can recycle.

R: Do you think it is an applicable method for managing your household waste? What is your opinion?

M₇: I definitely think it is. Rather, I think it's a strategy for individuals to do their own waste management. It is a convenient method for recycling food waste. You can easily do it on the balcony of your kitchen with a few easily accessible materials. You can follow the composting process with the participation of the entire household members. I think it's an application that empowers individuals related to waste management and sustainability.

R: How so?

M₇: When we say recycling, we think of paper, metal, plastic, batteries, etc. Even if we sort those wastes at home, we can't track them afterwards. We don't know how they go to the recycling areas and how they are recycled. However, the process of home composting is in your hands. You do your own waste management. You recycle your organic waste yourself in a practical way and get an end product in return. Therefore, the process turns into a sustainable production

R: Okay.

Subtheme₃: Communicating with Others is Essential for a Participatory Composting

Of all the participants, 15 mothers defined home composting as a social practice. Mothers who stated that there is a practice that every family or those who live at home can apply within themselves can be easily turned into a community-shared practice. Through role modeling, influencing, and encouraging each other, composting activities are considered as social practices that bring the community together in which neighbors, friends, and employees will work in cooperation within the scope of sustainable and responsible production. Regarding the issue, M₁ highlighted, "I want to apply what I have learned in the garden of the apartment where we live, for example. I will discuss this with the site management and inform my other neighbors about it," while M₈ stated, "Such an application will easily affect other people and will be a good example." For M₂₁, "I can do it in my own house. My neighbors would be inspired when they see me and my worm composting bins" According to M₁₀,

Home composting is a convenient practice that can be easily applied in the home environment. Every household can do on their own. However, it can also be easily done in cooperation with high-rise building gardens, site areas, and villages. This process will connect people both to each other and to nature.

M₇ expressed her thoughts as follows:

I think it's a good practice that we can do together with my neighbors. We live in detached houses. We have small gardens. I will also share with them what I have learned and how to do composting. I believe that it will turn into an interactive process that we can carry out together, follow, and use the valuable end-product we have obtained to grow lettuce, arugula, cucumbers, and blackberries in our gardens again. Frankly speaking, I think that these activities will become more meaningful and more sustainable when people living in society unite and interact. That is why I think we should share what we have learned with our relatives, friends and neighbors. Increasing the knowledge and awareness of others will facilitate to start up projects in our neighborhood.

In relation to this, regarding the question "*have you had the opportunity to share what you have learned with others?*" all of the participating mothers commented that they shared what they had learned with at least one person after the completion of the composting learning activities. At this point, especially the mothers who emphasized the *Compost Star* activity indicated that they were very enthusiastic to tell others what they had learned with their children. In this essence, M₂ explained, "We wanted to tell my son's grandma and grandpa. They have a summer house. We thought we could make compost there," while M₁₁ stated, "We shared it with our neighbors after school. Everyone who saw the star hanging around our neck asked us what it was. So, we made them curious by saying that we are *Compost Stars* now." According to M₁₈, "I shared it with my colleagues. I have friends who are interested in

environmental issues. They really liked to talk about compost," she said. Related to this M₆ mentioned:

R: Well, why did you share it with others? Was it important to share?

M₆: I think it was important.

R: Why though?

M₆: Just think about it. Food wastes come out like crazy every day at home and we throw them away unconsciously. I think everyone should know about home composting as a practical waste management technique and apply it.

R: Then, why?

M₆: If we were conscious, it would be different. Well, people don't know how to separate, sort out and collect waste. Our garbage and waste buckets should be separate. A bucket should be there for kitchen waste so that it does not mix with others. I think there should be a project to increase the awareness of citizens about that. The municipality can do this. The municipality should inform people. Thus, people also share information and transfer it to each other.

4.7.3 Executive Summary of Findings that Emerged From Mothers' Interviews

One of the research objectives of the current study is to reveal the self-reported knowledge of mothers who participate in composting learning activities with their children about organic waste and the recycling process of organic waste before and after the learning activities. Pre- and post-interviews with participating mothers were useful to unfold what mothers already knew about waste and waste management and their changed knowledge after participating in learning activities can be seen in Table 4.10.

Prior to participating in the learning activities, participating mothers identified waste and garbage as two different things. While waste is recyclable items, garbage is defined as "useless" things. Given this, participating mothers listed several recyclable items as paper, plastic, glass, and metal as well as kitchen leftovers, and identified them as garbage in pre-interviews. A further novel finding emerged from pre-interviews with mothers about the value of waste management. Considering that mothers associated waste and waste management with recycling and reusing stuff over and over again. Since filling the lands with garbage can be prevented through recycling waste, participating mothers expressed that recycling and reusing are critical waste management strategies for the well-being of the natural environment. Additionally, recycling and reusing contribute to the national economy by maintaining raw materials. In post-interviews, participating mothers declared that kitchen leftovers are not garbage. As organic waste, they can simply be recycled which makes composting a feasible waste management strategy. In contrast to pre-interviews, mothers were likely to mention what organic waste is in post-interviews. Besides paper, plastic, glass, and metal; mothers outlined lettuce leaves, apple scraps, watermelon peels, banana peels, dry leaves, coffee and tea pulp, and paper as biodegradable materials which can be recycled through composting. Immensely,

composting was suggested as a cycling process in which human beings and the non-human world have a role and typically work in collaboration. Concerning waste management practices, participating mothers agreed in pre-interviews that municipalities should be responsible for supporting household waste management. Since lack of space, lack of sufficient knowledge, and time issues were identified as barriers to effective household waste management, mothers suggested that municipalities should encourage the community in waste management tasks. On the contrary, after exploring composting through the learning activities, there was a sense among participating mothers that it should be individuals' responsibility. After conceptualizing the recycling of organic waste, mothers posited that each individual can typically be responsible for the home composting system. In this respect, there is a good match between children's and mothers' post-findings. As in children's depictions, participating mothers indicated that composting is a feasible, convenient, and sustainable practice that individuals can simply do in their everyday life. Of significance, the majority of mother respondents associated waste generation with household members' consumption habits. Thus, learning about composting and integrating it into daily routines was linked with changing consumption habits of the household members and can be claimed as one of the promising findings that emerged in the post-interviews with mothers. Further analysis of pre- and post-interviews with mothers showed that prior to participating in the learning activities, mothers identified recycling as critical for the well-being of the environment and maintaining raw materials. Turning now to the post-interview findings, mothers were likely to elicit the value of recycling as contributing to environmental well-being, circular economy, and social sustainability.

A common view amongst mothers was that composting systems are critical to reducing landfill waste. Through composting, raw materials are also protected which contributes to the national economy. Plus, it has the potential to turn into a social practice with the participation of different stakeholders. Considering that home composting was acknowledged as a social practice that potentially brings the community members such as family members, friends, neighbors, and employees together to collaboratively work for sustainable and responsible consumption and production. Hence, the majority of mothers in post-interviews highlighted that it is pivotal to share what they have learned through learning activities with others. The planned comparison between pre- and post-interviews with mothers highlights that respondent mothers had almost no valid recognition of recycling organic waste before participating in the learning activities. They mentioned recycling some types of solid waste and reusing it when they were asked about waste management in pre-interviews. On the other hand, post-findings confirmed that waste management was outlined through conceptualizing composting, thus

mothers' elaborations on the need and the value of waste management were all described through centralizing composting.

Table 4.10 A Comparison of Findings that Emerged From Mothers' Pre- and Post-Interviews

Pre-interviews	Post-interviews
• Recycling and reusing are waste management strategies. • As a waste management strategy, recycling and reusing is critical for the well-being of the natural environment and for maintaining raw materials to increase the national income. • Garbage and waste are different things. Garbage is <i>useless</i>, but waste is <i>recyclable</i>. • Paper, plastics, glass, and metals are recyclables. • Kitchen leftovers are garbage. • Lack of space and sufficient knowledge are barriers to managing household waste. It is also time consuming to separately collect the items. • Municipalities are responsible to carry out waste management tasks and encourage the community for waste prevention practices and strategies. • Consumption decisions are shaped by children. Children have an active role on the decision-making process about household consumption. • Food consumption choices are shaped by needs. Eating healthy food is the main factor that shapes consumption choices. • There is no valid recognition on recycling organic waste. Leftovers from meals are all sent to the garbage bin. • Earthworms are responsible for digging tunnels and opening holes to make soil aerate.	• Exploring composting with children through playing games, observing real earthworms, and having joint conversations is inspiring. Early years are quite eligible to immerse children in sustainability • As a waste management strategy composting is a cyclical process from consumption to production in which human and non-human worlds collaborate. • Kitchen leftovers and garden waste are not garbage, they are recyclable. • There are recyclable organic materials. • Lettuce leaves, apple scraps, watermelon peels, banana peels, dry leaves, coffee and tea pulp, paper, plastics, metals and glass are recyclables. • Composting is a good practice for environmental well-being, circular economy and social sustainability. It reduces landfill waste, protects raw materials and potentially turns into a social practice with the participation of other stakeholders. • Composting is a practical way of responsible and sustainable production. Starting up hot and worm composting practices is simple and convenient. • Earthworms have a profound role in the compost cycle. • Each individual is responsible for supporting the home composting system. Household consumption habits can be changed through integrating composting into daily life. • Since organic waste is an integral part of daily life, composting is a feasible waste management strategy that individuals can simply do in everyday life. • Home composting is a social practice that brings the community together in which neighbors, friends, employees will work in cooperation within the scope of sustainable and responsible production.

Analysis of mothers' post-findings illustrated that mothers were capable of explaining the process of hot and worm composting in detail. They explored how they got started with the composting process, which materials were required, and what types of green and brown waste were required. Thus, mothers emphasized that organic waste is related to everyday life, and as such, home composting is a feasible and convenient strategy that can be easily conducted in the home environment. Further explanations of mothers were related to their personal experiences. Correspondingly, mothers indicated that exploring composting with their children was inspiring for them. Questions, comments, and conversations presented by children during and after learning activities promoted mothers' participation. Considering this, participating mothers highlighted that early childhood years are needed to be considered as an eligible period to immerse young children in learning for sustainability. All in all, mothers' expanded knowledge of the need and the value of recycling organic waste after participating in the learning activities is apparent in post findings. In the next section, the conversations between participating children and mothers about learning activities and the relationship between mothers' conversational style with children's memory responses are discussed.

4.8 Findings Related to the Joint Conversations on Recycling Organic Waste

In the following section, preliminary analysis and the descriptive results of all variables are presented first. Next, the analysis of mother-child joint conversations in line with the descriptives of conversational variables of participating mothers and children and how high and low elaborative mothers differ in their conversation in each activity day are provided. At last, correlational results of post and follow-up interviews are reported to figure out the relation to the earlier mother-child conversations on children's memory reports about the composting learning activities in which children and mothers jointly participated.

4.8.1 Preliminary Analysis

Preliminary analyses particularly focused on addressing participating mothers' unique conversational styles. To do so, each mother-child dyad participated in a joint talk based on a shared past event that was recently experienced (Table 4.11).

Of particular interest to categorizing mothers as either high or low elaborative, mothers' use of memory questions (open-ended questions), yes/no questions, context statements, and their conversation about a personal shared event were helpful. A median split was performed on the variables of maternal elaborative styles in order to categorize mothers in the current sample as

high elaborative and low elaborative.

Table 4.11 Summary of the Past Shared Event Themes Discussed by Participating Mothers and their Children ($N=23$)

Content of the topics in past shared conversations	<i>f</i>
A recreational activity (e.g picnic, riding scooter, playing football)	9
A family activity (e.g baking cookie/cake, playing with blocks, watching a documentary)	5
Medical/Health (e.g visiting a dentist)	3
Birthday celebrations	3
Excursions	3

Mothers who were ranked in the bottom 50% of elaboration scores on the personal shared event, were considered to have a low elaborative reminiscing style, whereas the mothers in the top %50 were considered as high elaborative in the conversations. Of participating mothers ($N=23$), a total of 12 mothers were found to use more open-ended and yes/no questions, context statements, and evaluations ($M=123.58$, $Range=173-94$) in their conversations. Those 12 mothers were assigned to a high elaborative group and the remaining mothers ($n=11$) who were below the median in their usage of open-ended and yes/no questions, context statements, and evaluations were classified as low elaborative mothers ($M=74.18$, $Range=90-38$) (Table 4.12).

Table 4.12 Means, Standard Deviations, and Ranges of Participant Mothers' Conversational Variables in a Past Shared Event ($N=23$)

Variable	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
High elaborative mothers' variables ($n=12$) ($M_1, M_2, M_4, M_5, M_9, M_{10}, M_{12}, M_{13}, M_{15}, M_{16}, M_{17}, M_{22}$)				
Open-ended questions	22.60	6.41	14.00	34.00
Yes/no questions	25.41	6.55	11.00	37.00
Context Statements	60.83	30.22	19.00	121.00
Positive Evaluations	13.16	6.63	3.00	24.00
Negative Evaluations	1.50	1.62	.00	4.00
Repetition of open-ended questions	3.00	3.30	.00	10.00
Repetition of yes/no questions	1.50	2.61	.00	9.00
Repetition of context statements	1.10	1.08	.00	3.00
Elaborations ^a	123.58	28.03	94.00	173.00
Repetitions	5.75	5.27	.00	19.00
Words	401.66	136.96	180.00	632.00
Low elaborative mothers' variables ($n=11$) ($M_3, M_6, M_7, M_8, M_{11}, M_{14}, M_{18}, M_{19}, M_{20}, M_{21}, M_{23}$)				

Table 4.12 (continued)

Open-ended questions	10.90	4.27	3.00	16.00
Yes/no questions	15.36	7.04	5.00	26.00
Context statements	31.72	15.28	11.00	59.00
Positive evaluations	13.54	6.75	4.00	24.00
Negative evaluations	.82	1.17	.00	3.00
Repetition of open-ended questions	2.64	1.91	.00	7.00
Repetition of yes/no questions	.45	.82	.00	2.00
Repetition of context statements	1.18	1.40	.00	4.00
Elaborations ^a	74.18	17.06	38.00	90.00
Repetitions	4.09	2.25	1.00	8.00
Words	218.18	67.28	105.00	318.00

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements and evaluations.

As further shown in Table 4.12, mothers who were categorized in the high elaborative group asked more open-ended (Wh- questions) questions ($M=22.6$, $SD=6.41$) when compared to mothers who were categorized as low-elaborative mothers ($M=10.90$, $SD=4.27$). Moreover, it was also common for highly elaborative mothers to use context statements and evaluations to elaborate on conversations. On the other hand, the remaining 11 mothers used fewer evaluations and provided less context statements to follow children's responses during conversations.

4.8.2 Descriptive Statistics

Descriptive analyses were conducted to figure out the values of the participants' conversational variables. Concerning the study variables, mothers' and children's elaborations and repetitions were calculated for mother-child joint conversations. Since one of the central tenets of this study is to capture to what extent mothers' unique conversational styles facilitated children's memory reports about learning activities, elaborations were taken into consideration in order to understand the variations in mothers' conversational styles. Herein, *elaborations* refer to a score that includes the total number of open-ended questions, yes/no questions participating mothers and children asked, as well as the number of context statements and positive and negative evaluations that participants made. In addition, *repetitions* refer to a score that includes the total number of repetitions of open-ended questions, yes/no questions participating mothers and children asked, and context statements that participants made. In this vein, the mean of elaborations used by participating mothers was found as 415.61 ($SD=.03$), and the mean of elaborations used by participating children in joint conversations was found as 204.65 ($SD=.01$). Besides, the mean of repetitions made by mothers was found

as 19.17 ($SD=12.27$) and the mean of repetitions made by children was found as 3.04 ($SD=2.58$). When it comes to the total words, the mean of total words used by mothers was 1329.78 ($SD=652.02$) and the mean of total words used by children was 539.39 ($SD=302.0$).

Descriptive analyses were conducted to determine the values of the participants' conversation variables. Accordingly, the means, standard deviations and ranges of all key variables for mother-child conversations that took place immediately after each day's learning activity are presented in Table 4.13. Regarding the study variables, elaboration and repetition of mothers' and children's joint mother-child conversations were calculated. Since one of the main principles of this study was to capture the extent to which mothers' unique speaking styles facilitated children's memory reports of learning activities, elaborations were taken into account to understand differences in mothers' speaking styles. Elaboration here refers to a score that includes the total number of open-ended questions and yes/no questions asked by participant mothers and children, as well as the number of context statements and positive and negative evaluations made by participants.

In addition, repetitions refer to a score that includes the total number of repetitions of open-ended questions, yes/no questions, and context statements made by the participant mothers and children. Accordingly, the mean number of elaborations used by participant mothers was 415.61 ($SD=.03$), and the mean number of elaborations used by participant children in joint conversations was 204.65 ($SD=.01$). In addition, the mean number of repetitions used by the mothers was 19.17 ($SD=12.27$) and the mean number of repetitions used by the children was 3.04 ($SD=2.58$). As for the total words, the mean of the total words used by the mothers was 1329.78 ($SD=652.02$) and the mean of the total words used by the children was 539.39 ($SD=302.0$).

Table 4.13 Means, Standard Deviations, and the Ranges of Mothers' and Children' Total Variables

Descriptive Variable	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Mother-child conversations about the composting learning activities				
<i>Mothers' variables</i>				
Open-ended questions	78.83	37.84	27	151
Yes/no questions	74.52	45.42	18	181
Context statements	204.74	122.93	55	458

Table 4.13 (continued)

Positive evaluations	58.48	25.92	21	110
Negative evaluations	4.26	3.11	0	13
Repetitions of open-ended questions	12.91	10.52	0	49
Repetitions of yes/no questions	2.04	1.82	0	7
Repetitions of context statements	4.09	3.41	0	12
Elaborations ^a	415.61	210.67	170	776
Repetitions	19.17	12.27	1	54
Words	1329.78	652.02	420	2501
<i>Children's variables</i>				
Open-ended questions	9.26	9.20	1	40
Yes/no questions	7.04	5.32	1	29
Context statements	129.13	71.10	41	314
Positive evaluations	52.57	34.19	9	132
Negative evaluations	6.65	6.09	0	19
Repetitions of open-ended questions	.30	.88	0	4
Repetitions of yes/no questions	.43	1.16	0	4
Repetitions of context statements	2.09	2.02	0	6
Elaborations ^a	204.65	98.35	75	421
Repetitions	3.04	2.58	0	8
Words	539.39	302.0	161	1304

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and positive and negative evaluations.

4.8.3 Correlations

Children's elaborations in mother-child joint conversations about composting learning activities and children's variables in post and follow-up interviews were the dependent variables of the present study. Since one of the main research goals was to determine the positive associations between mothers' use of the elaborative reminiscing style and children's memory reports, the number of correlations involving interrelated variables including mothers' elaborations, child's elaborations, and the children's outcome variables are demonstrated in both post and follow up interviews. Furthermore, as a subcomponent variable, mothers' memory questions (open-ended questions) were also included in the correlational analysis to flesh out the potential of the elaborative conversational style of mothers which is considered influential in previous studies (Camilleri et al., 2021; Leichtman et al., 2000; 2017). As can be seen in Table 4.11, multiple positive relations were evident in children's variables during mother-child overall conversations. Mothers' total open-ended questions during conversations were highly associated with children's total open-ended questions ($r=.49, p<.01$), children's total elaborations ($r=.68, p<.05$), and children's total words ($r=.49, p<.01$). Together, mothers'

total elaborations were significantly correlated with children's total open-ended questions ($r=.54, p<.05$) and children's total elaborations ($r=.82, p<.05$). Similarly, mothers' total words in all mother-child joint conversations were highly predictive with children's total elaborations ($r=.77, p<.05$) and children's total words ($r=.60, p<.05$). To add, mothers' overall elaborations is significantly correlated with overall repetitions ($r=.64, p<.05$).

Furthermore, one of the primary concerns of the current study was to reveal how mothers' conversational style uniquely related to children's memory reports about composting learning activities that emerged in post and follow-up interviews. While mothers' conversational variables were examined, it was seen that mother's elaborations was positively correlated with children's descriptives ($r=.78, p<.05$), recalling the objects correctly ($r=.78, p<.05$), recalling actions correctly ($r=.69, p<.05$), time statements that children presented ($r=.57, p<.05$), and providing correct details related to learning activities ($r=.78, p<.05$) in post-interviews. Plus, the mother's elaborations were positively associated with children's descriptives ($r=.59, p<.05$), recalling the objects correctly ($r=.5, p<.05$), and providing correct details related to learning activities ($r=.57, p<.05$) in follow-up interviews. To add, mothers' total words used in joint conversations were predictive of children's total words in post-interviews ($r=.73, p<.05$) and in follow-up interviews ($r=.58, p<.05$). Further analysis proved that mothers' total repetitions were not significantly correlated with children's memory reports that emerged in post and follow-up interviews.

With regard to mothers' unique conversational styles, Table 4.15 compares the means and standard deviations of high and low elaborative mothers' conversational variables during all conversations about the composting learning activities. As it was outlined in the table shown below, mothers who had higher levels of elaborations encouraged their children with more open-ended and yes/no questions, provided more context statements, and used more evaluations. Plus, children whose mothers were categorized as high elaborative used more words when compared to low elaborative mothers.

The results also demonstrated that highly elaborative mothers used significantly more words ($M=1689.75, SD=510.03$) when compared to low elaborative mothers ($M=937.09; SD=569.24$). Furthermore, t-test analysis was helpful to statistically compare high and low elaborative mothers' overall elaborations. In this respect, mothers who had high elaborative styles were statistically significant in the use of overall elaborations ($M=518.92, SD=179.68$) compared to low elaborative mothers ($M=302.91, SD=188.02$); $t(21)=2.82, p=.01$.

Table 4.14

Correlations of All Conversational Variables of Mothers and During Mother-Child Joint Conversations About the Composting Learning Activities and Children's Reports During Post and Follow-Up Interviews (N=23)

[illegible]

Table 4.14 (continued)

12	Children's time statements (in post-interviews)	.615**	.567**	.375	.538**	.383	.119	.098	.518*	.775*	.619*	.775*								
13	Children's correct details provided (in post-interviews)	.731**	.780**	.457*	.751**	.712**	.326	.030	.691*	.933*	.874*	.887*	.800*							
14	Children's total words (in post-interviews)	.722**	.740**	.415*	.732**	.555**	.355	-.055	.705*	.937*	.853*	.887*	.752**	.913*						
15	Children's descriptives (in follow-up interviews)	.620**	.597**	.331	.624**	.525*	.465*	-.058	.750*	.799*	.697	.698*	.498*	.708*	.714*					
16	Children's objects correctly recalled (in follow-up interviews)	.513*	.576**	.332	.602**	.430*	.273	.082	.621*	.556*	.566	.443*	.305	.501*	.525*	.799*				
17	Children's actions correctly recalled (in follow-up interviews)	.375	.443*	.148	.487*	.462*	.283	-.061	.737*	.521*	.497*	.561*	.434*	.509*	.632*	.602**	.452*			
18	Children's time statements (in follow-up interviews)	.214	.271	.030	.241	.219	.091	.087	.430*	.524*	.345	.466*	.727**	.509*	.540*	.445*	.359	.543*		
19	Children's correct details provided (in follow-up interviews)	.490*	.570**	.241	.601**	.500*	.301	.029	.786*	.656*	.610*	.612*	.533**	.621*	.702*	.805**	.800*	.871*	.683**	
20	Children's total words (in follow-up interviews)	.511*	.561**	.304	.580**	.526**	.371	-.021	.734*	.771*	.640*	.643*	.579**	.701*	.728*	.930**	.799*	.685*	.604*	.883**

*. Correlation is significant at the 0.01 level (2-tailed)

**. Correlation is significant at the 0.05 level (2-tailed)

Table 4.15 Means and Standard Deviations of High and Low Elaborative Mothers' Conversational Variables in the Composting Learning Activities (N=23)

Variables	Mothers' conversational style	<i>n</i>	<i>M</i>	<i>SD</i>
Mothers' total open-ended questions	High Elaborative	12	99.17	29.14
	Low Elaborative	11	56.64	34.31
Mothers' total yes/no questions	High Elaborative	12	95.67	33.68
	Low Elaborative	11	51.45	46.57
Mothers' total context statements	High Elaborative	12	258.66	118.91
	Low Elaborative	11	145.91	101.96
Mothers' total positive evaluations	High Elaborative	12	71.00	27.73
	Low Elaborative	11	44.82	15.45
Mothers' total negative evaluations	High Elaborative	12	4.75	3.41
	Low Elaborative	11	3.73	2.79
Mothers' total elaborations ^a	High Elaborative	12	518.92	179.68
	Low Elaborative	11	302.91	188.02
Mothers' total words	High Elaborative	12	1689.75	510.03
	Low Elaborative	11	937.09	569.24

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and positive and negative evaluations.

4.8.4 Findings Related to Mother-Child Joint Conversations on the Recycling of Organic Waste

In this section, analysis of mother-child conversations related to each day's learning activities was examined in line with content descriptions of the conversations, descriptives of conversational variables, relations evident between mothers' contributions to children's variables, and the association of mothers' conversational styles with children's variables.

4.8.4.1 DAY 1: Conversations on Recycling as a Waste Management Strategy

There is a range of conversation headings related to the learning activities of the composting learning activities held on the first day. In this respect, the primary interests of the first day's mother-child conversations were what recycling was, the need for recycling as a waste management strategy, and recyclables. As can be seen in Table 4.16, the visit of the *Garbage Witch*, the "Meyve Sepeti" game, and the discussion on the need for recycling was the overwhelming focus of mother-child conversations.

Table 4.16 Summary of the Activity Content Jointly Discussed by Mothers and Children on
Day 1 ($N=23$)

Content description	<i>f</i>
The visit of <i>Garbage Witch</i>	18
The need for recycling	12
Recyclable materials	14
“Meyve Sepeti” Game	19
Organic waste	6

In the following analyses, mother-child conversational variables are indicated as related to learning activities held on the first day of composting learning activities. Table 4.17 displays descriptive analyses related to the main conversational variables.

Table 4.17 Means, Standard Deviations and Ranges of Mothers’ and Children’s Main
Conversational Variables on Day 1 ($N=23$)

Variable	<i>M</i>	<i>SD</i>	<i>Range</i>
<i>Mothers’ variables</i>			
Open-ended questions	14.74	9.53	0-37
Yes/no questions	13.26	9.15	0-34
Context Statements	33.08	23.32	0-84
Positive Evaluations	11.52	8.66	0-29
Negative Evaluations	.48	.59	0-2
Repetition of open-ended questions	2.65	3.43	0-14
Repetition of yes/no questions	.35	.78	0-3
Repetition of context statements	.83	1.23	0-4
Elaborations ^a	73.04	45.39	0-1
Words	239.43	149.62	0-459
<i>Children’s variables</i>			
Open-ended questions	1.82	2.04	0-6
Yes/no questions	1.65	2.33	0-7
Context Statements	28.65	24.99	0-112
Positive Evaluations	7.39	6.38	0-23
Negative Evaluations	1.17	1.50	0-5
Repetition of open-ended questions	.13	.63	0-3
Repetition of yes/no questions	.08	.42	0-2
Repetition of context statements	.30	.70	0-2
Elaborations ^a	40.26	31.16	0-2
Words	119.96	110.31	0-502

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

The mean of mothers' elaborations was 73.04 ($SD=45.39$) and the mean of children's elaborations on the first day of joint conversations with their mother was 40.26 ($SD=31.16$). Besides, the mean use of words was 239.43 ($SD=149.62$) for the mothers and 119.96 ($SD=110.31$) for children.

When it comes to the mothers' and children's talk related to the first day's learning activities, multiple relations were evident between the conversational variables (Table 4.18). In this regard, mothers' open-ended questions were significantly correlated with children's open-ended questions ($r=.60, p<.05$), children's yes/no questions ($r=.14, p<.01$), and children's context statements ($r=.66, p<.05$). Similarly, mothers' elaborations were significantly associated with children's open-ended questions ($r=.69, p<.05$), children's context statements ($r=.64, p<.05$), and children's evaluations ($r=.69, p<.05$).

Further analysis showed that mothers' total words were consistently related to children's elaborations on the first day of mother-child conversations. Together, mother's total words highly correlated with children's open-ended questions ($r=.59, p<.05$), context statements ($r=.63, p<.05$), and children's evaluations ($r=.63, p<.05$). Remarkably, the total words used by mothers in the conversations are highly correlated with children's elaborations ($r=.71, p<.05$). On the other hand, there is no significant relationship indicated between mothers' repetitions and the majority of the children's variables.

As mentioned before, participating mothers conversed with their children about varied content at the end of the first day. Considering Table 4.19, high elaborative mothers provided their children markedly more open-ended questions, more context statements, and more evaluations in their joint talk compared to low elaborative mothers. When it comes to the total elaborations, mothers who had a high elaborative conversational style talked with their children with more elaborations ($M=102.08, SD=34.93$) when compared to low elaborative ones ($M=41.36, SD=32.78$). Further statistical analysis also confirmed that highly elaborative mothers were significantly more engaged in their conversations held on Day 1 ($t(21)=4.29, p=.00$). The dialogue between M₂ and C₂ is a good illustration of how a high elaborative mother sustained the conversation related to the learning activities held on Day 1.

M₂: What do you remember about today's event? What did we do today?

C₂: Hmm. I remember that we talked about garbage.

M₂: Yes, you're right. We focused on garbage. The garbage on the *Garbage Witch* [giggling]. Who was that *Garbage Witch*, then?

Table 4.18 Correlations Between Mothers' and Children's Conversational Variables About the Content of the Composting Learning Activities Held on Day 1. ($N=23$)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Mothers' open-ended questions													
2 Mothers' yes/no questions	.734**												
3 Mothers' context statements	.771**	.771**											
4 Mothers' total evaluations	.669**	.653**	.645**										
5 Mother's elaborations	.880**	.876**	.952**	.792**									
6 Mothers' repetitions	.430*	.475*	.343	.391	.434*								
7 Children's open-ended questions	.604**	.439*	.641**	.765**	.688*	.432*							
8 Children's yes/no questions	.414*	.299	.184	.278	.298	.051	.380						
9 Children's context statements	.657**	.456*	.504*	.818**	.643**	.247	.769**	.052					
10 Children's total evaluations	.397	.612**	.736**	.573**	.692**	.303	.492*	-.046	.426*				
11 Children's elaborations	.703**	.558*	.633**	.846**	.745**	.255	.815**	.434**	.977**	.574**			
12 Children's repetitions	.028	.066	-.010	.047	.023	.340	.299	.035	.288	-.022	.407		
13 Mothers' words	.900**	.897**	.898**	.742**	.970**	.457*	.591**	.232	.629**	.628**	.709**	.065	
14 Children's words	.619**	.486*	.486*	.779**	.609**	.215	.752**	.259	.983**	.426*	.961**	.339	.611**

*.Correlation is significant at the 0.01 level (2-tailed)

**. Correlation is significant at the 0.05 level (2-tailed)

Table 4.19 High and Low Elaborative Mothers' Variables During Mother-Child Conversations on Learning Activities Held on Day 1 (N=23)

Variables	Mothers' conversational style	<i>n</i>	<i>M</i>	<i>SD</i>
Mothers' open-ended questions	High Elaborative	12	20.76	8.10
	Low Elaborative	11	8.19	6.08
Mothers' yes/no questions	High Elaborative	12	18.50	7.43
	Low Elaborative	11	7.55	7.38
Mothers' context statements	High Elaborative	12	45.75	20.34
	Low Elaborative	11	19.27	18.40
Mothers' positive evaluations	High Elaborative	12	16.75	8.35
	Low Elaborative	11	5.82	4.47
Mothers' negative evaluations	High Elaborative	12	.42	.51
	Low Elaborative	11	.55	.69
Mothers' elaborations ^a	High Elaborative	12	102.08	34.93
	Low Elaborative	11	41.36	32.78
Mother's words	High Elaborative	12	344.42	96.50
	Low Elaborative	11	124.91	106.55

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

C₂: Ah yes. *The Garbage Witch* visited us. She came to school. I remember her hat. Her black witchy hat.

M₂: Her hat made her seem like a real witch, right? Well, why did she call herself a *Garbage Witch*?

C₂: Because she had a lot of garbage hanging over her clothes. The *Garbage Witch* didn't know where to take the garbage.

M₂: Yes. She also had a black dress and a big bag. So, what waste came out of the *Garbage Witch's* bag?

C₂: Lego box, egg box, a metal can, a plastic water bottle, plastic bags, and a glass jar. I remember these things. The *Garbage Witch* brought all this to us because she didn't know where to throw it.

M₂: She asked us for help, didn't he? She mentioned that she couldn't find the recycling bins. So, we showed her the location of the recycling bins. Today the *Garbage Witch* gave us a surprising piece of information. What did he tell us?

C₂: I do not remember.

M₂: It was about the banana and tangerine peels on their clothes.

C₂: A-ha, okay, I remember now. We asked her to throw the banana and tangerine peels in the trash, but the *Garbage Witch* said they could be recycled too. She didn't want to throw it in the trash.

M₂: That's exactly what happened. We told her to put paper, cardboard, glass bottles, and metal cans in the recycling bins, but the *Garbage Witch* said there should also be a

recycling bin for banana and tangerine peels. Well, did you know before that banana and tangerine peels can also be recycled?

C₂: No, I didn't.

M₂: And what are these wastes called?

C₂: The *Garbage Witch* told us that they are not garbage, but waste. It's called organic waste.

M₂: Yes. So, what did we do after we met the *Garbage Witch*?

C₂: Can I think about it for a moment?

M₂: Of course. Remember the playing cards?

C₂: Yes, we played a game. We played the "Meyve Sepeti" game. It was really fun, wasn't it, mom? I was a banana.

M₂: I was an apple. What kind of game was that? What was on the cards?

C₂: There were some fruit visuals.

M₂: What fruits were they?

C₂: There were bananas, apples, tangerines and pears.

M₂: Exactly so. Why did we wear fruit cards around our necks?

C₂: Because the person who was in the middle of the ring had to see.

M₂: Yes. The midwife directed the game to the center of the ring. Right? What did he do?

C₂: When the midwife said the name of a fruit that appeared, those fruits in the fruit basket got mixed up and tried to find another place in the ring for themselves.

M₂: And what happened when they said "all the fruits"?

C₂: Then, all the fruits mixed up. They bumped into each other [giggling]

M₂: That's exactly what happened. After the Fruit Basket game, the teacher offered us some of the fruits that we saw pictures of in the game. We ate the fruits, but what about the peels? There were banana, apple, and tangerine peels. Right?

C₂: Our teacher did not throw the peels. She said they were not garbage. She's going to hide it. She's going to bring it back later.

M₂: Yes. She filled the peels of all the fruits into a yellow-colored container. She promised to bring it back in a few days. Let's see when she will bring it.

C₂: Yes, Mom. I'm also very curious.

Another dialogue between M₉ and C₉ also exemplifies an extended and detailed conversation conducted at the end of the first day of the composting learning activities:

M₉: ...what else have we learned today? Is every piece of garbage waste?

C₉: No.

M₉: And then what is waste?

C₉: Waste means recyclable. So, it does not need to accumulate in nature. We can regain it by recycling.

M₉: Okay. And how soon do you think waste will disappear if we leave it to nature? For example, how long does it take for glass to disappear?

C₉: It takes 4000 years.

M₉: Hu-huh. They disappear exactly in 4000 years. The environment needs 4000 years to destroy it. Can you imagine, it's a very long time.

C₉: Yes mom.

M₉: So, what do you think about plastics?

C₉: I found out that plastics can last up to 1000 years, mom. What a long time, isn't it?

M₉: Yes. The plastics we leave in nature take up space for so long. We played a game later today. What kind of game was it? What do you remember?

C₉: Yes. We played the game "Meyve Sepeti" game. The teacher gave us all the fruit cards. We hung it around our necks.

M₉: What fruit did you become?

C₉: I was a pear. And what fruit did you become?
M₉: I was a banana. When I was playing, I couldn't find a place for myself at first. Remember that?
C₉: [giggling] Yes, I remember. Then you said "all the fruits" and the fruit basket was thoroughly mixed up.
M₉: [Laughter] Yes, it was very enjoyable. But it was as if there was a purpose for us to play this game. What do you think the purpose was?
C₉: Can it be to recognize fruits?
M₉: Maybe. But do you remember that the *Garbage Witch* also came with some fruit peels on her?
C₉: Yes. She had tangerines and banana peels on her black dress.
M₉: What did he tell us?
C₉: *The Garbage Witch* told us that they were waste, not garbage. She didn't mean to throw it in the trash. Banana and tangerine peels are also recyclable, she said. I didn't know that. Did you know about it?
C₉: I didn't know either. Maybe the teacher will show us how to do it.
M₉: Do you remember what happened to the fruit peels we ate at the picnic?
C₉: Oh yes. The teacher collected all those fruit peels. She said she would keep it and bring it back to us later. This may be related to the recycling of fruit peels.
M₉: I think so too.

On the other hand, the conversation between M₁₄ and C₁₄ can be given as an example of a less detailed conversation held at the end of the first day.

M₁₄: How was your day? What did we do today?
C₁₄: It was nice.
M₁₄: What have we done?
C₁₄: We played a game
M₁₄: What else did we do?
C₁₄: We had a picnic.
M₁₄: What else?
C₁₄: I don't remember.
M₁₄: Do you remember the *Garbage Witch*?
C₁₄: Yes
M₁₄: What did the *Garbage Witch* tell us?
C₁₄: She talked about the stuff on her clothes.
M₁₄: What did the *Garbage Witch* bring us?
C₁₄: An egg box and a Lego box.
M₁₄: What else was there?
C₁₄: Hmm. Did she have a plastic water bottle on her?
M₁₄: So, what else was there?
C₁₄: I don't remember.
M₁₄: The banana peel was hanging from her clothes. Don't you remember that?
C₁₄: Yes, I remember.
M₁₄: What did he say about the banana peel?
C₁₄: The banana peel is not garbage, she said we can recycle it
M₁₄: What else did she say?
C₁₄: I don't remember.
M₁₄: Okay. We helped the *Garbage Witch*. We said don't throw it in the trash, use the recycling bins. Isn't it?
C₁₄: Yes.
M₁₄: So, what else have we done today?
C₁₄: I don't remember.

M₁₄: We had a picnic after playing the game. Right?
 C₁₄: Yes.
 M₁₄: What did we eat while having a picnic in the schoolyard?
 C₁₄: I ate a banana.
 M₁₄: What else?
 C₁₄: Apple
 M₁₄: Okay. Your teacher took the peels of the fruits. But she's going to bring it back.
 C₁₄: Yes.
 M₁₄: Is there anything else you can think of?
 C₁₄: No, nothing.
 M₁₄: Okay.

4.8.4.2 DAY₂: Conversations on Biodegradables and Non-Biodegradables

The primary focus of the second day's mother-child talk was the story reading activity in which children encountered a fascinating storybook character *Soso*, as well as the biodegradables that we can compost and non-biodegradables that are not appropriate to put in a compost bin and the types of organic and non-organic waste.

Table 4.20 Summary of the Activity Content Jointly Discussed By Mothers and Children on Day 2 ($N=23$)

Content description	<i>f</i>
<i>Soso</i> and its life	9
The role of earthworms in recycling organic waste	13
Biodegradables and non-biodegradables	17
Categorizing waste in play activity	14

One of the highlights of the conversation on the second day was the game that the participating children played together with their mothers in which participants tried to categorize the visuals as what *Soso* liked or disliked (Table 4.20).

Table 4.21 suggests descriptive analyses related to the main conversational variables on Day 2. Concerning study variables, the mean of the mothers' elaborations is 97.87 ($SD=46.91$), and the mean of children's elaborations was found to be 51.35 ($SD=23.15$). Plus, the mean of the use of words was observed for mothers to be 303.82 ($SD=147.90$) and for children to be 126.52 ($SD=67.49$).

Table 4.21 Means, Standard Deviations, and Ranges of Mothers' and Children's Conversational Variables on Day 2 ($N=23$).

Variable	Mean	SD	Range
<i>Mothers' variables</i>			
Open-ended questions	17.65	9.19	0-36

Table 4.21 (continued)

Yes/no questions	18.70	11.17	0-42
Context Statements	45.35	26.02	0-102
Positive Evaluations	15.96	9.92	0-45
Negative Evaluations	1.48	1.34	0-5
Repetition of open-ended questions	2.96	3.28	0-12
Repetition of yes/no questions	.52	.85	0-3
Repetition of context statements	.74	1.14	0-3
Elaborations ^a	97.87	46.91	0-188
Words	303.82	147.90	0-640
<i>Children's variables</i>			
Open-ended questions	2.74	2.80	0-8
Yes/no questions	2.83	2.99	0-10
Context statements	31.04	17.26	0-66
Positive evaluations	11.26	8.93	0-40
Negative evaluations	2.47	2.83	0-9
Repetition of open-ended questions	.09	.29	0-1
Repetition of yes/no questions	.22	.60	0-2
Repetition of context statements	.43	.95	0-4
Elaborations ^a	51.35	23.15	0-92
Words	126.52	67.49	0-241

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

Several positive relationships emerged from the analysis of the mother-child conversations made on Day 2. As it is shown in Table 4.22, mothers' open-ended questions highly predicted children's context statements ($r=.67, p<.05$) and children's total elaborations ($r=.72, p<.05$). Mothers' elaborations also significantly correlated with children's yes/no questions ($r=.50, p<.01$), children's context statements ($r=.71, p<.05$), children's evaluations ($r=.49, p<.01$) and children's elaborations ($r=.85, p<.05$). As further shown, there was a significant correlation between the total number of words that participating mothers used and children's context statements ($r=.66, p<.05$), children's evaluations ($r=.45, p<.01$) and children's elaborations ($r=.79, p<.05$). The correlational analysis also confirmed the negative relationship between the mothers' and children's conversational variables on the second day. With this regard, open-ended questions, yes/no questions, context statements, and elaborations provided by mothers negatively correlated with children's repetitions. One significant negative correlation was also observed between the words used by the mothers and children's repetitions ($r=-.08, p<.01$)

Consider Table 4.23, which plots the conversational variables of participant mothers according to their conversational styles. Planned comparisons revealed that mothers who had a higher elaborative style tended to extend the conversations with more open-ended and yes/no questions and more context statements when compared to mothers who had a low elaborative style. Concerns regarding mothers' total elaborations presented that high elaborative mother

used more elaborations ($M=115.33$, $SD=51.61$) than low elaborative mothers ($M=78.82$, $SD=33.86$) who used elaborations less in their mother-child talk at the end of the second day. This was also confirmed with further statistical tests that indicated high elaborative mothers were able to be more engaged in the conversation with their children than low elaborative mothers on Day 2; $t(21)=1.99$, $p=.06$. The dialogue between M_1 and C_1 illustrates how a mother who can be considered highly elaborative talked to her child about the details of learning activities on Day 2.

M₁: What have we done together today? Do you want to tell me about it?

C₁: Hmm. Okay.

M₁: What did your teacher tell us? What did she show us?

C₁: She showed us a puppet. Its name is *Soso*.

M₁: Yes, you are right. Then, what is *Soso*?

C₁: *Soso* is an earthworm.

M₁: Oh, really? Where did *Soso* live?

C₁: Hmm. It lives under the ground. Its house was inside the chest.

M₁: Yes, I also remember that.

C₁: *Soso* has lots of friends under the soil.

M₁: Yes. What was their name?

C₁: Microorganisms.

M₁: Okay, but the microorganisms were the things that were in the compost. Well, *Soso* had friends who shared the food with him. Then who were they? Remember that you already love one of them very much. You're constantly lifting them up to protect them.

C₁: Yay! It is a snail.

M₁: Okay, you are right with that.

C₁: ... there is one more thing; the compost will smell bad if there is no water.

M₁: That is why, the compost needs water. So, what were the very tiny creatures in the compost? Remember that they were dancing very fast. What was the name of those creatures that danced faster than you? [giggling]

C₁: I know the answer mummy. Those were the microorganisms.

M₁: Yes, microorganisms move incredibly fast.

C₁: He can pass me while running?

M₁: Exactly so. They move so fast.so, because they move so fast and because they are so small, we can't see them at all, but they are everywhere in our body, for example.

C₁: Mom, can I say something?

M₁: Of course, you can.

C₁: What are they doing?

M₁: Like *Soso*, microorganisms help in the recycling process of organic waste. What was *Soso* doing? Eating organic waste and pooping. So, he was making fertilizer. The microorganisms dance very fast, heat up the compost, and allow the waste to decompose. But you must remember. Microorganisms take part in hot composting. *Soso* and his friends are in charge of worm composting. So, let's talk about the game we played today. What was the last game we played? Can you tell me about it?

C₁: Okay. There were play cards hanging on the rope. I put the ones *Soso* likes in the green bucket; and the ones *Soso* doesn't like in the red box.

M₁: Yes. We categorized materials and the waste which are degradable and nondegradable. Right? Was it difficult for you to choose the play cards for the green box?

Table 4.22 Correlations Between Mothers' and Children's Conversational Variables About the Content of the Composting Learning Activities Held on Day 2 ($N=23$)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Mothers' open-ended questions													
2 Mothers' yes/no questions	.599**												
3 Mothers' context statements	.599**	.599**											
4 Mothers' total evaluations	.336	.313	.387										
5 Mother's elaborations	.771**	.748**	.915**	.587**									
6 Mothers' repetitions	.400	.232	.367	.221	.413								
7 Children's open-ended questions	.286	-.048	.375	.448*	.372	.123							
8 Children's yes/no questions	.194	.127	.636**	.414*	.505*	.266	.482*						
9 Children's context statements	.671**	.448*	.569**	.729**	.714**	.296	.624**	.549**					
10 Children's total evaluations	.366	.369	.516*	.136	.494*	.295	.034	.129	.222				
11 Children's elaborations	.722**	.564**	.760**	.675**	.853**	.122	.584**	.575**	.923**	.515*			
12 Children's repetitions	-.199	-.118	-.014	.243	-.016	-.241	.576**	.230	.227	-.111	.164		
13 Mothers' words	.794**	.781**	.867**	.553**	.972**	.317	.261	.391	.655**	.451*	.789**	-.088*	
14 Children's words	.524*	.344	.583**	.699**	.658**	.228	.630**	.658**	.877**	.232	.846**	.358	.622**

*.Correlation is significant at the 0.01 level (2-tailed)

**, Correlation is significant at the 0.05 level (2-tailed)

Table 4.23 High and Low Elaborative Mothers' Variables During Mother-Child Conversations on the Learning Activities Held on Day 2 ($N=23$)

Variables	Mothers' conversational style	<i>n</i>	<i>M</i>	<i>SD</i>
Mothers' open-ended questions	High Elaborative	12	20.42	10.71
	Low Elaborative	11	14.64	6.38
Mothers' yes/no questions	High Elaborative	12	23.17	11.09
	Low Elaborative	11	13.82	9.44
Mothers' context statements	High Elaborative	12	54.33	28.88
	Low Elaborative	11	35.55	19.21
Mothers' positive evaluations	High Elaborative	12	16.92	12.06
	Low Elaborative	11	14.91	7.37
Mothers' negative evaluations	High Elaborative	12	1.25	1.42
	Low Elaborative	11	1.73	1.27
Mothers' elaborations ^a	High Elaborative	12	115.33	51.61
	Low Elaborative	11	78.82	33.86
Mothers' words	High Elaborative	12	363.75	158.45
	Low Elaborative	11	238.45	107.21

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

C₁: Hu-huh. It was so easy for me. I chose the cards on which there were images of grass, watermelon, dry leaf, and even a compost bucket.

M₁: Where did you throw them?

C₁: Of course, mom, in the green box. Because all these were the ingredients for composting.

M₁: Well done.

C₁: Then, how about you?

M₁: I chose the microorganism, straw, water, and banana peel cards. I put them in the red box. I put the fishbone image in the red box. I grouped them like this because fish bones are not used in composting.

C₁: Yes.

M₁: So, what did you learn about composting today?

C₁: As far as I understand, it is about recycling waste. Recycling fruit and vegetable waste for example, but plastic, glass, meat and meat products, and milk and dairy products cannot be composted. I learned about this.

M₁: Great. I learned these things too. I am very happy to meet Soso. Let's see what we will do tomorrow.

A less detailed and shorter conversation example between M₁₃ and C₁₃ is given below;

M₁₃: ...what did we do today? Do you remember?

C₁₃: Uuh-uh.
 M₁₃: Did you remember the storybook?
 C₁₃: There was an earthworm.
 M₁₃: What was the name of the worm?
 C₁₃: I do not know.
 M₁₃: *Soso*
 C₁₃: Yes, *Soso*.
 M₁₃: Then, what was *Soso* doing?
 C₁₃: He was eating food.
 M₁₃: For example?
 C₁₃: Egg shells, banana peels.
 M₁₃: Anything else?
 C₁₃: Tangerine peels.
 M₁₃: Anything else? Does he eat glass pieces?
 C₁₃: No. He doesn't.
 M₁₃: How about the play activity? Do you remember it?
 C₁₃: Yes.
 M₁₃: There were microorganisms. Do you remember?
 C₁₃: Yes.
 M₁₃: We put the play cards red and green buckets.
 C₁₃: Yes.
 M₁₃: Could you please tell me the visuals on play cards?
 C₁₃: Hmm. There was grass, thermometer, cardboard, metals, compost bin.
 M₁₃: Yes. What else?
 C₁₃: Banana and water melon peels.
 M₁₃: Yes. What did we do?
 C₁₃: We took the cards and tried to put them into buckets.
 M₁₃: Buckets?
 C₁₃: I mean if the visual on play cards is related to composting, we put them into green buckets. If the visuals were not appropriate for composting, we put them into red buckets. That's all.
 M₁₃: Okay. Then, how about milk and dairy products? Are they compostable?
 C₁₃: No.
 M₁₃: *Soso* does not like them, right?
 C₁₃: No.
 M₁₃: What else? So, what else? Do you remember what else we had?
 C₁₃: The teacher wanted us to bring some organic waste for tomorrow.
 M₁₃: Ah yes. We must not forget that.
 C₁₃: Sure mom.

4.8.4.3 DAY 3: Conversations on Hot Composting

At the end of the third day of the composting learning activities, the focus of the mother-child conversations was on the details of hot composting. As a third day activity, mothers and children brought organic waste from home. During the activity period, they explored how hot composting process can be started and which materials they need to start up the process. Table 4.24 outlines the content of the mother-child talks which were the types of organic wastes they brought from home, the materials needed for hot composting, how to start the hot composting process, and the value of hot composting. Accordingly, the most frequently mentioned topic

in mother-child conversations was the organic waste brought from home by mothers and children, and many of them also wanted to talk about the hot composting process.

Table 4.24 Summary of the Content Jointly Discussed by Mothers and Children on Day 3
($N=23$)

Content description	<i>f</i>
Organic waste brought from home	20
Materials for hot composting	16
Hot composting process	19
The need for hot composting	12

When looking at Table 4.25, the descriptive results highlighted the main conversational variables of mother-child conversations held on Day 3. Participating mothers' responses ranged substantially in overall elaborations ($M=76.52$, $SD=42.94$) and their subcomponents. Participating children also varied in the degree to which they provided elaborations ($M=33.74$, $SD=22.46$) in their speech through memory responses.

Table 4.25 Means, Standard Deviations, and Ranges of Mothers' and Children's Main Conversational Variables on Day 3. ($N=23$)

Variables	<i>M</i>	<i>SD</i>	<i>Range</i>
<i>Mothers' variables</i>			
Open-ended questions	16.43	8.13	0-30
Yes/no questions	13.00	7.51	0-29
Context Statements	37.17	27.53	0-110
Positive Evaluations	8.78	5.78	0-21
Negative Evaluations	.91	.95	0-3
Repetition of open-ended questions	3.13	2.47	0-10
Repetition of yes/no questions	.52	.73	0-2
Repetition of context statements	.47	.85	0-3
Elaborations ^a	76.52	42.94	0-159
Words	247.83	136.65	0-527
<i>Children's variables</i>			
Open-ended questions	1.43	2.25	0-8
Yes/no questions	1.04	1.92	0-8
Context Statements	21.00	16.71	0-59
Positive Evaluations	8.65	6.96	0-22
Negative Evaluations	0.82	1.61	0-6
Repetition of open-ended questions	.00	.00	0
Repetition of yes/no questions	.04	.21	0-1
Repetition of context statements	.26	.62	0-2
Elaborations ^a	33.74	22.46	0-87
Words	81.48	62.03	0-269

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

The predicted positive relations were evident in mothers' elaborations and children's variables in the conversations about hot composting on Day 3 (Table 4.26). During the conversations about hot composting, there was a significant association between mothers' open-ended questions and children's context statements ($r=.51, p<.01$) and children's elaborations ($r=.52, p<.01$). Mothers' words were also predictive of children's words ($r=.78, p<0.5$) and children's elaborations ($r=.51, p<0.1$). Further correlational analysis also displayed that there were multiple significant relationships between mothers' elaborations and children's open-ended questions ($r=.53, p<0.5$), context statements ($r=.85, p<0.5$), and even also children's elaborations ($r=.93, p<0.5$). One of the promising results that emerged from the further analysis was that the context statements that mothers presented children related to hot composting-related activities significantly correlated with children's open-ended questions ($r=.57, p<.05$), yes/no questions ($r=.69, p<.05$), context statements ($r=.82, p<.05$), total evaluations ($r=.60, p<.05$), and even also children's total evaluations ($r=.92, p<.05$). Mother's repetitions, on the other hand, were not significantly associated with children's variables, but negatively correlated with children's open-ended and yes/no questions. Together, one significant correlation identified between mothers' repetitions and children's repetition.

High and low elaborative mothers' conversational variables are displayed in Table 4.27. As follows the table shown above, mothers' who were categorized as highly elaborative in the current study used more memory responses while talking to their children about hot composting compared to mothers who were categorized as low elaborative mothers. What is striking about the results in the table above is that, while the mean score of total elaborations of high elaborative mothers is 104.83, ($SD=31.40$), the mean score of elaborations of low elaborative mothers was 45.64 ($SD=30.99$).

This was also observed in further t-test analysis that indicated that high elaborative mothers use more memory responses while talking about the learning activity on hot composting with their children when compared to low elaborative mothers on Day 3, $t(21)=4.54, p=.001$.

At the end of the third day, all participating mothers had different conversations about the activities exploring the hot composting process. Some mothers talked longer and in more detail with their children, while some mother-child conversations were shorter. The talk between M₉ and C₉ can be considered as an elaborated conversation on hot composting and is given below:

M₁₀: What did we do today? We have learned many things, I think.

C₁₀: Today, we learned how to do composting. We collected tree shells.

M₁₀: What else did we use to start up composting?

C₁₀: Hmm. We also collected pine cones from the school garden.

Table 4.26 Correlations Between Mothers' and Children's Conversational Variables About the Content of Learning Activities Held on Day 3
($N=23$)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Mothers' open-ended questions													
2 Mothers' yes/no questions	.759**												
3 Mothers' context statements	.438*	.740**											
4 Mothers' total evaluations	.583**	.564**	.644**										
5 Mother's elaborations	.688**	.871**	.946**	.768**									
6 Mothers' repetitions	.572**	.230	.088	.489**	.281								
7 Children's open-ended questions	.205	.513*	.572**	.241	.527**	-.232							
8 Children's yes/no questions	.150	.391	.687**	.558**	.616**	-.141	.763**						
9 Children's context statements	.518*	.590	.824**	.829**	.848**	.226	.399	.695**					
10 Children's total evaluations	.308	.493*	.597**	.417*	.589**	.150	.282	.399	.412				
11 Children's elaborations	.508*	.715**	.916**	.818**	.926**	.198	.594**	.775**	.922**	.619**			
12 Children's repetitions	.211	-.019	.137	.385	.177	.435*	-.224*	.101	.312	.066	.223		
13 Mothers' words	.686**	.857**	.892**	.735**	.958**	.233	.405	.537**	.834**	.509*	.866*	.229	
14 Children's words	.360*	.574**	.883**	.737**	.840**	.192	.542**	.706**	.909**	.430*	.927**	.237	.779**

*. Correlation is significant at the 0.01 level (2-tailed)

**. Correlation is significant at the 0.05 level (2-tailed).

Table 4.27 High and Low Elaborative Mothers' Variables During Mother-Child Conversations on the Learning Activities Held on Day 3 (*N*=23)

Variables	Categorizing mothers	<i>n</i>	<i>M</i>	<i>SD</i>
Mothers' open-ended questions	High Elaborative	12	21.75	4.92
	Low Elaborative	11	10.64	6.93
Mothers' yes/no questions	High Elaborative	12	17.50	5.21
	Low Elaborative	11	8.10	6.59
Mothers' context statements	High Elaborative	12	52.83	26.28
	Low Elaborative	11	20.09	17.09
Mothers' positive evaluations	High Elaborative	12	11.50	5.69
	Low Elaborative	11	5.82	4.40
Mothers' negative evaluations	High Elaborative	12	1.33	1.07
	Low Elaborative	11	.45	.52
Mothers' elaborations ^a	High Elaborative	12	104.83	31.40
	Low Elaborative	11	45.64	30.99
Mothers' words	High Elaborative	12	340.58	99.55
	Low Elaborative	11	146.64	92.71

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements and evaluations.

M₁₀: Were they brown or green?

C₁₀: Brown.

M₁₀: And how about the green materials?

C₁₀: Tomato peels, potato peels, and carrot peels are all green materials. We put them into the compost bin.

M₁₀: Yes. There were also some fruit peels as green waste. Do you remember? What else was there?

C₁₀: There were also banana peels, apple peels, and tangerine peels. We also collected dry leaves from the garden.

M₁₀: Can we put them all in the compost bin? What did we pay attention to when placing it in the compost bin?

C₁₀: No, mom. We can't put them all in the compost bucket at the same time.

M₁₀: Then why?

C₁₀: Because we need to break it down first.

M₁₀: A-ha. I hadn't thought of that. You are right. We smashed it first. So why did we smash it?

C₁₀: It can compost more easily if we cut it into small pieces.

M₁₀: You're right. And what did we do about this?

C₁₀: We broke down the dry leaves and tree bark that we had collected for this into small pieces.

M₁₀: How many boxes were there?

C₁₀: Two bins for brown waste. One bin for green waste.

M₁₀: Where did the greens come from?

C₁₀: We brought it from home, mom. We brought lettuce shells, walnut shells, and egg shells. We took the waste left over from breakfast this morning.

M₁₀: Yes. Then we introduced those wastes to our friends. Right? Everyone talked about the kitchen waste coming out of their house. How much waste actually comes out of everyone's house, right?

C₁₀: Yes.

M₁₀: So how did we prepare the compost bin? Can you tell me a little bit about it? Let's remember together.

C₁₀: First we poured a bucket of brown waste into it. Then we put green waste and then brown waste again.

M₁₀: Yes. We put the waste in order. And what did we do after that?

C₁₀: Hmm. We watered it.

M₁₀: Why did we give water?

C₁₀: Because water is necessary for waste to become compost.

M₁₀: Okay. Well, do you remember the compost bucket? What kind of bucket was it? What characteristics did it have?

C₁₀: Yes, I remember. it was a blue bucket. It was a big bucket.

M₁₀: But there were some things on it?

C₁₀: There were holes.

M₁₀: Your teacher told us about it. What are these holes for?

C₁₀: Okay. If we put in a lot of water, my teacher told me that water would flow out of these holes. These holes also allowed the bucket to air out to be composted.

M₁₀: It certainly is true. Both water and air are necessary for a healthy compost. After moistening your waste in the compost bucket, you did one more thing. Do you remember what you did?

C₁₀: Hmm. No, I can't remember.

M₁₀: When your teacher brought something like a stick. You placed it in the waste.

C₁₀: Okay. I got it. We checked the temperature of the waste.

M₁₀: Why did you check the temperature?

C₁₀: To see how many degrees it was before composting.

M₁₀: How high was it?

C₁₀: I think it was about 22 degrees or something.

M₁₀: And then what happened?

C₁₀: Our teacher said that the temperature will increase while composting.

M₁₀: How will it increase?

C₁₀: Because microorganisms will dance in it [giggling]

M₁₀: Yeap. Microorganisms are very important for hot composting. They were dancing so fast that the compost bucket was heating up. When it gets hot, the waste starts to rot. And what will be the temperature of the compost bucket in a few days?

C₁₀: I don't know.

M₁₀: So, will it be less or will it increase?

C₁₀: It will increase, of course.

M₁₀: Exactly so. And what will happen if we don't pay attention to the ratio of waste, your teacher said?

C₁₀: Our compost would not be healthy.

M₁₀: Yes. There may be bad smells. That's why if we are putting two buckets of brown waste, we should continue to put one bucket of green waste. I'm very curious, I wonder how our waste will be recycled. Do you have any idea?

C₁₀: I'm also very curious. I think it will make a nice compost. The worms will love it very much, won't they, Mom?

M₁₀: No no no. No worms in hot composting either. Do not forget about that. They can't live in that much heat. There is also composting with earthworms. Your teacher told us, remember? I think we'll explore how composting can be done with earthworms tomorrow.

C₁₀: Okay.

M₁₀: Can I ask you one last question?

C₁₀: Hu-huh.

M₁₀: Why did we want to compost the waste we collected from the garden and brought from home?

C₁₀: Because if we didn't, these wastes would continue to accumulate in nature.

M₁₀: What would happen if it accumulated?

C₁₀: The whole place would smell bad, mom. Animals could not live. People would be very uncomfortable. If we constantly leave waste to nature, nature cannot breathe.

M₁₀: You're telling the truth. So, what happens when we make compost?

C₁₀: Compost is a substance like soil, right? We will give the compost to plants and trees. We will feed them. Instead of leaving waste to nature, we will leave compost.

On the other hand, a dialog between **M₁₆** and **C₁₆** was completed on the third day with fewer details about the hot composting activity discovered, with a shorter duration, fewer memory questions, and more repetitions;

M₁₆: What did we do today?

C₁₆: We made compost. **M₁₆:** What did we do? What did we take from the house? Did we bring waste from home?

C₁₆: Yes.

M₁₆: What were they? Huh??

C₁₆: Broccoli.

M₁₆: Yes.

C₁₆: Tangerine peels.

M₁₆: There were also carrots.

C₁₆: Carrots.

M₁₆: Yes. We didn't throw them away.

C₁₆: Yes, we brought them to school.

M₁₆: Do you remember what your friends brought?

C₁₆: Eggshells

M₁₆: What else?

C₁₆: Apple peels.

M₁₆: What else?

C₁₆: Hmm, I do not remember.

M₁₆: Okay. What did we do in the school garden?

C₁₆: We collected brown leaves.

M₁₆: Yes. What did we do after that? We threw them into two buckets.

C₁₆: Yes.

M₁₆: We threw the greens into one bucket and then what did we do? What did we do with green waste to make compost faster?

C₁₆: Hmm..To make it faster...

M₁₆: We broke them down into small pieces.

C₁₆: Yes. We smashed them.

M₁₆: Yes. What else did we do? Did we fill it all in the bucket?

C₁₆: Yes.

M₁₆: We poured water on it.

C₁₆: And we put the thermometer in it.

M₁₆: How was the bucket? What were the little things next to the bucket?

C₁₆: There were holes in the bucket.

M₁₆: Then, why?

C₁₆: To get some air.

M₁₆: To get some air. We need water to make compost. What else?

C₁₆: Air.
M₁₆: Yes, air. What else?
C₁₆: Water?
M₁₆: OK, we added water. There were also very small things. Don't you remember?
C₁₆: Microorganisms
M₁₆: Yes, there were microorganisms. They are responsible for breaking down the waste and turning it into compost.
C₁₆: Yes.
M₁₆: Okay.

4.8.4.4 DAY 4: Conversations on Worm Composting

On the fourth day, mother-child dyads met in the school garden and took part in activities related to worm composting. The day started with a play activity and continued with the mother-child pairs examining earthworms. Participating mothers and children then created a farm for the earthworms they examined with a magnifying glass. They placed the worms in their farms prepared with organic wastes and started to wait for compost formation. At the end of the day, the primary focus of the conversations between mother and child was the play activity, earthworm facts and earthworm farms (Table 4.28).

Table 4.28 Summary of the Activity Content Jointly Discussed by Mothers and Children on Day 4 ($N=23$)

Content description	<i>f</i>
Play activity: Let's create a big worm	20
Key characteristics of the earthworm	17
Earthworm experiments	21
Earthworm farms	23

As follows from Table 4.29 shown above, the descriptive analysis demonstrates the main conversational variables of mother-child conversations held on Day 4. Accordingly, the mean of mothers' and children's elaborations was found to be 98.00 ($SD=61.24$) and 46.30 ($SD=24.13$) respectively.

Table 4.29 Means, Standard Deviations, and Ranges of Mothers' and Children's Main Conversational Variables on Day 4. ($N=23$)

Variables	<i>M</i>	<i>SD</i>	<i>Range</i>
<i>Mothers' variables</i>			
Open-ended questions	17.04	11.13	0-57
Yes/no questions	16.00	12.40	0-49

Table 4.29 (continued)			
Context Statements	47.52	35.84	0-109
Positive Evaluations	12.04	7.57	0-26
Negative Evaluations	1.04	1.15	0-4
Repetition of open-ended questions	2.17	2.82	0-13
Repetition of yes/no questions	.30	.47	0-1
Repetition of context statements	1.39	2.31	0-10
Elaborations ^a	98.00	61.24	0-239
Words	312.30	191.23	0-787
<i>Children's variables</i>			
Open-ended questions	1.65	2.87	0-12
Yes/no questions	2.04	3.14	0-12
Context Statements	29.13	16.93	0-64
Positive Evaluations	11.60	9.09	0-31
Negative Evaluations	1.43	1.87	0-7
Repetition of open-ended questions	.04	.21	0-1
Repetition of yes/no questions	.04	.21	0-1
Repetition of context statements	.87	1.52	0-6
Elaborations ^a	46.30	24.13	0-103
Words	119.35	77.26	0-274

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

Related to the worm composting activity held on the fourth day, mothers' use of memory questions was highly predictive of children's conversational variables. As illustrated in Table 4.30, mothers' open-ended questions were significantly correlated with children's open-ended questions ($r=.60, p<.05$), children's yes/no questions ($r=.41, p<.01$), and children's context statements ($r=.66, p<.05$). Together, the results demonstrated that mothers' open-ended questions highly correlated with children's total elaborations ($r=.70, p<.05$) and children's total words ($r=.62, p<.05$).

There was a significant positive relationship between mothers' elaborations and children's open-ended questions ($r=.69, p<.05$), children's context statements ($r=.64, p<.05$), children's evaluations ($r=.69, p<.05$), and children's total elaborations ($r=.75, p<.05$). On the other hand, no significant correlation was found between mothers' repetitions and children's conversational variables except for children's open-ended questions ($r=.43, p<.01$).

Another promising result emerged from the correlation between mothers' elaborations and children's conversational variables. There was a significant positive relationship between mothers' elaborations and children's open-ended questions ($r=.69, p<.05$), children's context statements ($r=.64, p<.05$), children's evaluations ($r=.69, p<.05$), and children's total

elaborations ($r=.75, p<.05$). On the other hand, no significant correlation was found between mothers' repetitions and children's conversational variables except for children's open-ended questions ($r=.43, p<.01$).

As may be seen from Table 4.31, highly elaborative mothers asked more open-ended questions, more yes/no questions, and provided more context statements and evaluations while talking about the key characteristics of earthworm and worm composting. In this respect, highly elaborative mothers provided more elaborations ($M=121.67, SD=63.49$) than low elaborative mothers ($M=72.18, SD=49.12$) in the present study. Further analysis also suggested that high elaborative mothers talked with their children with more words ($M=393.08, SD=197.16$) when compared to low elaborative mothers ($M=224.18, SD=146.02$). Together, further t-test analysis showed that highly elaborative mothers provided more memory responses to their children while conversing on worm composting on Day 4, $t(21)=2.08, p=.05$. On the fourth day, participating children discovered worm composting together with their mothers. After a play activity, mother-child pairs examined the real worms presented to them and then started the worm composting process by making a living farm for earthworms. An embellished dialog between M₁₀ and C₁₀ can be considered a bountiful example to flesh out how a mother-child dyad constructs knowledge through a joint dialogue.

M₁₀: How was today? What did we do?

C₁₀: Nice, mom. We played a worm game.

M₁₀: Yeap. It was so funny. Who have you met today?

C₁₀: I have met with the friends of *Soso*. The teacher brought us a lot of earthworms. They were amazing. They were real earthworms.

M₁₀: You met with *Soso* and its friends. So how was it? What did you see? What have you explored today? Let's talk about it.

C₁₀: We washed the worms before examining them. So, we took them a bath [giggling].

M₁₀: Yes. In order for us to observe more comfortably, the teacher said, "Let's take a bath." We washed it without harming it.

C₁₀: We also wore gloves.

M₁₀: Yes, we had gloves. Your teacher gave us white gloves. Do you think the worm likes to take a bath?

C₁₀: Of course, he loved it. He loves wet and watery places.

M₁₀: What did we do after cleaning the worm?

C₁₀: We examined the earthworm with a magnifying glass. I saw its mouth.

M₁₀: Anything else? Did your worm have eyes, ears, and a nose?

C₁₀: No, it did not have ears, eyes, or a nose. It had just a mouth to eat something. Also, there were rings on it. Did you see that?

M₁₀: Yes, I also saw the ring-like structures. Well, could you please tell me what kind of environments do worms like?

C₁₀: They like wet places, because earthworms are also juicy living things.

M₁₀: Okay. That is the reason why they love rainy days. So, what was another thing we learned today?

C₁₀: Hmm. I think it was about the earthworm's poop. I have learned that its poop is being used as fertilizer.

Table 4.30 Correlations Between Mothers' and Children's Conversational Variables About the Content of Learning Activities Held on Day 4
($N=23$)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Mothers' open-ended questions													
2 Mothers' yes/no questions	.734**												
3 Mothers' context statements	.771**	.771**											
4 Mothers' total evaluations	.669**	.653**	.645**										
5 Mother's elaborations	.880**	.876**	.952**	.792**									
6 Mothers' repetitions	.430*	.475*	.343	.391	.434*								
7 Children's open-ended questions	.604**	.439*	.641**	.765**	.688*	.432*							
8 Children's yes/no questions	.414*	.299	.184	.278	.298	.051	.380						
9 Children's context statements	.657**	.456*	.504*	.818**	.643**	.247	.769**	.052					
10 Children's total evaluations	.397	.612**	.736**	.573**	.692**	.303	.492*	-.046	.426*				
11 Children's elaborations	.703**	.558*	.633**	.846**	.745**	.255	.815**	.434**	.977**	.574**			
12 Children's repetitions	.028	.066	-.010	.047	.023	.340	.299	.035	.288	-.022	.407		
13 Mothers' words	.900**	.897**	.898**	.742**	.970**	.457*	.591**	.232	.629**	.628**	.709**	.065	
14 Children's words	.619**	.486*	.486*	.779**	.609**	.215	.752**	.259	.983**	.426*	.961**	.339	.611**

*, Correlation is significant at the 0.01 level (2-tailed)

**, Correlation is significant at the 0.05 level (2-tailed).

Table 4.31 High and Low Elaborative Mothers' Variables During Mother-Child Conversations on Learning Activities Held on Day 4 (N=23)

Variables	Mothers' conversational style	<i>n</i>	<i>M</i>	<i>SD</i>
Mothers' open-ended questions	High Elaborative	12	22.42	11.70
	Low Elaborative	11	11.18	7.04
Mothers' yes/no questions	High Elaborative	12	20.92	11.58
	Low Elaborative	11	10.64	11.41
Mothers' Zcontext statements	High Elaborative	12	54.92	40.56
	Low Elaborative	11	39.45	29.66
Mothers' positive evaluations	High Elaborative	12	14.00	7.89
	Low Elaborative	11	9.91	6.92
Mothers' negative evaluations	High Elaborative	12	1.08	1.16
	Low Elaborative	11	1.00	1.18
Mothers' elaborations	High Elaborative	12	121.67	63.49
	Low Elaborative	11	72.18	49.12
Mothers' words	High Elaborative	12	393.08	197.16
	Low Elaborative	11	224.18	146.02

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements and evaluations.

M₁₀: Yes, exactly. This was also very surprising for me.

C₁₀: Earthworms were able to do fertilizer everywhere they went, mom. They ate too fast and made fertilizer too fast. Right?

M₁₀: That's exactly what happened. I only knew about worms as creatures that aerate the soil. That's why I was very surprised. Then, what else were they doing? Do they like the dark or light?

C₁₀: They like the dark side.

M₁₀: Huh. So, what have we done to observe this? Can you tell me a little bit about it?

C₁₀: They run away from the light. They preferred the dark.

M₁₀: Okay. There was also one more experiment. We used towel paper for that. Do you remember it?

C₁₀: Yeap mummy. We soaked the towel paper. One side was also left dry. When we put the worm on it, it went to the wet side.

M₁₀: So, we learned that worms do not like to live in dry places. They like wet places. Right? Your teacher warned us at the beginning of the event. She told us "So please don't disturb them by touching the worms". Because the moisture balance can be disturbed when we touch it. Well, then we did something for the worms. What did we do?

C₁₀: We built a house, a kind of worm farm for earthworms.

M₁₀: Yes. How did we make them? Tell me about your bed first if you want. What materials did we use when making the bed?

C₁₀: We used old newspapers when preparing the bed. After cutting them into small pieces, we placed them nicely. The worms will also eat newspapers, and then they will poop and make fertilizer.

M₁₀: Yes. The worms ate so fast, they were moving so fast, they even ate newspapers and turned them into fertilizer. Well, then we did something to the newspapers. What did we do?

C₁₀: We got a little wet.

M₁₀: Why?

C₁₀: Huh-huh, mom. I already told you. Worms like to live in wet and juicy places.

M₁₀: Okay. What was next?

C₁₀: Then we started to put the waste.

M₁₀: What did we put in?

C₁₀: Banana and melon peels.

M₁₀: Yes, banana and melon peels. There was one more thing. You know, it's something that *Sosos* like a lot. We'll drink it in the morning.

C₁₀: A-ha. We also put tea leaves.

M₁₀: One of the wastes that worms consume the fastest and easily convert into fertilizer is tea and coffee pulp. Right?

C₁₀: Yes.

M₁₀: And then what did we do?

C₁₀: Then we completed our worm farm. We closed the lid.

M₁₀: What was on the cover?

C₁₀: There were holes for the worms to breathe.

M₁₀: Yes. air is also very important for worm compost. According to the teacher, if we take care of the worms regularly, if we moisten them, they will eat the waste we give and turn it into fertilizer, which is a structure similar to soil. So, there will be recycling.

C₁₀: Yes mom.

M₁₀: This was new information for me. What do you think about what you've learned?

C₁₀: I am also very surprised that the worms are so hardworking. I was also surprised that they created fertilizer by pooping. It was also interesting for me to observe the worms closely. I liked them.

M₁₀: So did I. So, I'm wondering, do you think we can do worm composting at home?

C₁₀: I think we can.

M₁₀: I think we can too. Now we've learned how to do it. We also know what materials we need. We can do it on our balcony, for example.

C₁₀: Yes, we can do it on the balcony.

M₁₀: Can you take care of the food of worms?

C₁₀: Of course, I'm interested. I'll give them some of the foods that *Soso* likes.

M₁₀: All right, we have a deal. So how will we use the compost we made?

C₁₀: Mom, we can give it to the plum tree in the garden. So, we can feed the garden soil.

M₁₀: I think so too. That's a great idea.

There were also mothers and children who talked about the learning activities in less detail and with less elaboration at the end of the fourth day. The following conversation between M₁₃ and C₁₃ could be an example of that:

M₁₃: What did we do today? Do you know? Do you remember?

C₁₃: We played a game.

M₁₃: Can you explain the play activity?

C₁₃: Hmm. It was a game of catching the worm's tail.

M₁₃: Ok. And then what did we do?

C₁₃: We observed an earthworm.

M₁₃: Yes. We looked through a magnifying glass and examined it thoroughly. The earthworm had a mouth.

C₁₃: Yes.

M₁₃: What does he do when he eats?
 C₁₃: He pooped.
 M₁₃: Yes. What were we saying to that poo?
 C₁₃: Hmm... I do not remember.
 M₁₃: Compost.
 C₁₃: Compost.
 M₁₃: Yes, compost. We also did something with the newspapers. What did we do with the newspapers? What was the earthworm doing?
 C₁₃: What is a newspaper?
 M₁₃: We tore up the paper and put it in. That was the newspaper. Its name is newspaper.
 C₁₃: Yes, he loved them. We made them a soft bed with newspaper.
 M₁₃: Yes. Then, we watered the newspaper pieces. it became soft. What was that? It was the brown-type organic waste. One of the favorites of worms. What else do they like to eat?
 C₁₃: melons and..
 M₁₃: ...spinach.
 C₁₃: Spinach.
 M₁₃: and lettuce.
 C₁₃: Lettuce.
 M₁₃: Okay. How was our compost bin? It had a hole, right?
 C₁₃: Huh-huh
 M₁₃: So that the water flows down from the bottom. Well, where did we put the bin?
 C₁₃: Well, we put it in the dark place.
 M₁₃: Okay. Then what happened after 10 days?
 C₁₃: After 10 days, all the lettuce and newspapers there will become poop. So, it's going to turn into compost. Right?
 M₁₃: Yes.
 C₁₃: I wonder how it will be.
 M₁₃: Me too.

4.8.4.5 DAY 5: Conversations on Being a *Compost Star*

The aim of the last day of the composting learning activities was to make participants recall what they had learned about composting through documentation. The mother-child dyads also used musical instruments to create a song with the keywords given by the researcher and shared it with the group. In the last activity of the learning program, participating mothers and children received bright star-shaped necklaces and were entitled to become a *Compost Star*. Table 4.32 presented the content summaries of the conversations held by the mother-child dyads on the evening of the fifth day:

Table 4.32 Summary of the Activity Content Jointly Discussed by Mothers and Children on Day 5 (N=23)

Content description	<i>f</i>
What we did for four days: Documentation for a quick recall	12
Creating a song about composting	21
Being a <i>Compost Star</i>	23

Descriptive analyses were conducted to figure out the mean, standard deviations, and ranges of mothers' and children's main conversational variables on day 5. When looking at Table 4.33, the results indicated that the mean of mothers' elaborations for the learning activities held on the last day of the learning activities was found as 75.22 ($SD=23.90$) while the mean of children's elaborations was found to be 31.39 ($SD=23.09$).

Table 4.33 Means, Standard Deviations, and Ranges of Mothers' and Children's Main Conversational Variables on Day 5. ($N=23$)

Variables	<i>M</i>	<i>SD</i>	<i>Range</i>
<i>Mothers' variables</i>			
Open-ended questions	12.96	11.09	0-52
Yes/no questions	13.57	14.12	0-65
Context Statements	37.57	36.04	0-150
Positive Evaluations	10.70	8.93	0-36
Negative Evaluations	.48	.85	0-3
Repetition of open-ended questions	2.09	3.96	19
Repetition of yes/no questions	.39	.66	2
Repetition of context statements	.65	.83	3
Elaborations ^a	75.22	23.90	93
Words	239.22	202.34	0-912
<i>Children's variables</i>			
Open-ended questions	1.61	1.73	0-6
Yes/no questions	1.61	2.95	0-11
Context Statements	20.17	14.08	0-49
Positive Evaluations	8.74	9.02	0-36
Negative Evaluations	.87	1.32	0-5
Repetition of open-ended questions	.04	.20	1
Repetition of yes/no questions	.04	.20	1
Repetition of context statements	.22	.52	2
Elaborations ^a	31.39	23.9	93
Words	91.30	62.80	0-188

^aElaborations is a variable equal to the sum of open-ended questions, yes/no questions, context statements, and evaluations.

As it was outlined in Table 4.34, multiple positive relations were evident in children's variables in mother-child conversations related to learning activities held on the last day. Mother's use of open-ended questions significantly correlated with children's context statements questions ($r=.71, p<.05$), children's evaluations ($r=.78, p<.05$), and children's elaborations ($r=.80, p<.01$). Plus, the correlational analysis showed that mothers' open-ended questions were significantly correlated with children's total words ($r=.58, p<.05$). A positive correlation was also found between mothers' elaborations and children's open-ended questions ($r=.44, p<.01$), children's context statements ($r=.75, p<.05$), children's evaluations ($r=.82, p<.05$), and children's elaborations ($r=.89, p<.05$). Furthermore, multiple negative

correlations were evident between mothers' repetitions and children's yes/no questions, children's evaluations, and children's elaborations.

When it comes to total words, the correlational results suggested that words used by mothers were highly predictive of children's open-ended questions ($r=.44, p<.01$), children's context statements ($r=.75, p<.05$), children's evaluations ($r=.82, p<.05$), and children's elaborations ($r=.89, p<.05$). Mothers' total words also negatively correlated with children's repetitions. Planned comparisons also revealed that there was a significant correlation between mothers' total words and children's total words ($r=.65, p<.05$).

With respect to mothers' conversational styles, conversational differences were consistent in mother-child talk on the last day of the composting learning activities. As was seen in Table 4.35, high elaborative mothers engaged in more memory questions when compared to mothers who had a low elaborative conversational style. Comparisons revealed that high elaborative mothers encouraged their children with more elaborations ($M=84.67, SD=42.81$) than low elaborative ones ($M=64.91, SD=84.70$).

Similarly, high elaborative mothers used more words ($M=278.75, SD=144.24$) than low elaborative mothers ($M=196.09, SD=251.52$). Further t-test analysis statistically also demonstrated that mothers who were more elaborative in their mother-child conversations provided more memory elaborations and more memory responses on the last day of the composting learning activities; $t(21)=.72, p=.48$. At the end of the fifth day of composting activities, the participating children and mothers chatted about that day. While some mothers had more detailed and longer conversations with their children, some mothers continued a shorter and less detailed conversation.

The conversation between M₂ and C₂ about the last day of the learning activities can be considered an example of an elaborative conversation.

M₂: Do you remember what we did today in the school garden? Huh?

C₂: Hmm. We did lots of things mom.

M₂: Okay, you are right. I remember the song. Do you remember it?

C₂: Yeap. We wrote a song with you. It was so funny, I think.

M₂: What was the name of our song?

C₂: *Let's make compost* [Singing]

M₂: Let's say it together.

M₂-C₂: *Micro ooo organism. La la la. They dance fast. La la la. Two brown ones, eat one. It's compost. Come on, it's done. La la la.*

M₂: Bravo. Our song was really beautiful. Well, we also got two awards this morning, remember? What award did we get?

Table 4.34 Correlations Between Mothers' and Children's Conversational Variables About the Content of the Composting Learning Activities Held on Day 5 (N=23)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Mothers' open-ended questions													
2 Mothers' yes/no questions	.916**												
3 Mothers' context statements	.773**	.835											
4 Mothers' total evaluations	.786**	.764**	.698**										
5 Mother's elaborations	.905**	.939**	.960**	.522**									
6 Mothers' repetitions	.876**	.898**	.729**	.801**	.855**								
7 Children's open-ended questions	.413	.202	.503*	.349	.442*	.202							
8 Children's yes/no questions	.138	.059	.226	.257	.199	-.092	.576**						
9 Children's context statements	.709**	.616**	.699**	.819**	.754**	.579	.637**	.489					
10 Children's total evaluations	.784**	.857**	.765**	.591**	.822**	-.112	.247	.189	.435*				
11 Children's elaborations	.796**	.786**	.863**	.766**	.887**	-.246	.566**	.504*	.847**	.742**			
12 Children's repetitions	.61	-.140	-.074	.282	-.024	0.38	.219	.159	.244	-.115	.077		
13 Mothers' words	.879**	.933**	.956**	.799**	.989**	.835**	.438*	.214	.754**	.821**	.888**	-.078	
14 Children's words	.580**	.486**	.606**	.731**	.641**	.367	.679**	.524*	.946**	.346	.719**	.323	.652**

*, Correlation is significant at the 0.01 level (2-tailed)

**, Correlation is significant at the 0.05 level (2-tailed)

Table 4.35 High and Low Elaborative Mothers' Variables During Mother-Child Conversations on the Learning Activities Held on Day 5 (N=23)

Variables	Mothers' conversational style	<i>n</i>	<i>M</i>	<i>SD</i>
Mothers' open-ended questions	High Elaborative	12	13.83	7.66
	Low Elaborative	11	12.00	14.28
Mothers' yes/no questions	High Elaborative	12	15.58	8.95
	Low Elaborative	11	11.36	18.46
Mothers' context statements	High Elaborative	12	43.08	26.29
	Low Elaborative	11	31.55	44.95
Mothers' positive evaluations	High Elaborative	12	11.58	7.75
	Low Elaborative	11	9.73	10.36
Mothers' negative evaluations	High Elaborative	12	.67	.98
	Low Elaborative	11	.27	.65
Mothers' elaborations	High Elaborative	12	84.67	42.81
	Low Elaborative	11	64.91	84.70
Mothers' total words	High Elaborative	12	278.75	144.25
	Low Elaborative	11	196.09	251.52

C₂: Because we have participated in the activities and because we have learned to make compost now.

M₂: Yeap! Now we can make compost. Right?

C₂: Yes, we can mom.

M₂: Where do you think we can do it?

C₂: We can do it in the summer house. We can do it in our garden there. But we'll have to get the materials first.

M₂: Hmm. Which materials?

C₂: A compost bin, a thermometer, a watering can, etc
M₂: Okay. We will take the materials. The idea of doing it in a summer house is very nice. Then we grow tomatoes, peppers, and cucumbers with our compost. Then we compost their shells too. What do you say?

C₂: Okay.

M₂: I think your teacher gave us shining stars because we know how to make compost now. And we've become *Compost Stars* too. Who else should we tell what we know?

C₂: We can tell the grandma and grandpa. When they learn about it, they start accumulating their waste. We also put our compost bucket in the garden of the cottage. They accumulate it there.

M₂: That's a great idea. So, are we going to make hot compost or worm compost?

C₂: Let's do it with worms. Worms are very hardworking.

M₂: I think we should do both.

C₂: Okay, fine.

M₂: We sang our song very well, didn't we? Everyone applauded us.

C₂: Yes mummy.

M₂: Let's sing our song when we go to the summer house. Let everyone learn to compost. Those who are curious should ask us. We'll tell you about it.

C₂: Okay. Good idea mummy.

M₂: So, what did we do today before the songwriting? Do you remember?
C₂: Hmm. Ok. First, we looked at the pictures hung with pegs.
M₂: Yes. Your teacher took a photo of what we did for a week. It was so beautiful. We remembered what we had done. What do you remember the most?
C₂: I remember the worms.
M₂: Yes. you're talking about yesterday, about worm farms. I wonder what those worms are doing now?
C₂: They are eating tea pulp and pooping [chuckles].
M₂: Yes. Worms are really very valuable creatures. Let's tell everyone that they can recycle on their own, okay?
C₂: Okay.
M₂: I think a lot of people need to know. I just learned about it, too.
C₂: Me too.
M₂: Now that we are the *Compost Star*, we should talk about it. There may be those who want to learn from us and make their own compost.
C₂: Yeap.
M₂: It would be great if everyone managed to recycle their own waste.
C₂: You're right, mom. Thus, our nature would breathe.
M₂: You are absolutely right.

The dialogue between M₇ and C₇ below illustrates a less elaborated and more repetitive conversation about the last of the composting learning activities:

M₇: Let's think about today. What did we do today?
C₇: We examined the pictures that the teacher brought.
M₇: Yes. The teacher had taken photos of the activities. She made us remember what we did throughout the whole week. How did you feel when you saw the photos?
C₇: It was nice.
M₇: I think so too. What else did we do?
C₇: We wrote a song.
M₇: Yes. We wrote a song about composting, didn't we?
C₇: Yes.
M₇: We wrote a song using keywords related to recycling. Right?
C₇: Yes.
M₇: Do you remember the song?
C₇: Yes.
M₇: Do you want to sing it?
C₇: No.
M₇: Okay. What else did we do today?
C₇: Hmm.
M₇: Your teacher gave us something.
C₇: She gave a necklace to us.
M₇: Yes. What kind of necklace was it?
C₇: It was star-shaped.
M₇: Yes. We became the compost star.
C₇: Yes.
M₇: Why did they call us the "Compost Star"?
C₇: Because we can recycle kitchen waste. We can make compost. We can compost the autumn leaves accumulated in the gardens.
M₇: Yes. What else did we do today?
C₇: We talked about composting.
M₇: Yes. We decided to tell everyone about composting.

C₇: Yes.
M₇: Who are you going to tell?
C₇: I will tell my friends.
M₇: I will also tell my friends.
C₇: Maybe we will make compost at home.
M₇: We can. We can make compost with worms. We give the worms the food waste they like. Right?
C₇: Yes. I'll give you a watermelon peel.
M₇: They like it very much. Where else can we do it?
C₇: On the balcony.
M₇: What else?
C₇: I don't know.
M₇: Could it be in the garden of my apartment?
C₇: Yes, yes.
M₇: Okay. Let's tell our neighbors too. Let's always do it.

4.8.5 Researcher-Child Post and Follow-up Interviews on Composting Learning

Activities

Since one of the concerns of the present study was to unfold how mothers' conversational style was utilized during joint conversations and how this uniquely facilitated children's learning about composting and to what extent mothers' conversational variables contribute to children's memory reports, in addition to the content analysis, the post and follow-up interviews were analyzed once again by considering a number of variables identified and used in the context of developmental literature.

Table 4.36 Means, Standard Deviations, and Ranges of Children's Variables in Post and Follow-Up Interviews

Variables	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
<i>Children's variables in post interviews</i>				
Descriptives	41.17	17.05	10	66
Objects correctly recalled	36.35	9.44	22	55
Actions correctly recalled	32.87	10.11	12	58
Time statements	9.74	5.08	0	18
Words	527.69	172.69	154	801
<i>Children's variables in follow-up interviews</i>				
Descriptives	30.61	10.08	12	48
Objects correctly recalled	27.04	7.48	18	42
Actions correctly recalled	24.78	8.60	11	47
Time statements	5.17	3.65	0	11
Words	376.61	122.43	132	565

For that, post and follow-up interviews conducted with participating children were also coded regarding a set of variables including children's descriptives, recalling the objects and actions correctly, and time statements. Those variables, means, standard deviations, and ranges for post and follow-up interviews were given in Table 4.36.

4.8.5.1 Post-Interviews

Post-interviews were conducted 2 days after the completion of the composting learning activities. As shown in Table 4.37, mothers' total open-ended questions were significantly correlated with children's outcomes in post-interviews.

Table 4.37 Correlations Between Mother's Conversational Key Variables and Children's Responses in Post-Interviews ($N=23$)

Variables	1	2	3	4	5	6	7	8
1 Mothers' open-ended questions								
2 Mothers' total elaborations	.833**							
3 Mothers' total repetitions	.661**	.643**						
4 Children's descriptives	.773**	.778**	.192					
5 Objects correctly recalled	.750**	.778**	.118	.872**				
6 Actions correctly recalled	.773**	.690**	.403	.915**	.831**			
7 Time statements	.615**	.567**	.375	.775**	.619**	.775**		
8 Mothers' total words	.863**	.740**	.610**	.761**	.797**	.726**	.538**	
9 Children's total words	.722**	.631**	.415*	.937**	.853**	.887**	.518**	.732**

** . Correlation is significant at the 0.05 level (2-tailed)

* . Correlation is significant at the 0.01 level (2-tailed).

Analysis of post-interviews in the context of children's responses confirmed that mothers' open-ended questions were significantly associated with children's descriptives ($r=.77$, $p<.05$), recalling the objects correctly ($r=.75$, $p<.05$), recalling the actions correctly ($r=.77$, $p<.05$), and children's total words ($r=.72$, $p<.05$) in post-interviews. Simple correlational analysis also indicated that mothers' total elaborations were positively associated with children's descriptives ($r=.78$, $p<.05$), recalling the objects correctly ($r=.78$, $p<.05$), recalling the actions correctly ($r=.69$, $p<.05$), and time statements provided by children ($r=.57$, $p<.05$).

Further analysis demonstrated that the total number of the words used by mothers was highly predictive of children's descriptives ($r=.76, p<.05$), recalling the objects correctly ($r=.80, p<.05$), recalling the actions correctly ($r=.73, p<.05$), and time statements ($r=.54, p<.05$). By extension, mothers' total elaborations ($r=.63, p<.05$) and number of the words they used ($r=.73, p<.05$) significantly correlated with children's total words provided in post-interviews. On the other hand, mothers' repetitions showed no significant correlation with children's responses.

4.8.5.2 Follow-Up Interviews

With respect to interviews conducted 3 weeks after the learning activities, mothers' open-ended questions were highly correlated with children's descriptives ($r=.62, p<.05$), and the objects that children correctly recalled ($r=.51, p<.05$) in follow-up interviews.

Table 4.38 Correlations Between Mother's Conversational Key Variables and Children's Responses in Follow-Up Interviews (N=23)

Variables	1	2	3	4	5	6	7	8
1 Mothers' open-ended questions								
2 Mothers' total elaborations	.833*							
3 Mothers' total repetitions	.661*	.643**						
4 Children's descriptives	.620*	.597**	.331					
5 Objects correctly recalled	.513*	.576**	.332	.799**				
6 Actions correctly recalled	.375	.443*	.148	.602**	.452*			
7 Time statements	.214	.271	.030	.445*	.359	.543**		
8 Mothers' total words	.863*	.964**	.610**	.624**	.602**	.487*	.241	
9 Children's total words	.511*	.631**	.327	.750**	.621**	.737**	.430*	.580**

** . Correlation is significant at the 0.05 level (2-tailed)

* . Correlation is significant at the 0.01 level (2-tailed)

Similarly, mothers' elaborations were marginally associated with children's descriptives ($r=.60, p<.05$), objects correctly recalled ($r=.58, p<.05$), and actions correctly recalled ($r=.44, p<.05$) (Table 4.38). On the other hand, there is no significant relation indicated among mothers' total repetitions in mother-child conversations with children's descriptives, objects correctly recalled, actions correctly recalled, and time statements that children declared in follow-up interviews. Similar to post-interviews, mothers' total words were

highly predictive for children's descriptives ($r=.62, p<0.5$), objects children mentioned correctly ($r=.60, p<0.5$), and actions children correctly recalled ($r=.49, p<0.1$) in follow-up interviews.

4.8.6 Key Findings

4.8.6.1 Key Findings from Children's Pre-, Post and Follow-Up Interviews

Pre-interviews conducted with participating children aimed to reveal children's already existing knowledge of waste and recycling. Key findings that emerged from children's pre-interviews are summarized below:

- Waste was defined as a synonym for garbage.
- Recycling is associated with sorting plastics, glass, metals, and paper.
- Plastics, glass, metals, paper, and batteries were identified as the most common recyclables.
- Kitchen leftovers were identified as garbage.
- Recycling was valued to preserve the environment from being filled with garbage.
- Children had no valid recognition of organic waste and recycling of organic waste management.
- Waste and garbage were used as synonyms for each other.
- Kitchen leftovers were identified as garbage which is thrown in the garbage in the home environment.
- Recycling was identified as an important practice to prevent landfills with garbage.
- The source of children's favorite food was defined as soil.
- Eating fruits and vegetables was depicted as important to be a healthy, strong, and smart child.
- Earthworms were depicted as living creatures crawling and sleeping under the soil.
- Earthworms were seen in dark brown and red which were responsible for digging tunnels.
- Earthworms are living creatures that like to eat mud and bugs.

Post- and follow-up interviews conducted with children aimed to reveal children's self-reported knowledge on recycling organic waste after participating in composting learning activities. Key findings that emerged from children's post- and follow-up interviews are summarized below:

- Waste management was associated with the recycling of organic waste.
- Along with plastics, glass, metal, and paper, organic matters such as banana and apple peels, dry leaves and watermelon peels, spinach scraps, tangerine peels, and tree bark were illustrated as recyclables.
- Kitchen leftovers are not identified as garbage. They are simply recycled through composting.
- Organic waste is everywhere in everyday life. Thus, recycling of organic waste is daily-life related.
- The visit of the *Garbage Witch* was stated as one of the most memorable learning activities in both post and follow-up interviews.
- The puppet *Soso* was frequently mentioned through describing learning experiences.
- Meeting with real earthworms is one of the most memorable learning activities in both post and follow-up interviews.
- Play activities were mentioned in which children jointly participated with their mothers as “fun” and “exciting”.
- Hot composting was metaphorically identified as the dance of microorganisms and worm composting was identified as the dance of worms.
- Earthworm facts were recognized as earthworms having no ears, no noses, and no eyes. On the other hand, they have a mouth to eat organic materials in order to turn them into fertilizer.
- Earthworms are really hardworking living creatures that have a profound role in the compost cycle.
- Composting was associated with multiple aspects of sustainability. Accordingly, composting was associated with the well-being of the environment, the careful usage of natural resources, and the need to communicate with other stakeholders in post-interviews. On the one hand, it is linked with the well-being of the environment and the need to communicate with others in follow-up interviews.
- Being a *Compost Star* was highlighted as one of the salient experiences to highlight the critical aspect of sharing the value of composting with friends, family members, neighbors, and colleagues.
- Recycling organic waste through composting was identified as a feasible and convenient practice that participants can simply do in their everyday lives.
- Composting was acknowledged as a common shared activity in which different stakeholders could come together for responsible production.

4.8.6.2 Key Findings from the Learning Outcome Rubric on Composting

The learning outcome rubric designed for the current study was utilized as an assessment tool to reveal to what extent children's self-reported knowledge expanded after participating in the composting learning activities. Accordingly:

- The average of the mean scores derived from children's responses from pre-assessment is quite low ($M=5.22$) when compared to post ($M=19.13$) and follow-up assessments ($M=17.48$)
- There was a statistically significant increase in rubric scores from pre-scores ($M=5.22$, $SD=2.56$) to post-scores ($M=19.13$, $SD=2.56$), $t(22)=39.17$, $p<.001$ (two-tailed).
- There was a statistically significant increase in rubric scores from pre-scores ($M=5.22$, $SD=2.56$) to follow-up scores ($M=17.48$, $SD=2.39$), $t(22)=37.38$, $p<.001$ (two-tailed).
- There was no significant difference between post-scores ($M=19.13$, $SD=2.56$) to follow-up scores ($M=17.48$, $SD=2.39$), $t(22)=2.12$, $p=.06$.

4.8.6.3 Key Findings from Participant Mothers' Pre- and Post-Interviews

Pre-interviews conducted with participating mothers aimed to reveal participant mothers' already existing self-reported knowledge of waste and waste management. Key findings that emerged from mothers' pre-interviews are summarized below:

- Reusing and recycling were outlined as the waste management strategies.
- Paper, glass, metals, and plastics were expressed as the well-known recyclables whilst kitchen leftovers were identified as garbage. Kitchen leftovers were not recyclable.
- Waste management was valued for the well-being of the natural environment, preventing the depletion of natural resources, and maintaining raw materials.
- Lack of space, lack of time, and lack of sufficient knowledge were outlined as the barriers to supporting recycling systems.
- Municipalities were responsible for encouraging individuals and supporting the community to conduct effective waste management strategies.
- Household consumption decisions were also shaped by children.
- No valid recognition of recycling organic waste.
- Earthworms were depicted as creatures living under the soil in order to dig tunnels for aerating the soil.

Post-interviews conducted with mothers aimed to reveal mothers' self-reported knowledge of recycling organic waste after participating in composting learning activities. Key findings that emerged in mothers' post-interviews are summarized below:

- Kitchen leftovers were identified as recyclables, not garbage.
- Participating in learning activities with children was inspiring. Early years are critical and eligible to teach children about sustainability.
- Recycling organic waste was defined as a waste management strategy for responsible consumption and production. Organic waste generation was recognized as a part of everyday life. Thus, composting was suggested as a daily life-related issue.
- Composting was defined as a feasible, convenient, and sustainable practice that can be simply done in everyday life.
- Recycling organic waste was associated with multiple aspects of sustainability. It supports environmental well-being, circular economy, and social sustainability.
- Individuals are responsible for household waste generation and thus supporting home composting systems.
- Being a *Compost Star* was highlighted as one of the salient experiences to underline the critical aspect of sharing the value of composting with friends, family members, neighbors, and colleagues.
- Composting was acknowledged as a common shared activity in which different stakeholders could come together for responsible production.

4.8.6.4 Key Findings of Mother-Child Joint Conversations About the Composting Learning Activities

- Variations in mothers' conversational styles were predicted with children's conversational variables in mother-child joint conversations about the composting learning activities.
- Participating mothers' overall elaborations including open-ended questions, yes/no questions, context statements, and evaluations were all positively correlated with participating children's overall elaborations.
- Participating mothers' open-ended questions used in all joint conversations were highly associated with overall children's elaborations in all joint conversations.
- Participating mothers' use of total words during all joint conversations was highly predictive of children's overall elaborations and children's use of total words in all joint conversations.

- For each mother-child joint conversation conducted at the end of each activity day, mothers' 'open-ended questions were predictive of children's open-ended questions asked during conversations.
- For each mother-child joint conversation conducted at the end of each activity day, mothers' use of words was significantly correlated with children's use of words.
- Biodegradables and nonbiodegradables and the play activity were the favorite topics for mother-child joint conversations held on Day 2.
- The primary focus of the joint conversations conducted on the third day was mainly related to the organic waste that mother-child dyads brought from home and starting up the hot composting process.
- The fourth day in which earthworms were investigated and a worm farm was established to start up the worm composting process was the day on which mothers used the most words when compared to the rest of the days.
- Being a Compost Star was the central topic for all mother-child dyads in their joint conversation held on Day 5.
- Mothers who had higher levels of elaboration in their conversations encouraged their children to be an integral part of the conversations by providing more open-ended and yes/no questions, more context statements, and more evaluations when compared to mothers who had lower levels of elaboration.
- High elaborative mothers used significantly more words in all joint conversations compared to low elaborative mothers.
- High elaborative mothers used more open-ended questions in all joint conversations when compared to low elaborative mothers.
- High elaborative mothers provided more context statements in each joint conversation when compared to low elaborative mothers.
- Children whose mothers were more elaborative in their joint conversations contributed to the children's memory reports that emerged in post and follow-up interviews.
- In post-interviews, mothers' open-ended questions asked in mother-child joint conversations were significantly correlated with children's descriptives, objects correctly recalled, actions correctly recalled and time statements provided by children.
- With respect to follow-up interviews, mothers' open-ended questions are still, but only marginally, associated with children's descriptives, objects, and actions that were correctly recalled.
- Mothers' repetitions showed no significant relation with children's conversational variables.

4.9 Summary

This chapter has focused on i) participating children's findings that emerged from pre-, post, and follow-up interviews, ii) findings that emerged from the learning outcomes rubric, iii) participating mothers' findings that emerged from pre- and post-interviews, and iv) findings emerged from mother-child joint conversations.

The findings emerged from pre-, post, and follow-up interviews conducted with participating children indicated an extension in children's self-reported knowledge after participating in learning activities. The children mentioned more information and details about what organic waste is, how organic waste can be recycled, and why this is needed. Plus, the majority of children stated that composting is a daily practice that they can simply do on their own. To support this, analysis of rubric results revealed how children's self-reported knowledge about recycling of organic waste differed in pre-, post, and follow-up interviews. In the case of participating mothers, one of the remarkable findings was that mothers who have discovered composting as a sustainable life cycle have also identified themselves as part of this cycle. Following that, after participating in the composting learning activities, mothers identified composting as a feasible sustainable practice that can be done with their children to connect to nature and learn about responsible consumption.

Last, but not least, further analysis of mother-child joint conversations suggested there is a relationship between mothers' elaborations and children's contributions to joint conversations. Plus, mothers who had higher elaborations in joint conversations encouraged their children through more open-ended questions, yes/no questions, context statements, and evaluations. It was also confirmed that mothers' elaborations were profoundly associated with the number of details children reported about the learning activities in post and follow-up interviews. These findings will be interpreted in the following chapter.

CHAPTER 5

DISCUSSION, EDUCATIONAL IMPLICATIONS, AND RECOMMENDATIONS FOR FURTHER STUDIES

The overall purpose of the current study is to provide a rationale on the role of the mothers in fostering children's exploration of a sustainable practice through intergenerational engagement. In this sense, the aim of this present study is twofold. Firstly, the present study aims to unfold how recycling of organic waste was conceptualized by the 60–72-month-old preschool children and their mothers as a sustainable practice before and after jointly participating in the composting learning activities that were enacted in preschool settings. Secondly, it reveals the potential of mothers' individual conversational styles to foster children's self-reported knowledge as well as memory reports on recycling organic waste. In line with this, the current study contributes to the two interrelated fields of early childhood education for sustainability and developmental psychology by demonstrating preschool children's exploration of a sustainable practice and how children are cognitively guided within an interactional process fostered by intergenerational engagement.

In this final chapter, the themes that emerged from data analysis are contextualized with reference to related works drawn from the body of studies intersecting with the fields of early childhood education for sustainability and the development of autobiographical memory. The first part of the chapter focuses on how participants' self-reported knowledge was expanded and which aspects were highlighted in post and follow-up interviews and are discussed in the light of the current literature. This part is notable because it attempts to envisage why education for sustainability should be embedded into formal school settings with the collaboration of parents. In the following part, the potential of maternal conversational style on children's contributions to joint conversations and how mothers' unique conversational style was responsive to children's memory reports about composting is discussed. Related educational implications for practice and recommendations for future directions are presented at the end of this section, as well.

5.1 Discussion of Findings

5.1.1 Recycling of Organic Waste as a Context for Relevant, Meaningful, and Practical Learning for Sustainability in Everyday Lives.

According to Farley and Smith (2014), there is no universally accepted meaning of sustainability. Since conceptualizing sustainability is impacted by many factors such as politics, history, economy, social relations, and values (Davis, 2010; Dymment et al., 2014), different nations and cultures have built their own meaning and understanding that emerged from the decisions of millions of people in everyday life (UNESCO, 2008). Thus, this dynamic feature of sustainability requires understanding individuals' beliefs, understandings, notions, and habits might create a shift in unsustainable living patterns to build a more sustainable future (UN, 2004; UNESCO, 2019; UNEP, 2020).

Explanations of children in pre-interviews indicated that they had already existing knowledge about recycling and some kinds of recyclables. Accordingly, the majority of the children linked the need for sustainability to prevent landfill filling waste and garbage, that is, a polluted environment. That being the case, children demonstrated a positive perspective on the need for recycling for the well-being of the natural environment, yet they did not offer detailed information about why some waste can be sorted as plastics, glass, paper, and metals and after a while why and where they are being taken to be recycled. On the contrary, post findings placed a growing interest in participating children's self-reported knowledge of the need and the value of recycling organic waste. What is remarkable in the post findings of children was that the majority of children declared that composting is an easy and feasible practice that they can do on their own in their daily life. Accordingly, kitchen balconies and residual gardens were pointed as convenient places where they can simply create their own composting bins and feed the earthworms with green and brown organic materials to get the poop of earthworms which is also known as fertilizer. Consistent with findings that emerged in the content analysis of pre-, post, and follow-up interviews, analysis of the learning outcome rubric pointed out that there was a statistically significant difference between children's pre- and post & and follow-up assessments with respect to conceptualizing composting as a sustainable practice.

Taken together, the children and the mothers have jointly recognized the amount of recyclable organic waste generated in home and school settings in everyday lives. The learning activity in which mother-child dyads brought organic waste from home might be at the heart of this awareness since both children and mothers mentioned how they were surprised by the amount of organic waste coming out of their home kitchen. Regarding this, one of the striking findings

was that in post interviews the mothers started to look critically at their daily consumption habits, and their impacts on the natural environment and they even started to ask how a shift could be created to achieve more sustainable and responsible habits to ensure more environmentally and more sustainable lifestyles in the home environment with the collaboration of children. Such kind of shift in mothers' understanding has revealed a connection between "becoming a sustainable individual" and "everyday routines".

The importance of *everydayness* emerged from the current study also matches well with the work of McCrea and Littledyke (2015) and is consistent with previous findings in the literature (Cutter-Mackenzie & Edwards, 2006; Vare & Scott, 2007; Edwards et al., 2016; Ginsburg & Audley, 2020) as the precondition of children's active participation in learning for sustainability. This idea satisfactorily corroborates the notion that children's direct experiences in their everyday lives are important to create meaningful and sustainable ways of learning. In relation to the knowledge of sustainability, immediate interactions with teachers, peers, and families in daily routines have great potential to foster children to learn about sustainable lifestyles and citizens. This confirms the previous findings (Malone & Hartung, 2009; Elliott, 2012; Percy-Smith & Burns, 2013; Ärlemalm-Hagsér, 2014; Hill et al., 2014) that children's immediate involvement in sustainable-related topics helps them to understand the concepts through making the link between everyday routines and sustainable patterns. Children's deep engagement and relational understanding help them to create their own personal meaning and relevance in learning locally. As proposed by Singleton (2015), value-laden educational experiences and efforts close to the home environment could be inspiring for children to find their personal meaning, relevance, and responsibility in everyday life. This could lead children to establish a different point of view of unsustainable patterns of experiencing real-world learning in children's lives which is a good way to connect community members, children, and the environment.

This *everydayness* is also evident in post-findings in which participating children and mothers agreed that composting is one of the convenient activities to simply manage the organic matters in their everyday lives. Children might gain recognition that they can play a role to contribute home composting and share what they have already learned with others to spread this sustainable practice in order to prevent high volume of trash, save the landfills, and even feed the earthworms to increase the quality of soil for the well-being of non-human beings. This view of children was also paralleled with the mothers' responses depicted in post-interviews. *The everydayness* of recycling organic waste was also evident in mothers' responses that they have recognized that organic waste is an integral and relational part of their

everyday lives. Accordingly, home composting is a feasible and convenient waste management practice in which instead of sending fruit and vegetable scraps to landfills as garbage, they can simply imitate nature by breaking down the natural materials and allowing them to turn into fertilizer. Not surprisingly, both children and mothers agreed in their post-interviews that organic waste is *everywhere*. This focus makes sense as to why participants particularly highlighted the need and the value of composting related to the everyday life of every individual in interviews after participating in the learning activities.

Within the scope of this research, participants' experiences were broadened through direct and real-life experiences, as well. There is a large body of research considering children's meaningful experiences had significant and positive exposures that makes them environmentally sensitive and concerned individuals (Chawla, 1988; Kellert, 2002; Orr, 2002). Paralleling with that concern, child-mother dyads were provided opportunities to observe the physical features of real earthworms to understand their critical role in the compost cycle. Moreover, mother-child dyads ate bananas, apples, and tangerines in the picnic held on the first day, and rather than throwing away the peels of those fruits, they used the peels in hot and worm composting activity a few days later. Likewise, participants started up the hot composting process on Day 3 with the organic waste they brought from home and the garden waste they collected from the school garden. With that said, the current study provided an opportunity for participants to explore composting in their everyday context. Composting, as a firsthand experience, might enable children to explore one of the natural cycles of Earth. Concerning this, Orr (1992) acknowledged that exploring Earth's systems firsthand is considered one of the key tenets to understanding how systems within the Earth work and how people can be connected to their local context through relational and applied practices in everyday contexts. Thus, identifying practical pedagogical tools to integrate knowledge is vital to make connections visible in order to assist participants' conceptual development and learning for sustainability.

5.1.2 Exploring Composting as a Tool to Promote Agency for Sustainability

The notion of young children's agency has been widely recognized and accepted in existing literature (Caiman and Lundegård, 2014; Ärlemalm-Hagsér & Davis 2014; Davis, 2015; Walker, 2017; Sundberg et al., 2019; Borg, 2022). Agency of children in early childhood education for sustainability is closely related to children's active participation in the issues that concern their lives and sharing their opinions and voices (Borg, 2022). With this in mind, the conceptualization of agency is considered a guide, a factor to shape the curriculum, and

education policies to embed sustainability in early childhood education. In the current study, exploring a sustainable practice through intergenerational engagement developed its curricular manifestation that makes the researcher think about the role of children and mothers in the learning process to figure out the best-suited pedagogical approach in order to foster children's agency. Herein, composting learning activities can be acknowledged as an important tool in which recycling organic waste was explored through intergenerational interactions including the bidirectional relations of children and mothers.

As Greenwood (2013) stated, encouraging children's agency through the questions "*what is happening here?*" and "*in what direction is this place headed?*" are quite bountiful to immerse children in thinking about the systems in the natural world. Looking for answers to these questions makes children realize that there is a changing ecosystem and the communities are part of it. Change happens in the natural environment over time and it is important to inquire what is happening right now. With respect to this idea, the current study presented children and mothers with a series of learning activities in which participants have the opportunity to make future predictions about the compost piles that they prepared in hot composting and worm composting activities. During implementation, participating children were quizzed with many questions in order to understand what is happening now and how the composting process plays out over time. Notably, the "what if" questions were quite functional to enable children and mothers to predict, see, and comprehend how multiple factors may play roles in the composting process. This was of interest, because the "how", "why" and particularly "what if" questions might open a door for participants to investigate and reflect on the current situation of compost piles and also the potential future directions. A swathe of research suggests that the key questions are particularly essential to engage children's critical thinking in which their understanding is shaped by multi-dimensions of sustainability to promote children as ecologically responsive and agentic individuals (Bautista et al., 2018; Sinclair, 2004).

With respect to the multi-dimensions of sustainability, post-findings revealed how participants conceptualize sustainability in line with environmental, economic, and social dimensions. Before participating in learning activities, children associated recycling with preventing landslides from filling the garbage. Children only mentioned environmental aspects of sustainability. However, extended post findings indicated that children conceptualized the need and the value of composting in multiple and diverse ways. Accordingly, children depicted recycling organic waste as an important practice not only for the environmental well-being but also, they touched upon the economic aspect by associating recycling with using less energy. In post-findings, participating children highlighted that recycling paper, plastic, and organic

matter contributes to maintaining natural resources. These findings are consistent with the studies conducted by Davis (2009) and Prince (2010) that providing learning experiences has ample merits in helping children to conceptualize sustainability from diverse perspectives that could be clear evidence that exploring and understanding sustainable-related issues such as resource usage, caring natural environment, the value of recycling which are not actually so complex issues for young children.

Further, participation in composting learning activities expanded both child and mother participants' knowledge in terms of relationships and care for the social dimension of sustainability. As stated, being a *Compost Star* was one of the salient activities for both children and mothers in which their participation in composting learning activities was appreciated. When participants were asked about their thoughts and feelings about being a *Compost Star*, the majority of respondents noted that as a *Compost Star*, they were enthusiastic to share with others what they have already learned about composting. More importantly, they reported that they feel responsible for sharing what composting is and how they can do it in their close neighborhood to turn it into a commonly shared practice which fits well with the evidence found in a bulk of studies (Davis, 2005; Ärlemalm-Hagsér, 2014; Hill et al, 2014; Ji & Stuhckme, 2014). The idea of caring for the natural environment through collecting and recycling organic waste in their own may empower children and mothers' agency to create a positive relationship with the community to become a springboard for composting. Further explanations from participants demonstrated that composting was identified as a strategy that fosters a sustainable community in which individuals come together for common values. Post-interviews included mothers' excerpts that implied that composting is a common shared activity in which neighborhood or site residents can simply come together, collaborate to collect organic waste, care for their gardens, feed the earthworms, water the compost pile, and store and share seeds, fruits, and vegetables. This is notable since none of the learning activities has focused on the unifying role of composting. As Reinertsen (2016) stated, true connection of nature stems from partnership with others. Since agency is about the capacity to influence others, it must be built on relations and interactions. Agency is a matter of interacting; it is an enactment (Bennett, 2010; Cielemecka & Daigle, 2019).

In this study, composting was served to participants as a waste management strategy that can be a bountiful solution for waste generation in the routine of everyday life. In interviews conducted after the completion of learning activities, participating mothers recognized that generating organic waste is a complex environmental challenge. From this vantage point, they critically engaged with the ideologies of consumption in relation to their unsustainable living

styles and more specifically consumption patterns. It was remarkable to note that participating mothers conceptualize composting as a way of responsible consumption by reevaluating what and why they consume so much. Typically, they associated waste generation with their consumption habits and rethought their daily everyday routines and thus concluded that if they consume less and/or more environmentally friendly products, they will generate less waste. That is, mothers' inquiry throughout the learning activities may have the potential to increase their own agency through generating ideas and making decisions on waste management in their everyday lives.

Exploring the source of organic waste, how organic waste is recycled, and why it needs to be recycled were the key points consistently mentioned in post-findings by participating children and mothers. After participating in learning activities, both children and mothers stated that composting is a convenient sustainable practice, thus, they can simply do it in their everyday lives. The majority of respondents provided pretty enough details to start up the composting process in their home environment. They were aware of the materials and green and brown organic materials needed to build a compost pile. Besides, both participating children and mothers recognized that recycling organic waste in their daily life routine is a good option to manage waste, but also it increases the quality of soil which is also pivotal for earthworms, snails, and bugs living under the soil. Related to this, children touched upon earthworms which are hardworking living creatures that have a profound role in worm composting. In a similar vein, after exploring composting, participating mothers conceptualized the cycling process of composting in which the human and non-human world acts together.

These findings are noteworthy because they could signal how participants got an understanding of the living systems rationale. As McDonalds (2015) captured, learning about living systems encourages individuals to have a deeper and better understanding of their own actions. This might be the reason why mothers started to think critically about their own actions and their role in the environment and why they have decided that the food they eat is already a part of the living system they explored after participating in learning activities. Composting was valued not only for human beings but also for the benefit of non-human creatures such as the soil, earthworms, snails, and insects. Given that idea, they explored not only a sustainable practice but also the rationale of a living system and their own profound role in sustaining this system. These points of view correlate favorably with Malone (2016) and Weldemariam (2020) highlighted that the non-human world needs to be closely considered to change the notion that it is not the only human being's ability to control nature in which individuals were inspired to learn for sustainable patterns from non-human agents, as well.

5.1.3 A Meeting Zone for Children and Parents: Exploring Composting as a State for Intergenerational Learning

The sociocultural theory puts an emphasis on the role of adults, communities, and cultural facts in fostering children's knowledge development (Rogoff, 2003). According to Jordan (2004), the potential of interactions between children and adults is an effective tool for knowledge construction. Herein, this research provided a base focusing on sociocultural orientation in which social interaction is valued and composting is culturally defined. The current study provides children with a learning space in which purposefully framed activities build upon children's and mothers' everyday routines. They support each other throughout each day and foster what they learn through joint conversations about their local context.

As mentioned, guided participation in composting learning activities truly resonates with Rogoff's (2003) *Guided Participation Theory*. There is strong evidence that learning activities in which children and mothers jointly engaged in led to children's learning framed by mothers' perspectives. They participated in joint activities that made them possess something shared and something common. As Vygotsky put forward (1986) the kindergarten and home were considered as interconnected parts of children's everyday life and sociocultural context. Thus, it is pivotal to embed sustainability in children's everyday lives in their schools and home environments. In this study, composting was a novel topic for both mothers and children, yet about conceptualizing composting as a sustainable practice, some children presented a high level of recognition.

These findings correlate favorably well with the previous findings reported by Marchal-Gaillard (2022) who confirmed that young children are capable of developing an early understanding and how external influences such as parents, neighborhoods, parents and media could be effective in shaping children's understanding of reducing waste at home and the cycle of organic matters in everyday life. Mothers, as more experienced and elderly individuals, foster children's learning process and guide children's path to understanding composting as a sustainable production strategy. But at the same time, children opened a corridor and provided a space for their mothers to learn about the great role of earthworms in the composting process which is quite a natural process contributing to the natural cycle of Earth for many years. This is one of the remarkable findings of the current study. The majority of the participating mothers confirmed how amazing it was to participate in activities with their preschool children. Those individuals posited that children's curiosity and enthusiasm were so inspiring, thus children also played a promising role in bidirectional learning in which mothers benefitted from

children's contributions. These perspectives satisfactorily well with a large body of research indicated that (Ballantyne et al., 1998; Payne, 2005; Larsson et al., 2010; Istead & Shapiro, 2014; Meeusen, 2014; Spiteri, 2020) even though children are seen as the main target of environmental education programs, research studies including intergenerational learning posit the younger generation may actively support their parents in the transfer of environmental knowledge, attitudes, and behaviors about a variety of controversial topics (Fluury & Burns, 2005; Lawson et al., 2018; Liden et al., 2021).

In efforts to address intergenerational learning, involving mothers in the cycle of children's learning through intergenerational dialogues can be considered a notable step for this study. In particular, mothers were not included as superior or stronger figures than children in the current study. On the contrary, they took part in the whole process as reflective, responsive, and supportive individuals who were connected to the children's learning cycle. As a matter of fact, the conversations that take place between mother and child at the end of each day demonstrated how questions asked by mothers guided both children's and mothers' learning and stretched both children's and mothers' knowledge. In the first place, mothers took place in a part of their children's learning practice which was enacted in the school setting. Secondly, mother-child dyads were considered as equally competent individuals with rights to engage in exploring the recycling of organic waste as an everyday practice in relation to sustainability. Thirdly and more importantly, children's views were valued and respected within a democratic foundation in which mother-child dyads learned about composting which was a novel topic for both sides. Joint conversations played a key role in participants thinking, questioning, and reflecting on what they have already investigated. Regarding the conversations, the participating mothers mentioned that participating in the whole process together with their children has actually evolved into a "learning moment" in which exploring composting is potentially deepened through reflective narratives and open-ended questions both for the children and for themselves. In post-interviews, many mother respondents agreed that it was enjoyable and even productive to have this experience with their children. In relation to this, the excerpt of M₁₂ is given below:

As a whole, it was useful to be together during the learning experiences and then to talk and reevaluate what we have already learned. We did not know what organic waste is and how it is recycled before participating in these activities. During this process, my daughter and I learned together. Sometimes I have realized in the conversations we had in the evenings that there were points that I did not understand or I had overlooked. My daughter was telling me in detail. There have been times I've been surprised when I see how she knows and remembers so many details compared to me. I mean, it was instructive and full of discovery for both of us..... besides, the diversity of key experiences was also important. Play activities, book

reading activities, and worm composting activities were also interesting for mothers. I think this situation has allowed us to adapt to the process and join the children's learning cycle easily. This also had an impact on the content and the quality of the conversations we conducted each evening.

5.1.4 Contributing to Responsible Consumption and Sustainable Production Through Composting

The excerpts of participating mothers' post-interviews illustrated the importance of collaborative actions to foster a sense of responsibility in children. It has been evident in the findings that children were ready to take responsibility to ensure a change in family dynamics as children can play an active role in promoting everyday sustainable practices. In the current study, mothers jointly participated in composting learning activities with their children, they had the opportunity to observe how children engage and make sense of composting, how children asked questions and made comments about learning experiences, and how they feel responsible to collaboratively take part in the decision-making process on sorting kitchen scraps in everyday routines. Multiple mothers stated in post-interviews that early years are critical and eligible to make children explore composting as a sustainable practice in order to foster a sense of responsibility toward household consumption habits. This notion is also evident in the body of work touching on issues related to young children's participation in everyday sustainable practices positing that contextualizing sustainability with familial consumption habits impacts intergenerational dynamics among parents, children, and the parents' consumption choices (Ballantyne et al., 2001; Cook, 2009; Kerrane et al., 2012; Kaplan et al., 2017; Scopelliti, 2022). Kerrane et al. (2012) indicated that consumption related issues provide a site for family socialization in which children observe their parents and get an idea about familial norms on consumption. Therefore, articulation of a shared identity for daily consumption habits and developing conservation behaviors making visible the new practices are critical for family members to externalize the need for sustainable practices. Identifying the responsibilities of each family member, promoting a sense of "ownership", and sharing the priorities of household needs are considered good and strong steps to create a shift in household consumption toward more sustainable living manners (Ritch et al., 2009; Palmer et al., 2003; Payne, 2005).

One of the notable aspects of the findings that emerged from the present study was that the expanded knowledge of participants may trigger understanding to rethink the notion of sustainability. To illustrate, instead of perceiving sustainable practices as time-consuming and in need of considerable effort and action, participating mothers indicated that 'becoming sustainable' actually depends on the individual. In this respect, attending learning experiences

may offer an alternative perspective that each individual is responsible for his/her own actions. As respondent mothers initially stressed, supporting and organizing waste management was the responsibility of the municipalities. On the other hand, after participating in learning activities, they declared that it is the individuals' responsibility because waste generation and waste management are two interlinked issues. The importance of this finding comes from how mothers consider their lifestyle in the context of responsible consumption. They have realized that they need to rethink their consumption habits by choosing more environmentally friendly and more environmentally sensitive products. Further explanations of participating mothers claimed that preferring environmentally friendly products alone is not enough. In this regard, the respondents emphasized reduction in the amount of waste produced may be another solution to support responsible consumption and production. The source of mothers' perspective may be the awareness they develop about the amount of waste in their homes with the information they have acquired during composting learning activities. With this awareness, they may have developed the idea that consuming less could be a more bountiful solution in supporting sustainable living. This finding is also confirmed by multiple studies (Samuelsson & Kaga, 2008; Daries et al., 2009; Pratt, 2010) that engaging in sustainable-related interventions can potentially serve a change in family consumption patterns. The findings on children learning recycling and participating in home consumption and production practices is evident in the studies conducted by Grodzńska-Jurczak et al. (2003) and Maddox et al. (2011) who confirmed that children have potential to impact the decisions on household waste management strategies through transferring the relevant information to home setting. Furthermore, Maddox (2011) highlighted the importance of school-based waste management education on intergenerational influence which includes transferring environmental attitudes, behaviors and knowledge to adults.

5.1.5 The Potential of Mother-Child Joint Conversations to Explore Composting

In the present study, mother-child joint conversations can be perceived as a leading mechanism to flesh out children's learning as has already been evident in previous research (Ornstein et al., 2004; Fivush et al., 2006). The reunion of mother-child dyads in school settings for joint engagement to explore a sustainable practice can also be considered as an attempt to recognize how young children conceptualize sustainability based on their narratives immediately presented after participating in learning activities. Since assessing children's achievements and progress through questioning, interviewing, and binary dialogues has a strong place in the field of early childhood environmental education (Elliott et al., 2014; Siraj-Blatchford, 2014; Pramling-Samuelsson & Park, 2017), the joint conversations have a potential to fold out

children's initial understanding and even also misunderstanding about the concepts, issues and relevant topics.

Even though prior research in the field of the development of autobiographical memory particularly focused on specified past events such as birthday party, visiting a dentist, going to the zoo etc. (Fivush, 1991; Reese et al., 1993; Welch-Rose, 1997), the current study demonstrated how joint conversations related to learning activities held in a preschool setting facilitate children's learning about composting and memory responses. This study builds on previous literature examining the role of parents in their children's learning during science learning that takes place in the school context and not in the presence of the parents (Leitchman, 2017; Stone, 2015; Pagano et al., 2020). On the other hand, the current study makes children and mothers come together to jointly experience a sustainable practice which was novel for both parties.

The findings of this work suggested that mothers' conversational variables were associated with children's contributions to mother-child joint conversations conducted at the end of each activity day. Open-ended questions provided by mothers potentially encouraged children to stay alive in joint conversations to reflect on what they experienced and explored about each day's learning activities. In this vein, *Wh*- questions provided by participating mothers were helpful for children to reflect on the "what, where, why, and how" aspects of learning activities discussed that turned into a memory-sharing time. In the current study, participating mothers talked with their children as they naturally would. Open-ended questions, yes/no questions, context statements, and evaluations were naturally provided depending on each mother's conversational style that they uniquely possessed; thus, the results are correlational. It means, mothers who were more elaborative with their children in joint conversations had children who stayed alive in conversations with more open-ended questions and context statements related to learning activities. To put it another way, what and how participating mothers converse with their children influenced how the child talks during the conversations.

With respect to supporting children's engagement, *Wh*- questions were recognized as the key tenet of elaborative conversations on past activities in which parents and children jointly experienced (Wang, 2001, 2007; Boland et al., 2003; Wareham & Salmon, 2006; Hedrick et al., 2009; Benjamin et al., 2010; Leitchman et al., 2017). The findings of this research demonstrated that there is a strong correlation between the use of *Wh*- questions of mothers with children's memory questions and the statements related to each day's learning context. In this respect, exploring composting through a series of learning experiences may be particularly

centralized through highly elaborative mothers' divergent questions to shape children's understanding and direct children's attention to the relevant and related objects, places, materials, games, statements, actions, people, and so forth. Eliciting what has already been learned by focusing on salient and interesting aspects of learning experiences may be turned into a hint for children to remember and retrieve what has been learned about recycling organic waste and may help children to construct their own knowledge which might be more accessible in the future. The potential of Wh- questions for joint conversations is also consistent with previous results (Farrant & Reese, 2000; Celevaland & reese, 2005; Haden et al., 2009). Accordingly, Farrant and Reese (2000) have confirmed that frequency of mothers' use of Wh- questions were positively linked with children's later memory reports. Similarly, Haden et al. (2009) have further showed that mothers who ask more Wh- questions with elaborative statements supported their children who reported more memory information when compared to children whose mothers utilized fewer elaborative Wh- questions. One striking point here was the participating children's verbal contribution to the flow of the conversations. Being a highly elaborative mother is not solely about utilizing more memory questions or focusing on the details related to the context. Providing children with relevant and associative comments and being responsive to children's statements may also be critical to expanding children's exploration of composting. This is because open-ended questions asked more by highly elaborative mothers may also strengthen children's knowledge through following and observing what their child already knew or gained from the implementation of learning activities. This is also highlighted by previous research (Boland et al., 2003; Haden et al., 2004; Ornstein et al., 2004) that mothers have the potential to shape the content of the conversation and direct children's attention which is worthy, interesting, and important to be remembered. With this in mind, Ornstein et al. (2004) demonstrated that fostering children's later recall is positively associated with the frequency of mothers' use of elaborative questioning. Since Wh- questions potentially make children to provide new information about an ongoing event, each open-ended question resonates children's subsequent remembering which turns into a joint verbal exchange.

In this study, mother-child dyads jointly participated in composting learning activities and they experienced a novel practice together. Thus, mothers were not merely providing questions to reveal what children already learned about composting, rather, their elaborations were bountiful sources for children, and even children's questions, answers, and comments during conversations shaped mothers' perspectives. Consistent with the previous studies (Benjamin et al., 2000; Wang & Fivush, 2003; Wang, 2007; Haden et al., 2009; Callanan, 2012; Hedrick et al., 2009; Leitchman et al., 2000), mothers' elaborations were strongly and positively

associated with children's contributions to joint conversations. Regarding, the findings of this study have a number of similarities with Haden et al. (2009) who conducted a study with 4-year-old children and their mothers from three Western middle-class cultures. In the study, open ended questions were identified as the precursor of children's contributions and concluded that number of children's elaborations were linked with the number of mothers' elaborations. Paralleling that concern, Boyd (2018) indicated that it is pivotal to listen to young children's ideas and provide answers to their 'how' and 'why' questions to assist them in thinking critically. In this vein, provoking dialogues through divergent questions is one of the ways to break up children's stereotypes and they are functional to reestablish the already existing knowledge. Thus, early years are eligible to bring a critical lens into the classroom and promote children's critical thinking through open dialogues with peers, parents, teachers, and the community.

To provoke children's interest in environmental dispositions, early childhood settings are widely accepted to promote children's agency through interactions and conversations. Once children's awareness is constructed about what is unsustainable, they start to think about it to identify the reason for unsustainable habits in order to make responsible decisions (Samuelsson & Kaga 2008; Siraj-Blatchford et al., 2010). The study conducted by Bauista et. al. (2018) investigated how planned and incidental conversations foster children's understanding of sustainability. The findings suggested that the presence of open-ended questions such as 'What do you mean by...?', 'Why do you think way?', 'How would you do that?' or 'What do you think that will happen?' have the potential to foster children's reflexive thinking. Since open-ended questions are associated with multiple and varied responses, they potentially help children to take different perspectives which is also considered an important precondition of directing the flow of conversations (Edwards & Mackenzie, 2013; Dymont, 2014; Washington, 2019).

In the present study, all participating mothers followed their children's responses in joint conversations, yet mothers who were categorized as highly elaborative utilized more elaborations when compared to low-elaborative mothers. Simple correlation analysis strongly indicated that highly elaborative mothers are significantly more likely to elaborate the conversation by providing more open-ended questions and reminding the details about the context of the learning activities. It is also possible to see great differences between high and low elaborative mothers in the use of total words in their conversations. To put it another way, highly elaborative mothers talk more expansively when compared to low elaborative ones. This concurs well with many earlier findings (Fivush & Haden 1997; Boland et al., 2003;

Camilleri et al., 2021). Accordingly, Camilleri (2021) found that parents' elaborative questioning is positively associated with children's memory assessed both during parent-child conversation and with a researcher at delays of 3 and 15 days. Furthermore, Boland et al. (2003) utilized an experimental methodology to reveal between the maternal conversational style and children's remembering of the experiences of the camping activity. It was concluded that children whose mothers received training on high elaborative talking provided more embellished details when compared to children whose mothers were untrained.

The stylistic differences between high and low elaborative mothers in the present study were also highlighted in the use of context statements provided by participating mothers. As Benjamin et al. (2010) noted, questions may not always be a powerful indicator of understanding a novel topic. Associative details related to shared experience might assist children in making sense of what is currently experienced. Thus, instead of asking frequent open-ended questions to unfold an experience, expanding conversation by providing details about the learning context might be a critical strategy to make children stay engaged in verbal engagement. (Laible, 2004; Wang & Fivush, 2005; Tulviste et al., 2016). Given this, further analysis of this work indicated that there was a strong relationship between the context statements and children's elaborations in joint conversations. With this in mind, since exploring composting was a novel practice for both children and mothers, context statements provided by highly elaborative mothers might play a provocative role to make children engage in joint conversations.

The autobiographical memory literature has broadly agreed that the elaborative parental conversational style in which parents frequently reminisce with their children through memory questions, yes/no questions, context statements, and evaluations play a key role in contributing to children's memory process (Farrant & Reese, 2000; Leitchman et al., 2000; Fivush et al., 2006). As Fivush and Fromhoff (1988) declared, once mothers shape joint conversations with more open-ended questions and focus on contexts with more descriptive language, this enhances conversation content and fills it with details about locations, activities, objects, people, and materials. This may be one of the reasons why highly elaborative mothers' contributions were positively associated with the number of children's descriptive language about composting learning activities. In the current study, mothers' elaborations were all correlated with the novel details including objects, actions, and time statements that children provided in post and follow-up interviews. It is also worth noting that conversational elements participating mothers possessed have a profound role in scaffolding children's remembering in post and follow-up interviews. Herein, memory questions such as "what, where, why, and

how” about composting open a corridor for mother-child dyads to critically analyze what they have explored on that day.

The present study exclusively focused on how mother-child conversations that took place after joint engagement in composting learning activities assisted children’s memory reports. The current research is heavily built on previous literature that folded out the parent’s contributions to their children’s knowledge and concept development during visits to museums and parent-child dialogues on related science activities conducted in the classroom environment as an academic context (Callanan, 2012; Leithman et al., 2017; Camilleri, 2021). Broadly speaking, the analyses of mother-child joint conversations suggested that mothers’ unique conversational styles were associated with children’s learning on composting. In this vein, the use of memory questions, yes/no questions, evaluations, and context statements presented by mothers was profoundly linked with children’s depictions in post and follow-up interviews. These findings support previous findings in the literature. Accordingly, the longitudinal study conducted by Haden et al. (2003) demonstrated that children’s open-ended recall of the features of camping, birdwatching and ice cream store activities displayed consistency in children’s 3-week recall across all the activities is highly correlated with how mothers discussed with their children.

In the present study, organic waste recycling and the word 'compost' appeared as a new concept with which both the mothers and the children were not familiar. Although they went through the five-day learning process together, the novelty of composting may have been reflected in the shared conversations between mother and child. The relevant literature shows that mothers' contributions to the process of talking about familiar and novel events may vary (Hudson, 2002). While mothers talking about new experiences guide the conversational process with more speculative questions, the content of the conversation may change within the child's prior knowledge when talking about familiar experiences. In this study, as the mothers had a novel experience with their children that they did not know before, mother-child conversations involve the process of discovery, listening to each other and learning from each other about a sustainable practice. For this reason, the children of the mothers who carried out the conversation process with more open-ended questions in their conversations may have contributed to the conversation with more open-ended questions and descriptive details.

If we now turn to how mothers’ conversational elements had an impact in post and follow-up interviews, it is also revealed that there was a strong positive relationship between mothers’ conversational elements and the number of details children remembered 3 weeks following the completion of learning activities. In this tradition, bivariate correlation analysis pointed

out that mothers' elaborations were highly associated with children's memory reports. To that extent, children whose mothers provided more memory questions tended to use descriptive language and expressed more correct details related to objects, actions, and the time of the event in the past and follow-up interviews. Herein, the remarkable point was that the strong correlation between mothers' elaborations and children's responses, including correct details, were still observed in follow-up researcher-child interviews conducted three weeks after the implementation of learning activities. About this, mothers' elaborations may assist children's understanding, and details provided may help children to reconstruct their knowledge encoded in long-term memory and help children to restore their constructed knowledge in the long term. This finding is also evident in the results that emerged from the analysis of the learning outcome rubric designed for this study. Children whose mothers were more elaborative in their joint conversations have higher scores in post and follow-up assessments. On the contrary, children whose mothers provided less elaboration in joint conversations gained low scores in post and follow-up assessments.

The potential of the conversational style that was suggested by the mothers and the children in learning for academic contexts was guided by previous research (Leitchman et al., 2017; Stone, 2015; Leitchman et al., 2020; Camilleri et al., 2021) and an emerging perspective to reveal how learning activities, projects, and topics are best understood and remembered (Fivush & Fromhoff, 1988). Herein, *Wh*- questions were taken into consideration as a key element of the elaborative reminiscing style. Furthermore, evidence that emerged in the current study indicated that not only *wh*-questions, but also providing the details about the context were highly predictive for children's memory reports depicted in post and follow-up interviews. Hence, context statements provided by participating mothers' need to be considered as a premise elaborative strategy to promote joint talk and keep children active in verbal engagement between the mothers and children. Details about the contexts provided by participating mothers were provoked for children to sustain the conversation and make children think about the different aspects of the learning activities.

As noted, parent-child conversations potentially serve educators to measure children's learning (Callanan & Jipson, 2001; Fivush et al., 2006). In the current study, mother-child dyads jointly participated in composting learning activities consisting of various kinds of activities such as story reading, science, math, and play which were all integrated. In this vein, the reunion conversations could be considered a further attempt to evaluate how children make sense of their own experiences related to composting immediately held after the learning activities. In this respect, joint conversations between mothers and children potentially turned into a kind

of assessment of how children conceptualize the recycling of organic waste and which aspects of the learning process were salient for children. In this respect, children engaged in more elaborative and embellished talk with their mothers were successful in retrieving the details of the learning process.

The current study has also an important insight into how everyday conversations with others in a formal educational context help children to take on new meanings and learn to recall the salient aspects of newly learned concepts, topics, and information. Even though there is a considerable amount of research on children's memory for specific personal life events such as birthday parties, visiting a doctor, holidays, and playing with peers, the findings of the current study appear to be well substantiated on the role of parent-child conversations about learning in an academic context is an emerging area in the field of autobiographical memory.

Of significance, focusing on shared endeavors and allowing children to express their ideas, perspectives, and even conflicts are needed to be centered in early childhood classrooms to encourage young children to ask questions, to make comments, and to bring solutions about the topics discussed. Despite the potential of critical dialogues on children's understanding of sustainability (Weldemariam et al., 2017; Boyd, 2019; Engdahl et al; 2023), less is known about how particular mother-child conversations are generated in an academic context supporting children's learning outcomes (Leitchman et al., 2017; Camilleri et al., 2021). Pillemer (2001) stressed specific memories belonging to learning events can potentially serve a role in education. From a theoretical perspective of autobiographical memory development, the findings of this research add substantial knowledge of the role of mother-child joint conversations about academic context to the existing literature. In recent years, the potential of enhancing the memory development of children has been considered a tool for academic experiences. In this tradition, enhancing children to remind about particular moments of ongoing learning experiences helps them to revisit the learning events and remember the specific episodes, facts and already learned concepts (Callanan, 2012; Leitchman et al., 2017).

5.2 Educational Implications and Recommendations for Further Studies

In this dissertation, how recycling of organic waste was conceptualized by the participant children and mothers as a sustainable practice before and after jointly participating in a series of composting learning activities was investigated. In this respect, this study could serve as a possible alternative approach for methodological creativity in the field of early childhood education for sustainability through utilizing parents' unique conversational styles which has been focused on a swathe of empirical studies in autobiographical developmental literature. In

this vein, empowering children's agency to know the ways of sustainability and how young children's conceptions are facilitated in line with sustainability issues need to be further explored with more examples and practices. The current study could be considered a kind of investigation to reveal how preschool children explore a sustainable practice through intergenerational learning, yet more studies are needed on how it works out in different contexts and different cultures.

The present findings might have important implications on how participating children and mothers explore sustainable practices and their roles within them through daily life activities. Exploring composting through series of learning activities potentially lead children and mothers' various moments in which they dynamically interact, discuss the embeddedness of composting in everyday life, reconfiguring their household activities and consumption habits in which they recognized that their micro-decisions might have macro-scale effects for the environment. In this vein, post findings are encouraging for offering a window for participants about everydayness of sustainability which helped them to grow environmental knowledge and provide a generative environmental learning opportunity (Rickinson, 2006; Gibson et al., 2014). Thus, a further implication for teachers, families, curriculum makers and researchers might be to spark children's interest toward relational and concrete environmental issues from everyday life to help them make sense about environmental issues. It is recommended to highlight how sustainability focused government programs and policies intersect with daily life (Wals, 2012; Gibson et al., 2014; Rieckmann, 2017), because encouraging individuals to explore and rediscover about their everyday realities provide them a lens which could be appreciative and critical. Thus, local context could be considered by policy makers as a bountiful starting point for individuals to develop a sense of belonging, recognizing environmental responsibility (Sauve, 2002). In this essence, when learning for sustainability related with individuals' life experiences through daily interactions and engagement, it makes the learning more continuous, more sustainable that facilitates integration of individuals into sustainability in everyday life contexts (Rogoff, 2004; Payne, 2006). Even though informal and incidental learning opportunities were underexamined in environmental literature (Bautista et al., 2018; Ardoin & Heimlich, 2021), this research has potential to demonstrate how a sustainable practice can be embedded into preschool setting. Further studies, which take sustainable practices into might consider the potential of institutional places such as recycling centers, botanical gardens, community gardens, museums that serves a foundational role in the everyday-life learning system. This is a vital issue for the future research, since learning for sustainability should not be bounded within schooling.

The current research could possibly support educators and parents, because it demonstrates the potential the strong relationship between home and school environment. As highlighted by ecological systems theory, varied environmental context play crucial role in children's development (Bronfenbrenner, 1986). In this vein, home school collaboration, engagement of families in children's learning has great potential for children learning for environment through doing with family members, informing by parents and communication with all about the real and embodied experiences in their daily routines (Tali Tal, 2004; Siraj-Blatchford et al., 2010; Engdahl, 2015). One of the further practical implications could be embracing family members and facilitating connections across the children's learning context for sustainability. Parents who provide unique opportunities for children not only teach for sustainability, but also make them involved in sustainable practices. The findings of the current are encouraging to demonstrate the agentic role of the parents which is also consistent with previous studies (Ballantyne et al., 2001a; Tali Tal, 2004; Duvall & Zint, 2007; Grønhøj & Thøgersen, 2009; Spiteri, 2020) in which parents facilitate children's learning through discussion about environmental issues, reading stories and reflecting ideas through family interactions. Hence, it is recommended that future studies need to concentrate parents' agentic role to shape children's pro-environmental behaviors.

With this in mind, it is recommended that to create a shift in children's mind in terms of environmental issues, schools and families can might work closely together. Increasing household sustainable action repertoires by parents may create shifts in young children's priorities. This may also helpful to underline the capacity and actions of children to give them a 'message' that "you and your responsible actions are considered important". To put in another way, decisions on household consumption pattern may be framed by the parents, but it should also include the children's voices. Allowing a division of responsibility in home environment can simply passed into a springboard for children to transfer his/her knowledge in wider communities.

Furthermore, future studies might also focus on the importance of living sustainably through link connections across generations. In this essence, grandparents who potentially transfer their collective awareness about sustainable practices to their grandchildren can shared their knowledge to create a shift towards more sustainable thinking (Istead & Shapiro, 2014; Spiteri, 2020). As evident in the study of Ballantyne et al (2001b), children reported the influence of their grandparents on learning environmental sustainability. Thus, future research can concentrate to understand under what contexts intergenerational learning occurs and the impact of multigeneration households in which grandparents, parents and children are living

together has an influence on children's learning for sustainability. Child to grandparent intergenerational learning need to be further investigated to reveal the potential of extended family interaction in education for sustainability.

Another notable point was that children's agency should be supported in line with what place-based theory suggests (Mackey, 2014; Malone, 2016). Focusing on the problems of local context might be efficient to develop a sense of belonging. In line with this, young children are provided a chance to envision the future and recognize their own responsibility and potential to deal with the dispositions and become a change agent (Malone, 2013; Walker, 2017; Konerman, 2021). In this present research, it was somewhat pivotal to observe how children felt responsible about contributing compost cycle not only to cope with generated organic waste in their kitchen, but also, they demonstrated a sense of respect and appreciation towards the role of earthworms, in the words of children *Sosos*. This implies how children started to think responsibly toward other species which is remarkable to establish precise human-environment relationship within the context of sustainability. Even though the potential of human agency of over-polishing to bring about solutions toward global crisis, it was quite gratifying to capture how 60–72-month-old children recognize the composting cycle as a whole in which human beings and other species are working collaboratively. It might be noted that it was a common assumption in the field of early childhood education for sustainability that supporting children's agency is worthwhile to trigger young children to take actions for the sake of natural environment.

As Ballantyne et al. (1999) and Ballantyne and Fien (2001) reported learning activities are quite influential to transfer environmental knowledge to home environment through embellishing dialogues. With this in mind, a further important implication could be about the content of learning programs which can be turn into a vehicle to transfer children's environmental knowledge to home environment. According to Ballantyne et al. (1999), the quality of conversations between children and parents is more important than the frequency of dialogues. Thus, rich, diverse, child-centered and play based learning experiences are needed to create a bountiful avenue for the deepness of joint conversations. For the current study, *Garbage Witch*, as an intriguing start to investigate what is organic waste, was one of the predominant focus of children and mothers. Through *her*, children and mothers jointly engaged in thinking about garbage, waste, the problem of *Garbage Witch* and they served an effort to solve *Garbage Witch's* problem which is considered as a pleasant starting point to take children's attention for the researcher. Extended post and follow-up interviews of participating children highlighted that meeting *Garbage Witch* was featured by the majority of

children as the most memorable learning moments. As Wilson (2018) stated providing children pleasant and memorable experiences can be stimulating their attention to tie them natural environment and appreciate the sustainability. This idea further expanded by the study Ernst and Burcak (2019) which pointed that children's curiosity, motivation and enthusiasm are critical sources to foster their exploratory behaviors and for seeing answers. Furthermore, during post and follow-up interviews, participating children explained how they conceptualized composting through a character named *Soso*. Children expressed that they were glad to meet the puppet *Soso* and even also its *real* friends at worm composting activity held in Day 4. Children consistently and frequently mentioned about the word "Soso" while talking about worm farms, experiments done with earthworms, collecting kitchen scraps and garden waste as delicious food for them in post and follow-up interviews.

Together, play activities were also one of the central points of participating mothers. Creating a big worm, categorizing biodegradables and nonbiodegradables and 'Meyve Sepeti' game were the topics that mother-child dyads talked more in Day 1, Day 3 and Day 4. With this concerning, multiple mother respondents agreed in post interviews that through play activities, exploring a sustainable practice turns into a pleasurable activity for children. Since participating mothers recognized the children's desire and experiences through observing, playing and discussing with them, they had decided that learning through play is a bountiful stage to elaborate children's questions, encourage children to seek the answers and feed the children's curiosity toward environmental issues. (Ward, 2013; Cutter-Mackenzie et al., 2014; Davis, 2014; Green, 2020). To the extent, the interaction they had with their mothers during the play activities and the conversations they had with their mothers afterwards may have influenced the children's increased knowledge about composting. Paralleling this concerning, research in the field of early childhood education for sustainability posited that play-based environmental education is highly supportive for child-adult interaction (Pramling, Samuelsson, & Carlsson, 2008; Feller, 2010; Cutter-Mackenzie & Edwards, 2013).

Given that, educators' pedagogical content knowledge in relation to sustainability is needed to be taken into consideration. In order to arrange key experiences to make children alert for sustainability, knowledgeable and enthusiastic educators are important to bring about continuous and generative ways of become sustainable. Teachers' agentic role in early childhood setting is not just about transferring predefined knowledge to children. Rather, they have a key role to investigate and learn together with children (Davis & Elliott, 2014; Ginsburg & Audley, 2020). Therefore, it is recommended for educators, researchers and curriculum and policy makers not solely focus upon increasing the knowledge of children, but rather aiming

to serve emerging notions of relational pedagogies to lead children to become more sustainable becoming. In addition, it is suggested for educators to include parents in sustainable practices held in school settings. Organizing sessions in which parent and children come together to explore the sustainability-related topics may have likely to be an open-door policy to connect parents as an important stakeholder to fulfill the principles of education for sustainability.

Mother-child joint conversations was also considered as one of the multiple ways of exploring for sustainability for the present study. In this respect, arranging daily routines in home and school environment to engage children into meaningful conversations could be an effective option to support children's learning. Herein, the critical point for parents and educators should develop an understanding that how vital conversational interactions and how those conversational elements are best fitted to make children initiate and engage the learning process. As it was revealed in this research, *Wh-* questions were quite functional to expand children's knowledge and stretching their thinking. Put more simply, joint conversations could simply be scrutinized as a strategic way to get children, educators and parents continuously involved in learning process to discuss and think about the environmental problems in an extended way. Hence, it is pivotally crucial to spend adequate time and place for conversation in which children think about the need and the value of sustainable practices critically and respect their own perspectives and evaluate the efforts in more sophisticated and abstract ways.

At the heart of intergenerational learning, mother-child dialogues were the source of sustained shared thinking in which mothers' unique conversational styles had a further effort to determine how preschool children made sense of their personal experiences on their narratives reported immediately after engagement in composting learning activities. Memory sharing in this study pass into a kind of binary thinking and bidirectional learning in which participating children had an active role to shape the flow of conversations. Previous studies on parent-child conversations (Leitchman et al., 2000; Wang, 2001; Stone, 2015; Pagano et al, 2020; Camilleri, 2021) had varied goals than the current study, yet how mothers' memory questions effective on children's memory reports on a sustainable practice in a formal preschool setting was a worthy evident in the current study. Future works on the current topic are recommended to study with children of different age groups. In addition, conversations about sustainability-related topics among families of children living in different countries and cultures can be investigated. The present study focused on mothers' and children's talk about the shared past. Future research could address parent-child conversations during learning activities. Last, but not least, in the present study, children's memory reports about learning activities were

examined by giving 2-day and 15-day postponements. It is proposed that future research may give longer delays to reveal the effectiveness of the activities, programs and the projects.

A further implication of the current study is related to utilizing rubric as a tool to assess children's environmental knowledge. For the current study an assessment rubric was constructed in line with the principles of learning objectives of SDG 12 served as a comprehensive tool for the researcher to evaluate children's progress before and after participating in composting learning activities. Since there is little empirical evidence in the current literacy to evaluate young children's learning for sustainability (Borg, 2017; Davis & Elliott, 2014), rubric has potential for teachers and curriculum makers not only to assess children's performance, but also evaluate the quality of learning experiences. For the current study, children's changed knowledge on organic waste recycling was grasped through pre-, post and follow-up interviews, yet learning outcome rubric offered researcher a flexible framework to reveal children's extended knowledge through scoring rubrics for generating a quantitative score of a qualitative study. Future studies in the field of early childhood education for sustainability are therefore recommended in utilizing rubrics as an authentic assessment tool to recognize the diversity of children's understanding and learning in sustainability-related topics. Further investigations that will intends to identify how to best support the implementation to stimulate participants' learning, need to focus on different stakeholders such as parents, educators, children.

In the present study, the researcher received mother-child joint conversations through *WhatsApp* application. This approach may encourage for the future works for the researchers and educators concerned to connect parents to school setting. Technology and media use may be more prevalent than it would have previously imagined, thus one promising application of utilizing media and digital tools in preschool classrooms. As evident in previous research studies (Pila et al., 2019; Dore & Dynia, 2020), technology and media become increasingly prevalent in preschool classrooms, yet little is known about use in preschool classrooms. Future studies on this topic are therefore suggested in investigating the use of technology and media in preschool classrooms. Concerning home settings, the use of media might be detrimental to support children's development though enriching activities such as parent-child shared reading, playing to support children's learning across settings.

Overall, "composting" was generative and uplifting for participating children and mothers to explore the cycle of composting together in this study. Multiple learning experiences such as play, science, math, language etc. supported participants' exploration by enriching the learning

context. Given the uniqueness of each mother-child dyad, multiple learning opportunities and joint conversations were provided to help participants conceptualize organic waste recycling. In this sense, children are not the sole focus of the current study. On the other hand, the interaction between mothers and children could help both parties explore sustainable lifestyles through relational pedagogy in everyday life.



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APPENDIX A. LEARNING OUTCOMES RUBRIC FOR COMPOSTING LEARNING ACTIVITIES

Core Indicators					
Learning Outcomes	Related learning objectives derived from ESD Goal 12: Responsible Consumption and Production	Level 1 (Score=0) Needs Improvement ^a	Level 2 (Score=1) Emerging ^b	Level 3 (Score=2) Accomplished ^c	Level 4 (Score=3) Exemplary ^d
The child knows the value of recycling as a strategy for responsible consumption and production	<i>Cognitive Learning Objective 4.</i> The learner knows about strategies and practices of sustainable production and consumption. <i>Social-Emotional Learning Objective 1.</i> The learner is able to communicate the need for sustainable practices in production and consumption.	The child does not mention about recycling as a strategy to reduce waste generation	The child explains the role of recycling to reduce waste generation as a strategy for responsible consumption and production.	The child indicates the potential of recycling to reduce waste generation as a strategy for responsible consumption and production and s/he also gives examples of possible recyclables.	The child makes clear definition of recycling as a sustainable strategy to reduce waste generation. Plus, in Level 4, the child is able to give possible reasons to emphasis the need of recycling as a strategy for responsible consumption and production.

The child knows organic wastes are also part of the generation waste and they are recyclable.	<i>Cognitive Learning Objective 2.</i> The learner understands production and consumption patterns and value chains and the interrelatedness of production and consumption (supply and demand, toxics, CO2 emissions, waste generation, health, working conditions, poverty, etc.)	The child does not notice organic wastes as an integral part of production and consumption patterns.	The child is able to describe what organic wastes are.	The child understands the organic wastes and s/he is able to give examples as kitchen (fruits, vegetables) and garden wastes	In addition to Level 3, the child is aware about organic wastes are biodegradable substances as part of production and consumption patterns.
The child notices organics and organic wastes are part of everyday life.	<i>Cognitive Learning Objective 1.</i> The learner understands how individual lifestyle choices influence social, economic and environmental development.	The child does not link organic waste generation with everyday life routines.	The child mentions about organic wastes could be part of everyday life, yet there is no valid example.	The child mentions about organic wastes are integral part of everyday life. S/he also gives example of what kind of organic waste could be generated in everyday life routines.	The child not only describes organics and organic wastes are integral part of everyday life, but also s/he is able to discuss the source of organic wastes and its relation with our life styles
The child knows Do's and Don'ts for compost pile	<i>Cognitive Learning Objective 4.</i> The learner knows about strategies and practices of sustainable production and consumption.	The child does not provide relevant and/or correct components for a compost pile	The child expresses limited, but correct ingredient for a compost pile. Herein, there is no valid response about ratio and ordering of the organics.	In Level 3, the child is able to tell compostable food scraps and/or garden wastes for high quality compost pile. Still, there is no information on correct ratio and ordering of the organics.	The child knows what compost pile should be included with correct ratio, sorting and more specifically correct waste type as <i>Greens</i> and <i>Browns</i> . In this level, the child is expected to differentiate compostable and non-compostable food scraps and garden wastes to promote high quality compost pile.

The child knows how composting process is started up.	<i>Behavioral Learning Objectives 1:</i> The learner is able to plan, implement and consumption related activities using existing sustainability criteria	There is no relevant explanation on how composting process is planned and implemented	The child partially explains how composting process is started up, but there are missing points	The child hierarchically explains all steps with needed materials and equipment to start up composting process.	In this level, it is expected that the child has well-developed knowledge on how composting process is planned and started up with its materials, equipment and steps in detail. For instance, it is expected that the child is able to explain the compost physics as why we need moisture (water), aeration (holes on the bins), dark (the lid of the bin), temperature, organics with correct ratio of <i>Greens</i> and <i>Browns</i> .
The child notices the worms and their unite role for worm composting (vermicomposting)	<i>Cognitive Learning Objective 4:</i> The learner knows about strategies and practices of sustainable production and consumption.	The child does not provide any relevant response about worms and their unique role for worm composting.	The child partially describes the salient physical characteristics and/or physiological characteristics of red worms, yet still there is no satisfactory information about why red worms have a unique role in composting process.	The child provides entire details of red worms regarding physical and physiological characteristics observed in learning activity. However, s/he is not able to extend his/her knowledge about worms with composting process.	The child knows that physical and physiological characteristics makes red worms unique for composting process. In this level, it expected that child knows the features of red worms and build the knowledge that how those features are closely linked with composting process.

The child knows how worm composting (vermicomposting) process is started up.	<i>Behavioral Learning</i> <i>Objectives 1:</i> The learner is able to plan, implement and consumption related activities using existing sustainability criteria	The child is not able to explain how composting process with worms is started up. The child's point is lack about required materials and equipment to set up the composting bin and the steps of composting process.	The child partially explains how composting process is started up. The child depicts the entire process, yet there are missing and/or incorrect points in terms of required materials and equipment and the steps of worm composting process.	The child hierarchically describes the entire process with correct materials, equipment and steps of the process.	In this level, it is assumed that the child has satisfactory knowledge about how a worm composting process is started up with its materials, equipment and steps. Furthermore, the child is able to explain the necessity of each material and equipment in detail. For instance, it is expected that the child is able to explain why we need moisture (water), aeration (holes on the worm bins), dark (the lid of the bin), organics (organic wastes), <i>Browns</i> (as beds for worms) and <i>Greens</i> (organics) etc.
The child appreciates composting/worm composting as a strategy for sustainable consumption & The child knows the importance of communicating with others about the value of composting/worm composting.	<i>Cognitive Learning</i> <i>Objective 4:</i> The learner knows about strategies and practices of sustainable production and consumption. <i>Social-Emotional Learning</i> <i>Objective 1.</i> The learner is able to communicate the need for sustainable practices in production and consumption.	The child neither provide a valid response about value of composting (environmental, economic, social) nor the need for communicating with other stakeholders to spread the knowledge and inspire them.	The child is able to point the potential of composting in limited aspect. S/he is aware that composting is a strategy for sustainable consumption and production, yet there are no extended perspectives related to environmental, economic and social aspects. Still, there is no emphasis on communicating with others to share the knowledge.	The child is able to explain the reasons why composting is desirable strategy for sustainable consumption regarding three domains of sustainable development; environmental, social and economic. In this level, the child expresses not a linear, but a closed-loop system of composting process which is composting is not just decomposition of organic food scraps,	In this level the child is already know what is indicated in Level 3. Furthermore, s/he is able to discuss about the need to share the knowledge with multi-stakeholders (peers, teachers, families, neighborhoods) through bringing communication alternatives to inspire others and envision sustainable lifestyles.

yet as a result of the
process organic
waste turns into
nutrient rich
substance.

Notes: The learning objectives are organized by UNESCO (2017) to achieve Sustainable Development Goals (SDG) specifically Goal 12: Responsible Consumption and Production. Learning objectives for Goal 12 outlined above described in *cognitive*, *social-emotional* and *behavioral* domains related to learning outcomes regarding composting learning activities.

^aLearning outcome is not achieved. The child needs to be supported;

^bThe stated learning outcome is beginning to be developed, but not totally achieved by the child;

^cThe stated learning outcome is achieved by the child with its fundamental aspects;

^dThe stated learning outcome is well-achieved by the child with its vital and well-elaborated aspects.

APPENDIX B: APPROVAL OF METU HUMAN SUBJECTS ETHICS COMMITTEE

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER



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Sayı: 28620816 / 2019

09 Nisan 2019

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (IAEK)

İlgili: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Doç. Dr. Refika OLGAN

Danışmanlığını yaptığınız Seçil CENGİZOĞLU'nun "Anne ve Çocuk Arasında Ortak Geçmişe Yönelik ve Katıldıkları Ortak Etkinlikler Sırasında Yapılan Konuşmaların Çocuğun Kompostlama ile İlgili Öğrenmesine Etkisinin İncelenmesi: Bir Durum Çalışması" başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve 197-ODTÜ-2019 protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunan;

Prof. Dr. Ayhan SOL

Üye

Prof. Dr. Yaşar KONDAKÇI

Üye

Doç. Dr. Pınar KAYGAN

Üye

Prof. Dr. Hülin GENÇÖZ

Başkan

Prof. Dr. Ayhan Gürbüz DEMİR

Doç. Dr. Emre SELÇUK

Dr. Öğr. Üyesi Ali Emre TURGUT

Üye

APPENDIX C: CURRICULUM VITAE

SEÇİL CENGİZOĞLU

EDUCATION

Ph.D.: Early Childhood Education, Middle East Technical University, Ankara, Turkey (2013-2023)

M.S.: Early Childhood Education, Middle East Technical University, Ankara, Turkey (2010-2013)

B.S. – Minor: Psychology, Middle East Technical University, Ankara, Turkey (2008-2010)

B.S.: Early Childhood Education, Middle East Technical University, Ankara, Turkey (2005-2010)

WORK EXPERIENCE

Research Assistant
2010/ February 2020

Middle East Technical University, Faculty
of Education, Department of Elementary
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Education and Social Research Specialist
2021/March 2023

TEDMEM

RESEARCH PROJECTS

“From Waste to Fertilizer 3 – Composting”, Project Supported by The Scientific and Technological Research Council of Türkiye (TÜBİTAK) 4004 Nature Education and Science Schools, Project Coordinator: Dr. Serap Bilen, Consultant: Seçil Cengizoğlu, 15/02/2019 – 24/09/2019

Investigating the Influence of Mother-child Joint Conversations on 60–72-Month-old Children's Memory Outcomes: A Vermicomposting Study, Project Supported by Higher Education Institutions, Project Coordinator: Doç. Dr. Refika Olgan, Researcher: Seçil Cengizoğlu, 27/06/2018 - 03/12/2019

“From Waste to Fertilizer 2 – Composting”, Project Supported by The Scientific and Technological Research Council of Türkiye (TÜBİTAK) 4004 Nature Education and Science Schools, Project Coordinator: Dr. Serap Bilen, Consultant: Seçil Cengizoğlu, 01/01/2018 – 15/01/2019

“From Waste to Fertilizer – Composting”, Project Supported by The Scientific and Technological Research Council of Türkiye (TÜBİTAK) 4004 Nature Education and Science Schools, Project Coordinator: Dr. Serap Bilen, Consultant: Seçil Cengizoğlu, 01/01/2017 – 15/01/2018

AWARDS

The World Organization for Early Childhood Education (OMEP), Commendation for Special Achievement in Education for Sustainable Development, ESD Awards 2021

The World Organization for Early Childhood Education (OMEP), Honorable Mention in Education for Sustainability, ESD Awards 2018

SELECTED PUBLICATIONS

Cengizoğlu, S., Olgan, R., & Teksöz, G., (2022). Preschool children’s perceptions on human–environment relationship: follow-up research. *Early Child Development and Care* , vol.192, no.4, 513-534.

Şenyurt, E., & Cengizoglu, S. (2022). *Mind mapping as a system thinking tool: How preschool children conceptualize water on our planet*. 74th OMEP World Assembly and Congress, OMEP, Athens, Greece.

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Olgan, R., & Cengizoğlu, S., (2020). Erken Çocukluk Dönemi Çevre Eğitimi Etkinliklerinin Planlanması ve Değerlendirme. *Erken Çocukluk Döneminde Çevre Eğitimi* (pp.227-249), Ankara: Pegem Yayıncılık.

Cengizoğlu, S., & Olgan, R., (2019). *Mothers's reminiscing styles and preschool children's memory reports and learning about recycling: A qualitative ECEfS program from Turkey* . The European Conference on Educational Research (ECER), Hamburg, Germany

Bilen, S., & Cengizoglu, S. (2018). How the Worms Turned in Red? : Examining Middle School Students' Drawings within the scope of Vermicomposting Activities. 27th International Conference on Educational Sciences (ICES), Antalya, Türkiye

Cengizoğlu, S., Olgan, R., & Teksöz, G. (2017). Who destroyed the Forest: The forest witch? European Educational Research Association. ECER, Copenhagen, Denmark.

APPENDIX D: TURKISH SUMMARY (TÜRKÇE ÖZET)

1. Giriş

Hızlı nüfus artışı ve buna bağlı olarak doğal kaynakların tükenmeye yüz tutması artık gezegenin ‘taşıma kapasitesini’ çoktan aştığının bir nedeni olarak birçok ulusal ve uluslararası raporda vurgulanmaktadır (Hükümetlerarası İklim Değişikliği Paneli [IPCC], 2018; OECD; 2022; Ritchie & Roser, 2019; Roser & Ortiz-Ospina, 2018; BM, 2019). Temiz su kaynaklarına erişimin daha zor bir hale gelmesi, iklim krizinin belirgin etkileri, biyolojik çeşitliliğin azalması, atık yönetim sistemlerinin etkili bir şekilde sürdürülememesi, hızla gelişen teknoloji ve kentleşme insanoğlunun antroposentrik yaşam tarzının bir sonucu olarak çevre ve çevre-insan ilişkisi üzerinde oldukça olumsuz bir etki bırakmaktadır (Kahn, 2002; Kahn & Weiss, 2017). Artık dış mekânda daha az zaman geçiren ve doğal çevre ile daha az tatmin edici deneyimler yaşayan küçük çocuklar ise yukarıda bahsi geçen tüm bu sürdürülemeyen yaşam tarzlarının yaygın etkilerine en çok maruz kalacak savunmasız ve kırılgan gruplar olarak nitelendirilmektedir (Davis, 2008; Davis ve Elliott, 2014).

Öte yandan, daha sürdürülebilir bir gelecek inşa etmek amacıyla 2030 Sürdürülebilir Kalkınma Gündemi ile belirlenen 17 Sürdürülebilir Kalkınma Amacı (SKA) ve 168 alt hedef merkezine küçük çocukları almaktadır (UNESCO, 2017). *Amaç 4: Nitelikli Eğitim* başta olmak üzere belirlenen amaçların tamamı 2030 yılına kadar insanoğlunun doğa ile uyum içinde olduğu bir yaşamı benimsemesini ve doğa ile olan bağların güçlendirilmesini destekleyecek öğrenme fırsatlarının sağlanmasını hedeflemektedir (BM, 2022; UNESCO, 2017). Bu bağlamda, *Amaç 12: Sorumlu üretim ve Tüketim* özellikle küçük çocuklar için öncelikli alanları ele almayı amaçlayarak 2030 yılına kadar önleme, azaltma, geri dönüşüm ve yeniden kullanım yoluyla atık üretimini önemli ölçüde azaltmayı amaçlamaktadır.

Daha sürdürülebilir bir gezegen için başlangıç noktası kabul edilen sürdürülebilir kalkınma amaçları ele alınırken günümüz çocuklarının sürdürülebilirliği nasıl kavramsallaştırdıklarını anlamak kritik bir öneme sahiptir. Sürdürülebilirliği ve doğada bulunan sürdürülebilir sistemleri günlük yaşam ile ilişkilendirmek, yaparak ve yaşayarak öğrenecekleri öğretim süreçleri tasarlamak ve sürdürülebilirlik ile ilgili düşüncelerine kulak vermek küçük çocukların öğrenmelerini desteklemekte önemli noktalardan sadece birkaçıdır. McCrea ve Littledyke (2014), küçük çocukların sürdürülebilirlik bağlamında değiştirici güce sahip ajanlar

olarak görülmelerine rağmen, “gezegeni kurtarmanın” aslında onların sorumluluğunda olmadığını vurgulamaktadır. Daha ziyade, sürdürülebilirlik için erken çocukluk eğitimi, günlük yaşam ve yeryüzü sistemleri içindeki açık etkileşimler ile birlikte çocuklara gelişimsel olarak uygun ve ilgili öğrenme deneyimleri sunmak ve çocukların bakış açısını değiştirmek ile ilgili olduğu belirtilmektedir (Barratt ve ark., 2014; Green, 2015, 2017; Green & Sommerville, 2017). Çocukların sürdürülemeyen ve sürdürülebilen yaşam tarzlarının farkında olması, sürdürülebilirlik ile eylemlere etkin katılımı ve gösterdiği ilgi sürdürülemeyen rutinlerin getirdiği karmaşıklığı anlamlandırmak için iyi bir başlangıç noktası olacaktır. (Malone, 2017; Percy-Smith & Burns, 2013). Ebeveynler çocukları için önemli rol modelleri olduğundan, anneler, babalar ve çocuklar arasında paylaşılan değerler ve eylemler, çocukların sürdürülebilirlik sorunları hakkındaki bilgileriyle olumlu ilişkilere sahiptir (Borg ve ark., 2017; Elliott ve ark., 2016). Çocukları ev ortamında sürdürülebilir kalkınma ile ilgili tartışmalara dahil etmek, sürdürülebilirliğin günlük yaşamın ayrılmaz bir parçası olduğunun farkına varmaları için teşvik edici niteliktedir. Çocuklar başlangıçta çevre yanlısı eylemleri araştırırken rehberli katılım önemli bir rol oynadığından, sürdürülebilirlik için erken çocukluk eğitimi konusunda ebeveynlerle etkileşimler ve iletişim keşfedilmeye değerdir (Pramling-Samuelsson & Park, 2017; Spiteri, 2020, 2022).

Ballantyne ve arkadaşları (2006), ebeveynlerin çevre yanlısı tutumlarının ebeveyn-çocuk bilgi alışverişi yoluyla da teşvik edilebileceğini öne sürmüştür. Burada, daha deneyimli kişiler olarak, ebeveynlerin deneyimlerini paylaşmada ve çocuklarının çevresel sürdürülebilirlik algılarını desteklemede kritik bir rolü vardır. Rogoff ve arkadaşları (2003), günlük çevre yanlısı davranışlarla ilgili ebeveyn iletişiminin, çocukları potansiyel olarak duyarlı çevre yanlısı normlar oluşturmaya teşvik ettiğini belirtmiştir. Bu bağlamda, ebeveynlerin günlük çevre yanlısı davranışları, çocukların yeni davranışlar edinmeleri için bir alan sağlamaktadır. Ebeveynlerle iletişimin ve kolektif eylemler gerçekleştirmenin, çocukları sürdürülebilir kalıpları keşfetmek ile ilgili motive ettiği bilinmektedir (Grønhøj & Thøgersen, 2009; Matthies ve ark., 2012). Ayrıca çocuklar, okulda öğrendikleri sürdürülebilir uygulamalar ile ilgili konuları ebeveynleriyle kolayca paylaşabilirler. Çocuklar nesiller arası diyaloglara katılarak düşündüklerini paylaşmaya teşvik edildiklerinden sürdürülebilirlik için kendilerini rahat ve düşünme, paylaşma ve hareket etme yeteneğine sahip hissederler.

Birlikte ele alındığında, sürdürülebilirlik için erken çocukluk eğitimi, aynı zamanda mevcut çalışma için kavramsal bir temel olan otobiyografik bellek gelişimi alanı için bir çerçeve sunmaktadır. Bu noktada Vygotsky (1978) ve Rogoff (1990) tarafından önerilen sosyokültürel yaklaşımın temel dayanaklarından biri, sosyal ve kültürel olarak yönlendirilen etkileşimlerin, çocuklara kişisel anlatılarını ve hikayelerini otobiyografik bellek oluşturma lehine inşa etmesi

ile ilgilidir. Bu bağlamda, çocukların günlük deneyimleri hakkında ebeveynleri ile yaptığı günlük konuşmalar çocukların sosyalleşmesini teşvik ettiği gibi (Kulkofsky ve ark., 2010; Pillemer, 1998; Wang, 2013) çocuklara diyalogların oluş ve akış şekline ve içeriğine katılma ve yönlendirme olanağı da sağlar. Ebeveynler ile sürdürülen diyaloglar yoluyla çocuklar eylemlerini, duygularını, ilgili kişiler hakkındaki düşüncelerini ve deneyimlerini yeniden gözden geçirme fırsatını yakalar ki karşılıklı gerçekleşen bu sohbetlerde ortaya çıkan yeni bakış açıları paylaşılan deneyimi yeniden düşünmelerine ve zihinsel temsiller oluşturmalarına olanak tanır (Fivush, 2007; Neale ve Pino-Pasternak, 2017; Reese ve ark., 2019).

Buradaki temel nokta, ebeveynlerin – özellikle annelerin- sahip oldukları bireysel konuşma stilleri ile konuşmaları nasıl yönlendirdikleridir. Konuşmalarında detaylandırıcı konuşma stilini benimsemiş annelerin çocukları annelerinin yaptığı gibi betimleyici ve değerlendirci sözlü etkileşimleri benimsemeye daha fazla ilgi duyarlar (Haden ve ark., 2001; Salmon ve diğ., 2011). Bu gelenekte, açık uçlu sorularla ortak olarak yaşanan geçmiş olaylar ile ilgili çocuklarına ayrıntılar sunan anneler, çocuklarına eylemlerinin, niyetlerinin ve duygularının nedenlerini ve sonuçlarını daha iyi anlama fırsatı sunar (Boland ve ark., 2003; Hedrick ve ark., 2009; Langley ve ark., 2017). Öte yandan, daha az detaylandırıcı olan anneler çocuklarıyla yaptıkları sohbetlerde daha az işbirlikçi bir şekilde tekrarlanan sorular sorma eğilimindedir. Öte yandan, anne-çocuk arasında geçen sohbetlerin içeriği ve yapısı çocuklar tarafından da şekillendirilebilir (Boland ve ark., 2003; Taumoepeau & Reese, 2013). Sonuçta, konuşmanın niteliği, çocuk ile annesi arasındaki karşılıklı etkileşimden gelmekte ve bu da çocukların kişisel deneyimlerini anlamaları ve anlamını kendi başlarına oluşturmaları için benzersiz bir öğrenme fırsatı sağlamaktadır. (Graci & Fivush, 2017; Neale & Pino-Pasternak, 2017; Pearson & Pillow, 2016; Reese & Cleveland, 2006, Schröder ve diğ., 2013).

İlgili alan yazını ışığında mevcut çalışmayı önemli kılan birkaç noktadan bahsetmek mümkündür. Öncelikle, sürdürülebilirlik için erken çocukluk eğitimi bağlamında yapılan bilimsel çalışmalar geniş bir yelpazede toplanmaktadır. Çeşitli araştırmacılar küçük çocukların çevreye olan duyarlılıklarına odaklanırken (Ballantyne & Packer, 1996; Melis ve ark., 2020; Wilson, 1993), çocuk-doğa bağlantısı (Bailie, 2012; Beery ve ark., 2020; Chawla, 2015; Spiteri, 2016, 2020; Yılmaz & Olgan, 2017), bahçecilik (Green & Duhn, 2015; Lee ve ark., 2017; Witt ve Kimple, 2008) ve katı atık yönetimi (Buil ve ark., 2019; Kara ve ark., 2015) gibi farklı konuların ele alındığı çalışmalara da rastlanmaktadır. Öte yandan, okul öncesi dönem çocuklarının organik atıkların geri dönüşüm sürecini nasıl kavramsallaştırdıkları ve birer değişim ajanı olarak diğer paydaşlar ile olan etkileşimi ile ilgili çok az şey bilinmektedir (Ergazaki ve ark. 2009; Marchal-Gaillard, 2022; Palmer ve ark., 2003).

Mevcut çalışmayı etkileyen bir diğer çıkış noktası, nesiller arası öğreniminin sürdürülebilir kalkınma için eğitim üzerindeki etkisi hakkında daha fazla fikir vermektir. Yetişkinlerin çocukların öğrenmesindeki rollerine odaklanan nesiller arası öğrenme üzerine yapılan birçok çalışma aslında çocukların da ebeveyn kararlarını şekillendirmede yetkin bireyler olduğunu göstermektedir (Kerrane ve ark. 2012; Lawson ve ark., 2019; Peterson ve ark., 2019). Ayrıca, mevcut çalışma annelerin bireysel konuşma stilleri aracılığıyla çocukları sürdürülebilir bir uygulama olan organik atıkların geri dönüşüm sürecini nasıl teşvik ettiklerini ortaya çıkarmak potansiyeline sahiptir. Yapılan araştırmalar çocukların örgün okul bağlamında nasıl öğrendiklerine ve yetişkinlerle konuşma etkileşimlerinin çocukların akademik deneyimlerini nasıl somutlaştırdığına ortaya koymaktadır (Bemis ve ark., 2011; Camilleri ve ark., 2021; Leithman ve ark., 2017; Bemis & Leithman, 2019; Tang & Bartsch, 2012). Bu bağlamda, müze gezisi sırasında ve sonrasında anne-çocuk arasında geçen konuşmalar (Benjamin ve ark., 2010; Callanan ve diğ., 2012; Haden, 2010; Haden ve diğ., 2014), çocukların katıldığı bir akvaryum gezisi sonrası yapılan anne-çocuk sohbetleri (Oküler ve ark., 2022; Kelly ve diğ., 2023) ve ışık, uçuş, hayvanlar vb. bilimsel kavramlar hakkındaki kavramsal bilgileri öğrenmek için konuşma etkileşimlerinin potansiyeli (Callanan ve Jipson, 2001; Camilleri ve ark., 2021; Conrad & LoBue, 2015; Haden, 2010; Leithman ve ark., 2017; Stone, 2015) bu zamana kadar yapılan çalışmaların odak noktası olmuştur. Öte yandan, anne ve çocuk sohbetlerinin çocukların çevre eğitimi veya sürdürülebilir kalkınma için eğitim ile ilgili herhangi bir konudaki bilgilerine nasıl katkıda bulunduğunu ortaya çıkarmak için şimdiye kadar hiçbir çalışmaya rastlanmamıştır.

Sürdürülebilir kalkınma için öğrenim süreçlerini değerlendirmenin önemi alan yazınında sıklıkla vurgulanmaktadır (UNESCO, 2014; Rieckmann, 2017). Bu kapsamda yükseköğretim seviyesinde (Caeiro ve ark., 2020; Mckeown, 2011; Shephard, 2008) ve uluslararası yapılan geniş ölçekli değerlendirme sistemlerinde (OECD, 2022; OMEP, 2019; UNESCO, 2017) örneklere rastlamak mümkünken, erken çocukluk eğitimi özelinde sürdürülebilirlik konularına ilişkin değerlendirme süreçlerine duyulan ihtiyacı belirten farklı çalışmalara rastlamak mümkündür (Borg, 2017; Davis & Elliott, 2014). Buradan yola çıkarak, mevcut çalışma kapsamında geliştirilen *Kompostlama Öğrenme Etkinliklerine Yönelik Öğrenme Çıktıları Rubriği*, katılımcı çocukların öğrenme etkinliklerine katılmadan önce ve sonra SKA 12 için belirlenmiş bilişsel, davranışsal ve sosyal-duygusal öğrenme hedefleri doğrultusunda ilerlemelerini ortaya çıkarmak için özgün bir değerlendirme aracı olarak kabul edilebilir. Bu husus göz önüne alındığında, geliştirilen değerlendirme rubriğinin temel amacı, çocukların bilgilerinin öğrenme etkinliklerine katılmadan önce ve sonra ne ölçüde değiştiğini nitel bulgulara ek olarak nicelik verileriyle sunmaktır.

Yukarıda bahsi geçen bilgiler ve alan yazını ışığında mevcut çalışmanın amacı iki yönlüdür. İlk olarak, kompostlama öğrenme etkinliklerine katılmadan önce ve sonra katılımcı çocukların ve annelerin sürdürülebilir bir uygulama olarak organik atıkların geri dönüşüm sürecini nasıl kavramsallaştırdığını ortaya çıkarmaktır. İkinci olarak, annelerin bireysel konuşma stillerinin, katılımcı çocukların öğrenme etkinliklerine ilişkin bellek raporlarını geliştirme potansiyelini ortaya koymaktır. Bu kapsamda, bu çalışma ile aşağıda belirtilen şu araştırma sorularına cevap aranmaktadır;

1. Kompostlama öğrenme etkinliklerine katılmadan önce ve sonra 60-72 aylık okul öncesi dönem çocuklarının organik atıkların geri dönüşümüne ilişkin bilgileri nelerdir?
2. Kompostlama Öğrenme Etkinliklerine Yönelik Öğrenme Çıktıları Rubriğine dayanarak, çocukların organik atıkların geri dönüşümü ile ilgili bilgi düzeyleri ne ölçüde değişti?
3. Kompostlama öğrenme etkinliklerine katılmadan önce ve sonra katılımcı annelerin organik atıkların geri dönüşümüne ilişkin bilgileri nelerdir?
4. Annelerin konuşma stilleri, çocukların organik atıkları geri dönüşümüne ilişkin bilgisine nasıl katkıda bulunmaktadır?
 - a) Kompostlama öğrenme etkinliklerine ilişkin yapılan anne-çocuk sohbetlerinde annelerin detaylandırmaları ile çocukların ortak konuşmalara sunduğu katkı arasında bir ilişki var mıdır?
 - b) Daha fazla ve daha az detaylandırıcı konuşma stiline sahip anneler, kompostlama öğrenme etkinlikleriyle ilgili anne-çocuk ortak konuşmalarına ne ölçüde katkıda bulunur?
 - c) Annelerin anne-çocuk sohbetlerini detaylandırma derecesi, çocukların son ve takip görüşmelerinde kompostlama öğrenme etkinlikleri hakkında sunduğu bilgileri ne ölçüde etkiliyor?

2. Yöntem

Bu çalışma kapsamında nitel araştırma tasarımının ilkeleri göz önünde bulundurarak araştırma problemi belirlenmiş ve sonrasında araştırma soruları formüle edilmiştir. Bir durum çalışması olarak tasarlanan mevcut çalışmada kompostlama öğrenme etkinliklerinin uygulanmasından hemen önce ve sonra katılımcıların ifadelerine odaklanılmış, deneyimlerini ve öğrendiklerini

nasıl kavramsallaştırdıklarını ortaya çıkarmak adına özellikle olayların ve “ne” sorusuna cevap aramak üzere çalışma deseni belirlenmiştir (Sandelowski, 2000).

Bu çalışmaya Ankara’da bulunan iki ayrı anaokuluna devam eden okul öncesi dönem çocukları (12 erkek, 11 kız; yaş aralığı 56-74 aylık; $M = 63.74$, $SD = 4.39$) ile anneleri ($N=23$) katılmıştır. Her iki okul fiziksel ortam ve işleyiş açısından benzerlik gösterdiği için katılımcılar bu okullardan seçilmiştir. Amaçlı örneklem yoluyla çalışmaya katılan katılımcıların çalışma sürecine dahil olabilmeleri için belirlenen ölçütlerden bir tanesi katılımcıların organik atıkların geri dönüşümüne yönelik bir ön bilgilerinin olmaması iken bir diğer önemli ölçüt annelerin bireysel konuşma stillerinin belirlenmesiydi. Bu amaçla, çalışma sürecine katılmadan önce olası katılımcı annelerin konuşma stillerini belirlemek için araştırmacı anne-çocuk ikilileri ile buluşmuş ve bir ön çalışma olarak ortak geçmişleri ile ilgili yapacakları bir sohbet için elverişli bir ortam hazırlanmıştır.

Mevcut çalışma nitel araştırma deseni ilkeleri ile yönlendirildiğinden süreç boyunca katılımcıların kişisel deneyimlerinin zengin ve ayrıntılı bir şekilde sunması önem teşkil etmektedir. Bu bağlamda, çoklu veri toplama araçlarından yararlanılmış; zengin, güvenilir ve derinlemesine bilgi edinmek amaçlanmıştır. Bu amaç doğrultusunda i) katılımcı çocuklarla birebir yarı yapılandırılmış ön, son ve takip görüşmeleri yapılmış, ii) katılımcı annelerle ön ve son görüşmeler yapılmış ve iii) her gün sonunda yapılan anne-çocuk konuşmaları değerlendirilmiştir. Hem katılımcı çocuklar hem de katılımcı anneler için hazırlanan yarı yapılandırılmış görüşme protokolleri bir dizi esnek açık uçlu sorudan oluşmaktadır. Çocuklar için hazırlanan ön, son ve takip görüşme ve anneler için hazırlanan ön ve son görüşme soruları UNESCO tarafından ortaya konan *SKA 12: Sorumlu Üretim ve Tüketim* (2017), *Sürdürülebilir Tüketim ve Üretim Kalıpları Üzerine 10 Yıllık Çerçeve Programları* ve güncel alan yazın ışığında öğrenme hedeflerine uygun olarak şekillenmiştir. Yarı yapılandırılmış görüşmelere ek olarak, her kompostlama öğrenme etkinliği gününün sonunda anne-çocuk ikilileri o günün etkinlik sürecine ilişkin ettikleri sohbet mevcut çalışmaya zengin veri sunan bir diğer veri toplama yöntemi olarak nitelendirilebilir. Annelere araştırmacı tarafından; “Öğrenme etkinlikleri ile organik atıkların geri dönüşüm sürecini keşfedeceğiz. Bunun için etkinliklere birlikte katıldıktan sonra o günün sonunda etkinlik gününün içeriği hakkında sohbet etmenizi rica ediyorum. Çocuğunuzla günlük hayatınızda normalde yaptığınız gibi konuşabilirsiniz.” yönergesi verilmiştir. Konuşmalar çoğunlukla her öğrenme etkinliği gününün akşamında tamamlanıp sesli olarak kaydedilmiş ve *WhatsApp* uygulaması üzerinden araştırmacıya gönderilmiştir.

Bu çalışma kapsamında hazırlanmış kompostlama öğrenme etkinliklerinin odağında katılımcı çocukların ve annelerin sürdürülebilir bir uygulamayı birlikte keşfetmelerini olanak sağlamak

yatmaktadır. Pratt'in (2010) belirttiği gibi, kompostlamayı keşfetmek, küçük çocukların gezegenin canlı sistemlerinden birini öğrenmeleri ve takdir etmeleri için bir araç niteliğindedir. Organik atıklar ve bu atıkların yönetim süreci herkesin günlük yaşamıyla yakından ilgilidir, bu nedenle kompostlama sürecini farklı paydaşlarla birlikte keşfetmek sürdürülebilirlik için erken çocukluk eğitiminin temel ilkelerinden biri olarak teori ve pratiği bütünleştirme potansiyeline sahiptir. Yukarıda belirtilen perspektifler ışığında, kompostlama öğrenme etkinlikleri, sürdürülebilir kalkınma amaçları ve ulusal erken çocukluk eğitimi programı için kararlaştırılan temel yetkinlikler doğrultusunda geliştirilen beş günlük bir dizi öğrenme etkinliğinden (hikâye anlatımı, müzik, bilim, oyun, matematik, dil vb.) oluşmaktadır. Her öğrenme etkinliği, Sürdürülebilir Kalkınma Amaçlarından *Amaç 12: Sorumlu Üretim ve Tüketim* (UNESCO, 2017) için belirlenmiş öğrenme hedeflerine (bilişsel, davranışsal ve sosyal-duygusal dahil) dayandırılmıştır.

Kompostlama öğrenme etkinliklerinin tamamlanmasından iki gün sonra katılımcı çocuklar ile son; üç hafta sonra ise takip görüşmeleri gerçekleştirilmiştir. Tüm katılımcı anneler ile de son görüşmeler yapılmıştır. İlk iki araştırma sorusunun yanıtlarını bulmak amacıyla ön ve son görüşmeler içerik analizi yöntemi ile değerlendirilmiştir (Bengtsson, 2016). Öncelikle çocuklar ve anneler ile öğrenme etkinlikleri öncesinde ve sonrasında yapılan tüm görüşmeler deşifre edildikten sonra tüm deşifreler bütünü anlamak adına birden fazla kez okunmuştur. Görüşmelerdeki belirgin ve tekrarlanan cümleler vurgulanmasının ardından araştırma soruları temaları ve alt temaları oluşturmak adına araştırmacıya rehberlik etmiştir.

Miles ve Huberman'a (1994) göre, çoklu kodlayıcılar arasındaki derecelendirmeler arası ile ilgili anlaşma çalışmanın inanırılığını elde etmek için gereklidir. Bu bağlamda, kodlayıcılar arasındaki %80'lik anlaşma yeterli kabul edilir. Mevcut çalışma için Miles ve Huberman (1994) tarafından önerilen formül kullanılmış ve katılımcı anneler ve çocuklar ile yapılan yarı yapılandırılmış görüşmeler iki bağımsız araştırmacı tarafından kodlanarak sırasıyla 92. ve 86. oranında anlaşma sağlanmıştır.

Ayrıca, *Kompostlama Öğrenme Etkinliklerine Yönelik Öğrenme Çıktıları Rubriği*, kompostlama öğrenme etkinliklerine katılmadan önce ve sonra çocukların değişen ve gelişen bilgilerini ortaya çıkarmak için analitik bir araç olarak çocukların ön, son ve takip görüşmelerini değerlendirmek için üç kez kullanılmıştır. Rubrik verilerinin analizi kapsamında kodlayıcılar arası güvenilirliği sağlamak için, toplanan verilerin %25'i rastgele seçilmiş ve iki araştırmacı tarafından bağımsız olarak puanlanmıştır. Kompostlama öğrenme etkinlikleri için öğrenme çıktıları rubriği için kodlayıcılar arası güvenilirlik hesaplanmış, ön görüşmeler için 94., son görüşmeler için 90. ve takip görüşmeleri için 88. anlaşma oranları elde edilmiştir.

Bununla birlikte, her etkinlik günü sonunda yapılan anne-çocuk sohbetlerinin kodlama şemaları Fivush (1993) ve Fivush ve Vasudeva'nın (2002) orijinal çalışmalarından uyarlanmıştır. Kompostlama öğrenme etkinliklerini ile ilgili yapılan anne-çocuk konuşmaları sırasında annelerin ve çocukların söylemleri ayrı ayrı olarak kodlanmış; katılımcıların sohbet sırasında sordukları detaylandırıcı sorular (açık uçlu soruları), evet/hayır soruları ve sundukları bağlamsal ifadeler, değerlendirmeler ile tekrar olarak sordukları detaylandırıcı (açık uçlu sorular) sorular, evet/hayır soru tekrarları ve bağlamsal ifade tekrarları kodlanmıştır. Konuşma sırasında sunulan toplam detaylandırmalar; açık uçlu sorular, evet/hayır soruları, sunulan bağlamsal ifadeler ve yapılan değerlendirmelerin toplamı olarak ele alınırken; toplam tekrarlar ise annelerin ve çocukların sordukları açık uçlu soruların, evet hayır sorularının ve sundukları bağlamsal ifadelerin toplam tekrar sayısı olarak hesaplanmıştır. Birbirinden bağımsız araştırmacılar tarafından yapılan kodlamalar neticesinde annelerin söylemleri için yapılan kodlamalarda açık uçlu sorular için 92., evet / hayır soruları için 92., bağlam ifadeleri için 90., olumlu değerlendirmeler için 97., ve olumsuz değerlendirmeler için 98. oranında anlaşma sağlanmıştır. Çocukların sohbet sırasındaki söylemlerinin kodlama sürecinde ise 92. açık uçlu sorular için, 94. evet / hayır soruları için, bağlam ifadeleri için 90., olumlu değerlendirmeler için 98. ve. olumsuz değerlendirmeler için 98. oranında anlaşma sağlanmıştır.

3. Bulgular

Bu araştırmanın amaçlarından biri, katılımcı çocukların kompostlama öğrenme etkinliklerine katılmadan önce ve sonra organik atıkların geri dönüşümü hakkında bilgilerini ortaya koymaktır. Bu amaçla, beş günlük öğrenme etkinliklerinden önce ve sonra yapılan yarı yapılandırılmış görüşme soruları çocukların değişen bilgilerini ve öğrenme etkinlikleri sonrasında organik atıkların geri dönüşüm sürecini sürdürülebilirlik perspektifinde nasıl kavramsallaştırdıklarını anlamak adına yardımcı olmuştur.

Katılımcı çocuklar ile yürütülen ön, son ve takip görüşmelerinden elde edilen bulgulara göre kompostlama öğrenme etkinliklerine katılmadan önce atık ve çöp kavramları çocuk katılımcıların çoğunluğu (n=19) tarafından eşanlamlı olarak belirtilmiştir. Bununla birlikte çocuklara geri dönüşüm ile ilgili bildikleri sorulduğunda geri dönüşümü atık ve çöple ilişkilendirmişlerdir. Buna göre geri dönüşüm çocukların çoğunluğu tarafından bir şeyi 'yeniden kullanmak' ve 'yeniden değerlendirmek' olarak tanımlanmıştır. Bu çerçevede, plastik (n=17), cam (n=16), metal (n=9) , kâğıt (n=21) ve piller (n=2) geri dönüştürülebilir olarak tanımlanan atıklar olarak örneklendirilirken, mutfak artıkları günlük yaşamlarında çöp kutusuna gönderilen çöpler olarak kategorize edilmiştir. Öte yandan, çocukların son ve takip bulgularında öğrenme etkinliklerine katılan tüm çocukların en az bir organik atığı geri

dönüştürülebilir bir madde olarak belirttiklerini göstermiştir. Öyle ki, ön görüşmelerde katılımcı çocukların çoğunluğu kâğıt, plastik, cam, metal ve pili geri dönüştürülebilir maddeler olarak tanımlamış, ancak son ve takip görüşmelerinde çocuklar organik atıkların da geri dönüştürülebilir olduğunu vurgulamış ve elma artıkları ($n=8$), muz kabukları ($n=11$), kuru yapraklar ($n=8$), karpuz kabukları ($n=5$), ıspanak artıkları ($n=4$), ağaç kabuklarını ($n=3$) geri dönüştürülebilir organik atıklar olarak örnek vermiştir.

Çocukların son ve takip görüşmelerinde öne çıkan bulgulardan biri, katılımcıların çoğunluğunun ($n=14$) organik atıkların günlük yaşamlarının bir parçası olduğunu ifade etmeleridir. Buna göre, organik atıklar ev ve okul mutfakları gibi birçok olduğu için, kompostlamayı keşfetmenin organik atıkları yönetmek için kritik ve günlük yaşamla ilgili bir uygulama olduğunu belirtmişlerdir. Ön görüşmelerde organik atıkların ne olduğunu ve mutfak artıkları ile park ve bahçe atıklarının nasıl geri dönüştürülebileceği konusunda bilgisi olmayan katılımcı çocukların, son ve takip görüşmelerinde organik atıkların geri dönüşümünün günlük yaşam pratiği olduğu ve bunu sadece mutfak balkonlarında veya apartman dairelerinin bahçesinde yapabilecekleri konusunda hemfikir oldukları gözlemlenmiştir. Öyle ki, son ve takip görüşmelerinde çocuklar organik atıkların sağlıklı bir şekilde geri dönüşümünün yapılması için gerekli olan kompost yığınının malzemelere ve atıkları detaylandırmışlardır. Çocukların büyük bir kısmı biyolojik olarak bozulabilen atıkların kompost yığını için uygunluğunu belirtirken süt ve süt ürünleri, et ve et ürünleri, plastik, cam ve metaller gibi biyolojik olarak parçalanamayan malzemeleri kompost yığınının dahil edilemeyen malzemeler olarak tanımlamıştır.

Çocuklarla yapılan yarı yapılandırılmış görüşmelerinin analizi çocukların solucanların fiziksel özellikleri hakkındaki değişen bilgilerini de ortaya çıkarmıştır. Buna göre, ön görüşmelerde katılımcı çocuklar ($n=12$) solucanları toprak altında yaşayan koyu kahverengi canlılar olarak tasvir ederken son ve takip görüşmelerinde katılımcı çocuklar ($n=20$) yeryüzü solucanlarına ilişkin betimlemeleri detaylandırılmış ve solucanların gözleri, kulakları ve burunları olmadığını, ancak vücutlarında bir ağzı ve halkaları olduğunu ifade etmişlerdir. En önemlisi, kompostlama öğrenme etkinliklerine katılan çocukların birçoğu, solucanların kompost döngüsündeki kritik rolünü vurgulamıştır. Çocuklar yeryüzü solucanlarını organik atıkları yiyebilen ve onları gübre haline getirerek yeryüzü döngülerinden birinde önemli bir role sahip olan çalışkan canlılar olarak belirtmişlerdir.

Mevcut çalışma kapsamında geliştirilen ve kullanılan *Kompostlama Öğrenme Etkinliklerine Yönelik Öğrenme Çıktıları Rubriğinin* temel amaçlarından biri çocuklarla gerçekleştirilen ön, son ve takip görüşmeleri arasında çocukların bilgileri arasındaki farkı niceliksel olarak ortaya çıkarmaktır. Ön ve son değerlendirmelerden, ön ve takip değerlendirmelerinden ve son ve

takip deęerlendirmelerinden elde edilen puanlardaki farkın istatistiksel önemini test etmek için bağımlı örneklem t-testi uygulanmıştır. Yapılan analize göre, rubrik puanlamalarında çocukların ön görüşme analizlerinden elde edilen puandan ($M=5,22$, $SD=2,56$) son görüşmelerden elde edilen puanlara ($M=19,13$, $SD=2,56$) istatistiksel olarak anlamlı bir artış olmuştur, $t(22)=39,17$, $p<.001$. Ayrıca, ön test puanları ($M=5,22$, $SD=2,56$) ve takip görüşmelerinden elde edilen puanlar ($M=17,48$, $SD=2,39$) karşılaştırıldığında istatistiksel olarak anlamlı bir artış olduğu bir kez daha dikkat çekmektedir, $t(22)=37,38$, $p<.001$. Bununla birlikte, son test ($M=19,13$, $SD=2,56$) ve takip görüşmelerinden elde edilen puanlar ($M=17,48$, $SD=2,39$) arasında anlamlı bir fark bulunamamıştır, $t(22)=2,12$, $p=.06$.

Bu çalışmanın araştırma hedeflerinden biri, çocuklarıyla birlikte kompostlama öğrenme faaliyetlerine katılan annelerin, öğrenme faaliyetlerinden önce ve sonra organik atıklar ve organik atıkların geri dönüşüm süreci hakkında deęişen bilgilerini ortaya çıkarmaktır. Bu bağlamda, katılımcı annelerle yapılan ön ve son görüşmeler, annelerin atık ve atık yönetimi hakkında halihazırda bildiklerini ve öğrenme etkinliklerine katıldıktan sonra deęişen bilgilerini ortaya çıkarmak açısından faydalı olmuştur. Öğrenme etkinliklerine katılmadan önce, katılımcı anneler atık ve çöpü iki farklı şey olarak tanımlamıştır. Annelerin birçoęu için atık geri dönüştürülebilir maddeler iken, çöp "işe yaramaz" şeyler olarak bahsedilmiştir. Bu noktada, katılımcı anneler kâğıt, plastik, cam ve metalin yanı sıra mutfak artıkları gibi çeşitli geri dönüştürülebilir maddeleri listelemiş ve ön görüşmelerde bunları çöp olarak tanımlamıştır.

Öte yandan son görüşmelerde, katılımcı anneler mutfak artıklarının çöp olmadığını beyan etmişlerdir. Mutfak ve bahçe atıklarını organik atık olarak sınıflandırmış ve kompostlama uygulaması ile basitçe geri dönüştürülebilir olduğunu belirtmişlerdir. Ön görüşmelerin aksine, katılımcı anneler son görüşmelerde artık organik atığın tanımını yapabilmış ve örnekler vermişlerdir. Kâğıt, plastik, cam ve metalin yanı sıra anneler; marul yaprakları, elma artıkları, karpuz kabukları, muz kabukları, kuru yapraklar, kahve ve çay posası ve kâğıdı kompostlama yoluyla geri dönüştürülebilecek biyolojik olarak parçalanabilir malzemeler olarak detaylandırmıştır.

Atık yönetimi uygulamaları ile ilgili olarak, katılımcı anneler ön görüşmelerde belediyelerin evsel atık yönetimini desteklemekten sorumlu olması gerektięi konusunda hemfikir olmuştur ($n=16$). Alan yetersizlięi, yeterli bilgi eksiklięi ve zaman sorunları etkili evsel atık yönetiminin önündeki engeller olarak tanımlandığından, annelerin birçoęu belediyelerin atık yönetimi görevlerinde toplumu teşvik etmesi gerektięini öne sürmüştür. Aksine, öğrenme faaliyetleri aracılığıyla kompostlamayı keşfettikten sonra, katılımcı anneler arasında bunun bireylerin sorumluluęu olması gerektięi yönünde bir fikir oluşmuştur ($n=17$). Organik atıkların geri

dönüşümünü kavramsallaştırdıktan sonra anneler, her bireyin ev kompostlama sisteminden sorumlu olabileceğini öne sürmüştür. Çocukların tasvirlerinde olduğu gibi, katılımcı anneler de kompostlamanın bireylerin günlük yaşamlarında basitçe yapabilecekleri, uygulanabilir, uygun ve sürdürülebilir bir uygulama olduğunu belirtmiştir ($n=16$). Anneler, organik atıkların günlük yaşamla ilgili olduğunu ve bu nedenle kompostlamanın ev ortamında kolayca gerçekleştirilebilecek uygulanabilir ve uygun bir strateji olduğunu vurgulamışlardır ($n=19$). Katılımcı annelerin çoğunluğunun atık üretimini hane üyelerinin tüketim alışkanlıklarıyla ilişkilendirmesi de son görüşmelerde öne çıkan bulgulardan bir tanesidir. Buna ek olarak anneler, kompostu çocuklarıyla birlikte keşfetmenin kendileri için ilham verici olduğunu belirtmiştir. Öğrenme etkinlikleri sırasında ve sonrasında çocuklar tarafından sunulan sorular, yapılan yorumlar ve konuşmalar anneler tarafından cesaretlendirici olarak nitelendirilmiştir. Bu durum göz önünde bulundurulduğunda, katılımcı anneler, erken çocukluk yıllarının küçük çocukların sürdürülebilirlik için öğrenme sürecine dahil edilmesi için uygun bir dönem olarak değerlendirilmesi gerektiğini vurgulamıştır.

Anneleri konuşma stilleri açısından daha çok ya da daha az detaylandıran anneler olarak sınıflandırmak için özellikle annelerin açık uçlu soruları evet/hayır soruları, kullandıkları bağlam ifadeleri ve değerlendirmeler yardımcı olmuştur. Kompostlama öğrenme etkinliklerine katılmadan hemen önce yapılan bir ön çalışma ile katılımcı anneler konuşma stilleri göz önünde bulundurularak yukarıda bahsi geçen değişkenler göz önünde bulundurularak daha fazla detaycı ve daha az detaycı anneler olarak katılımcılar iki gruba ayrılmıştır. Ön çalışma kapsamında, anne-çocuk ikililerinin çalışma sürecine dahil olmadan hemen önce ortak geçmişte paylaştıkları bir olay ile yaptıkları sohbetlerin analizi neticesinde elde ettikleri puanın en alt %50'sinde yer alan anneler daha az detaylandırıcı konuşma stiline sahip olan anneler olarak kabul edilirken, en üst %50'de yer alan anneler konuşmalarında yüksek detaylandırıcı konuşma stiline sahip anneler olarak kabul edilmiştir. Katılımcı annelerden ($N=23$) toplam 12'sinin konuşmalarında daha fazla açık uçlu ve evet/hayır soruları, bağlam ifadeleri ve değerlendirmeler ($M=123.58$, $R=173-94$) kullandığı tespit edilmiştir. Bu 12 anne daha çok detaylandırıcı konuşma stiline sahip anne grubuna atanırken, açık uçlu ve evet/hayır soruları, bağlam ifadeleri ve değerlendirmeleri kullanımında ortalamanın altında kalan diğer anneler ($n=11$) daha az detaylandırıcı anneler olarak sınıflandırılmıştır ($M=74.18$, $R=90-38$).

Bu araştırmanın ana hedeflerinden biri, annelerin detaylandırıcı konuşma stili ile çocukların son ve takip görüşmelerinde öğrenme etkinliklerine ilişkin detaylar arasındaki pozitif ilişkileri belirlemek olduğundan, annelerin ve çocukların değişkenleri arasındaki ilişkileri ortaya çıkarmak için iki değişkenli korelasyon analizi yapılmıştır. Ayrıca, çocukların öğrenme etkinlikleriyle ilgili anne-çocuk sohbetlerindeki sundukları detaylandırmalar ve çocukların son

ve takip görüşmelerindeki değişkenleri bu çalışmanın bağımlı değişkenleridir. Bu bağlamda, bir alt bileşen değişkeni olarak annelerin her etkinlik günün sonunda çocuklarıyla yaptıkları sohbetler sırasında sordukları açık uçlu sorular alan yazında var olan çalışmalarda olduğu gibi annelerin detaylandırıcı konuşma stilinin potansiyelini ortaya çıkarmak için korelasyon analizine dahil edilmiştir (Camilleri ve ark, 2021; Leichtman ve ark., 2000). Yapılan analizlere göre, anne-çocuk sohbetleri sırasında çocukların değişkenlerinde çoklu pozitif ilişkiler ortaya çıkmıştır. Öyle ki, annelerin konuşmalar sırasındaki sorduğu açık uçlu sorular, çocukların sorduğu açık uçlu sorular ($r=.49, p<.01$), çocukların toplam detaylandırmaları ($r=.68, p<.05$) ve çocukların kullandığı toplam kelime sayısı ($r=.49, p<.01$) ile yüksek düzeyde ilişkili olduğu bulunmuştur. Bunun yanında, annelerin toplam detaylandırmaları, çocukların sorduğu açık uçlu sorular ($r=.54, p<.05$) ve çocukların yaptığı toplam detaylandırmalar ($r=.82, p<.05$) ile anlamlı şekilde ilişkilidir. Benzer şekilde, annelerin tüm anne-çocuk ortak konuşmalarındaki kullandığı kelimelerin toplamı, çocukların yaptığı tüm detaylandırmalar ($r=.77, p<.05$) ve çocukların kullandığı toplam kelime sayısı ($r=.60, p<.05$) için yüksek düzeyde yordayıcıdır.

Ayrıca, bu çalışmanın bir diğer odak noktası, katılımcı annelerin sahip olduğu konuşma stilinin, çocukların kompostlama öğrenme faaliyetlerine ilişkin bellekleri ve öğrenme çıktıları ile nasıl bir şekilde ilişkili olduğunu ortaya çıkarmaktır. Annelerin konuşma değişkenleri incelendiğinde, annenin detaylandırmalarının çocukların son ve takip görüşmelerinde sundukları betimlemeler ($r=.78, p<.05$), nesneleri doğru hatırlamaları ($r=.78, p<.05$), eylemleri doğru hatırlamaları ($r=.69, p<.05$), çocukların sundukları zaman ifadeleri ($r=.57, p<.05$) ve son görüşmelerde öğrenme etkinlikleriyle ilgili doğru detaylar vermeleri ($r=.78, p<.05$) ile pozitif ilişkili olduğu görülmüştür. Ayrıca, annenin detaylandırmaları, takip görüşmelerinde çocukların tanımlamaları ($r=.59, p<.05$), nesneleri doğru hatırlamaları ($r=.5, p<.05$) ve öğrenme etkinlikleriyle ilgili doğru detaylar vermeleri ($r=.57, p<.05$) ile pozitif yönde ilişkilidir. Ek olarak, annelerin ortak konuşmalarda kullandıkları toplam kelimeler, son görüşmelerde ($r=.73, p<.05$) ve takip görüşmelerinde ($r=.58, p<.05$) çocukların toplam kelimelerini yordamaktadır. Annelerin kendilerine özgü konuşma tarzlarıyla ilgili olarak ise daha yüksek düzeyde detaylandırmaya sahip anneler çocuklarını daha fazla açık uçlu ve evet/hayır sorusuyla teşvik etmiş, daha fazla bağlam ifadesi sunmuş ve daha fazla değerlendirme kullanmıştır. Ayrıca, konuşmalarını daha fazla detaylandıran annelerin ($M=1689.75, SD=510.03$) daha az detaylandıran annelere ($M=937.09; SD=569.24$) kıyasla önemli ölçüde daha fazla kelime kullandığını göstermiştir. Bağımsız örneklem t-testi analizi, daha çok ve daha az detaylandıran annelerin genel detaylandırmalarını istatistiksel olarak karşılaştırmak için yardımcı olmuştur. Bu bağlamda, sohbetlerinde daha çok detaylandıran stile sahip anneler, daha az detaycı anneler ($M=302.91, SD=188.02$) ile genel

detaylandırma kullanımı ($M=518.92$, $SD=179.68$) açısından yapılan karşılaştırmada istatistiksel olarak anlamlı bir fark bulunmuştur; $t(21)=2.82$, $p=.01$.

4. Tartışma

Çalışma kapsamında katılımcı çocuklardan ve annelerden elde edilen bulgularla dikkat çekici olan organik atıkların geri dönüşüm sürecini günlük yaşamlarında kendi başlarına başlatabilecekleri ve sürdürebilecekleri kolay ve uygulanabilir bir uygulama olduğunu beyan etmeleri olmuştur. Buna göre, mutfak balkonları ve apartman bahçeleri, kendi kompost kutularını oluşturabilecekleri ve gübre olarak da bilinen solucan dışkısını elde etmek için solucanları yeşil ve kahverengi organik maddelerle besleyebilecekleri uygun yerler olarak belirtilmiştir. Ön, son ve takip görüşmelerinin içerik analizinde ortaya çıkan bulgularla tutarlı olarak, öğrenme çıktıları rubriği kullanılarak yapılan değerlendirme ve analiz sonuçları da kompostlamayı sürdürülebilir bir uygulama olarak kavramsallaştırma açısından çocukların ön, son ve takip değerlendirmeleri arasında istatistiksel olarak anlamlı bir fark olduğuna işaret etmiştir.

Bununla birlikte, katılımcı çocuklar ve anneler günlük yaşamlarında ev ve okul ortamlarında ortaya çıkan geri dönüştürülebilir organik atık miktarı ile ilgili farkındalıkları artmıştır. Anne-çocuk çiftlerinin evden organik atık getirdikleri öğrenme etkinliği bu farkındalığın merkezinde yer alıyor olabilir, nitekim hem çocuklar hem de anneler evlerinin mutfağından çıkan organik atık miktarına nasıl şaşırdıklarını dile getirmişlerdir. Öyle ki, görüşmeler sonrasında annelerin günlük tüketim alışkanlıklarına ve bunların doğal çevre üzerindeki etkilerine eleştirel bir gözle bakmaya başlamaları ve hatta çocukların iş birliğiyle ev ortamında daha çevresel ve daha sürdürülebilir yaşam tarzları sağlamak üzere alışkanlıklar edinmek için nasıl bir değişim yaratılabileceğini sorgulamaya başlamaları olmuştur. Annelerin anlayışındaki bu tür bir değişim, "sürdürülebilir bir birey olma" ile "günlük rutinler" arasında bir bağlantı olduğunu ortaya koymuştur. Mevcut çalışmada ortaya çıkan sürdürülebilirliğin kişilerin günlük yaşam tarzları ile olan ilişkisi, McCrea ve Littledyke'nin (2015) çalışmasıyla da örtüşmekte ve çocukların sürdürülebilirlik için öğrenmeye etkin katılımının bir ön koşulu olarak ilgili alan yazında bulunan önceki bulgularla (Cutter-Mackenzie & Edwards, 2006; Vare & Scott, 2007; Edwards vd., 2016; Ginsburg & Audley, 2020) tutarlılık göstermektedir. Öyle ki, sürdürülebilirlik ile ilgili olarak, günlük rutinlerde öğretmenler, akranlar ve ailelerle kurulan doğrudan etkileşimler, çocukların sürdürülebilir yaşam tarzları hakkında bilgi edinmelerini teşvik etmek için büyük bir potansiyele sahiptir. Bu durum, çocukların sürdürülebilirlikle ilgili konulara hemen dahil olmalarının, günlük rutinler ve sürdürülebilir modeller arasında bağlantı kurarak kavramları anlamalarına yardımcı olduğu yönündeki önceki bulguları (Malone ve

Hartung, 2009; Elliott, 2012; Percy-Smith ve Burns, 2013; Ärlemalm-Hagsér, 2014; Hill vd., 2014) doğrulamaktadır.

Organik atıkların geri dönüşümünün günlük yaşamda yapılabilecek kolay ve sürdürülebilir bir uygulama olduğu gerçeği, katılımcı çocukların ve annelerin son görüşmelerde hemfikir olduğu bir nokta olmuştur. Buna göre, katılımcı çocuklar evde kompost yapımına katkıda bulunabileceklerinin farkına varmış ve öğrendikleri bu bilgiyi başkalarıyla paylaşarak bu sürdürülebilir uygulamayı yaygınlaştırmanın yüksek hacimli atık üretimini önlemek, çöp sahalarını azaltmak ve hatta solucan, salyangoz, böcekler ve bitkiler gibi canlıların iyi olma hali için gerekliliğini vurgulamışlardır. Çocukların bu görüşü, annelerin görüşme sonrası verdikleri yanıtlarla da paralellik göstermektedir. Organik atıkların geri dönüştürülmesinin günlük yaşam ile olan bağlantısı, annelerin organik atıkların gündelik yaşamlarının ayrılmaz ve ilişkisel bir parçası olduğunu fark ettiklerine dair verdiği yanıtlarında da görülmektedir. Buna göre, evde kompost yapımı, meyve ve sebze artıklarını çöp olarak düzenli depolama alanlarına göndermek yerine, doğal malzemeleri parçalayıp gübreye dönüşmelerini sağlayarak doğayı taklit edebilecekleri uygulanabilir ve uygun bir atık yönetimi uygulamasıdır.

Sürdürülebilirliğin çoklu boyutlarıyla ilgili olarak, öğrenme etkinlikleri sonrası yapılandırılmış görüşmelerden elde edilen bulgular katılımcıların sürdürülebilirliği çevresel, ekonomik ve sosyal boyutlar doğrultusunda nasıl kavramsallaştırdıklarını ortaya koymuştur. Öğrenme faaliyetlerine katılmadan önce çocuklar sürdürülebilirliğin sadece çevresel boyutundan bahsederken, öğrenme etkinliklerine katıldıktan ve kompostlamayı keşfettikten sonra çocuklar kompostlama yapmanın değerini çeşitli bakış açıları sunarak belirtmiştir. Buna göre, çocuklar organik atıkların geri dönüşümünü sadece çevrenin iyi olma hali ile ilişkilendirmemiş, aynı zamanda daha az enerji kullanımını da sağlaması ile bağlantı kurarak ekonomik boyuta da değinmişlerdir. Aynı şekilde, son görüşmelerde katılımcı çocuklar organik maddelerin geri dönüştürülmesinin doğal kaynakların korunmasına katkıda bulunan sürdürülebilir bir uygulama olarak tanımlamışlardır. Bu bulgular, Davis (2009) ve Prince (2010) tarafından yapılan ve öğrenme deneyimleri sağlamanın, çocukların sürdürülebilirliği farklı perspektiflerden kavramsallaştırmalarına yardımcı olma konusunda büyük yararları olduğu yönündeki çalışmalarla tutarlıdır. Bu durum, kaynak kullanımı, doğal çevreye özen gösterme, geri dönüşümün değerini bilme ve uygulama gibi sürdürülebilirlikle ilgili konuları keşfetmenin ve anlamının küçük çocuklar için aslında karmaşık konular olmadığının açık bir kanıtı olabilir.

Bununla birlikte, kompostlama öğrenme etkinliklerine katıldıktan sonra hem çocuk hem de anneler organik atıkların geri dönüşüm sürecini sosyal sürdürülebilirlik ile de ilişkilendirmiştir. Öğrenme etkinliklerinin son gününde artık birer *Kompost Yıldızı* olmak hem

çocuklar hem de anneler için etkin katılımlarının takdir edildiği göze çarpan faaliyetlerden birisi olarak belirtilmiştir. Katılımcılara *Kompost Yıldızı* olmakla ilgili duygu ve düşünceleri sorulduğunda, katılımcıların çoğunluğu Kompost Yıldızı olarak kompostlama hakkında öğrendiklerini başkalarıyla paylaşmaya hevesli olduklarını belirtmiştir. Daha da önemlisi, kompostlamanın ne olduğunu ve yakın çevrelerinde bunu nasıl yapabileceklerini paylaşma konusunda kendilerini sorumlu hissettiklerini ve bunu yaygın olarak paylaşılan bir uygulamaya dönüştürebileceklerini belirtmişlerdir ki bu da birçok çalışmada bulunan bulgularla uyumludur (Davis, 2005; Ärlemalm-Hagsér, 2014; Hill ve diğerleri, 2014; Ji ve Stuhckme, 2014). Öyle ki, kendi organik atıklarını toplayıp geri dönüştürerek doğal çevreye özen gösterme ve katkıda bulunma fikri, kompostlamanın bireylerin ortak değerler için bir araya geldiği sürdürülebilir bir topluluğu teşvik eden bir strateji olarak kullanabileceğini göstermiştir. Katılımcı anneler kompostlamanın mahalle ya da site sakinlerinin bir araya gelerek organik atık toplamak, bahçelerine bakmak, solucanları beslemek, kompost yığını sulamak ve tohum, meyve ve sebzeleri depolayıp paylaşmak için iş birliği yapabilecekleri ortak bir faaliyet olduğunu belirtmişlerdir. Reinertsen'in (2016) belirttiği gibi, doğayla gerçek bağlantı başkalarıyla ortaklıktan kaynaklanır. Eylemlilik başkalarını etkileme kapasitesiyle ilgili olduğundan, ilişkiler ve etkileşimler üzerine inşa edilmelidir. Eylemlilik bir etkileşim meselesidir; bir canlandırmadır (Bennett, 2010; Cielemecka & Daigle, 2019).

Mevcut çalışma okul öncesi dönem çocuklarını ve annelerini okul ortamında bir araya getirerek sürdürülebilir bir uygulamanın birlikte nasıl ele alındığını ve kavramsallaştırıldığını göstermeyi amaçlamıştır. Hiç şüphesiz, anneler daha deneyimli ve yaşça büyük bireyler olarak çocuklarının öğrenme sürecini teşvik etmekte ve kompostu sürdürülebilir bir üretim stratejisi olarak anlamaları için onlara yol göstermektedir. Ancak aynı zamanda, çalışma sürecinde çocukların ilgisi, öğrenmeye karşı duyduğu heves, anneleri ile ortak bir etkinliğe dahil olmaları ve geliştirdikleri etkileşim annelerin de öğrenme sürecini kolaylaştırdığı birçok katılımcı annenin son görüşmelerde vurguladığı bir diğer noktadır. Öyle ki, anneler okul öncesi çocuklarıyla etkinliklere katılmanın ne kadar şaşırtıcı olduğunu özellikle vurgulamış ve çocukların merak ve coşkusunun kendileri için ilham verici olduğunu, dolayısıyla organik atıkları geri dönüşüm sürecini keşfetmenin çocukların katkılarından da faydalandıkları çift yönlü bir öğrenme sürecine dönüştüğünden bahsetmişlerdir. Bu bakış açısı, ilgili alan yazında yer alan ve nesiller arası öğrenmeye odaklanan birden fazla çalışma ile örtüşmektedir (Ballantyne vd., 1998; Payne, 2005; Larsson vd, 2010; Istead ve Shapiro, 2014; Meeusen, 2014; Spiteri, 2020). Çevre eğitimi programlarının ana hedefi olarak çocuklar görülse de, nesiller arası öğrenmeye odaklanan araştırmalar, küçük çocukların ve gençlerin çevresel bilgi,

tutum ve davranışların aktarılmasında ebeveynlerini etkin bir şekilde destekleyebileceğini ortaya koymaktadır (Fluury ve Burns, 2005; Lawson vd., 2018; Liden vd., 2021).

Nesiller arası öğrenmeyi ele alma çabası göz önünde bulundurulduğunda, anneleri diyaloglar ve öğrenme etkinliklerine ilişkin sohbetler yoluyla çocukların öğrenme döngüsüne dahil etmek, bu çalışma için kritik bir adım olarak kabul edilebilir. Özellikle anneler mevcut çalışmada çocuklardan daha üstün ya da daha güçlü figürler olarak yer almamıştır. Aksine, çocukların öğrenme döngüsüne bağlı, yansıtıcı, duyarlı ve destekleyici bireyler olarak tüm süreci çocukları ile birlikte deneyimlemişlerdir. Nitekim her günün sonunda anne ve çocuk arasında gerçekleşen konuşmalar, annelerin sordukları soruların hem çocukların hem de annelerin öğrenmelerine nasıl rehberlik ettiğini göstermiştir. İlk olarak, anneler çocuklarının okul ortamında hayata geçirilen öğrenme pratiğinin bir parçasında yer almıştır. İkinci olarak, anne-çocuk ikilisi, sürdürülebilirlikle ilişkili olarak organik atıkların geri dönüşümünü günlük bir uygulama olarak keşfetmeye katılma hakkına sahip eşit derecede yetkin bireyler olarak kabul görmüştür. Üçüncü ve daha da önemlisi, anne-çocuk ikilisinin her iki taraf için de yeni bir konu olan kompostlama hakkında bilgi edindiği demokratik bir temelde çocukların görüşlerine değer verilmiş ve saygı duyulmuştur. Ortak sohbetler, katılımcıların düşünmesinde, sorgulamasında ve halihazırda araştırdıkları konular üzerinde derinlemesine düşünmesinde kilit bir rol oynamıştır.

Bu çalışmadan elde edilen bulguların dikkat çekici yönlerinden biri, katılımcıların genişleyen bilgilerinin sürdürülebilirlik kavramını yeniden düşünme anlayışını tetikleyebileceğidir. Örneğin, katılımcı anneler sürdürülebilir uygulamaları zaman alıcı ve büyük çaba ve eylem gerektiren uygulamalar olarak algılamak yerine, 'sürdürülebilir olmanın' aslında bireye bağlı olduğunu belirtmişlerdir. Bu bağlamda, öğrenme deneyimlerine katılmak, her bireyin kendi eylemlerinden sorumlu olduğuna dair alternatif bir bakış açısı sunabilir. Katılımcı annelerin başlangıçta vurguladığı gibi, atık yönetimini desteklemek ve organize etmek belediyelerin sorumluluğunda iken öğrenme faaliyetlerine katıldıktan sonra, atık üretimi ve atık yönetiminin birbiriyle bağlantılı iki konu olması nedeniyle bunun bireylerin sorumluluğu olduğunu beyan etmişlerdir. Bu bulgunun önemi, annelerin yaşam tarzlarını sorumlu tüketim bağlamında nasıl değerlendirdiklerinden kaynaklanmaktadır. Daha çevre dostu ve çevreye daha duyarlı ürünler seçerek tüketim alışkanlıklarını yeniden düşünmeleri gerektiğini fark etmişlerdir. Bu bağlamda katılımcılar, üretilen atık miktarının azaltılmasının sorumlu tüketim ve üretimi desteklemek için bir başka çözüm olabileceğini vurgulamıştır. Annelerin bu bakış açısının kaynağı, kompostlama öğrenme etkinlikleri sırasında edindikleri bilgilerle evlerindeki atık miktarı hakkında geliştirdikleri farkındalık olabilir. Bu farkındalıkla, daha az tüketmenin sürdürülebilir yaşamı desteklemede daha etkin bir çözüm olabileceği fikrini geliştirmiş

olabilirler. Bu bulgu, sürdürülebilirlikle ilgili müdahalelerde bulunmanın potansiyel olarak aile tüketim kalıplarında bir değişikliğe hizmet edebileceğine dair birçok çalışma (Samuelsson ve Kaga, 2008; Daries vd., 2009; Pratt, 2010) tarafından da doğrulanmaktadır. Çocukların geri dönüşümü öğrenmesi ve evdeki tüketim ve üretim uygulamalarına katılmasına ilişkin elde edilen bulgular, Grodzínska-Jurczak ve arkadaşları (2003) ile Maddox ve arkadaşları (2011) tarafından yapılan ve çocukların ilgili bilgileri ev ortamına aktararak evsel atık yönetimi stratejilerine ilişkin kararları etkileme potansiyeline sahip olduğunu doğrulayan çalışmalarda açıkça görülmektedir.

Bu çalışmanın bulguları, annelerin konuşma değişkenlerinin, çocukların her etkinlik gününün sonunda yapılan anne-çocuk ortak sohbetlerine katkılarıyla ilişkili olduğunu göstermiştir. Anneler tarafından sorulan açık uçlu sorular, çocukları her günkü öğrenme etkinliği ilgili deneyimledikleri ve keşfettikleri şeyleri yansıtmak ve sohbet sürecine katkı sunması adına teşvik etmiş olabilir. Bu doğrultuda, katılımcı anneler tarafından sunulan açık uçlu sorular, çocuklar için öğrenme etkinliklerinin "ne, nerede, neden ve nasıl" yönleri üzerinde düşünmelerine yardımcı olmuştur.

Çocukların katılımını destekleme açısından, açık uçlu sorular, ebeveynlerin ve çocukların ortaklaşa deneyimlediği geçmiş faaliyetlere ilişkin ayrıntılı konuşmaların temel ilkesi olarak kabul edilmiştir (Wang, 2001, 2007; Boland ve ark., 2003; Wareham ve Salmon, 2006; Hedrick ve ark., 2009; Benjamin ve ark., 2010; Leicthman ve ark., 2017). Bu araştırmanın bulguları, annelerin açık uçlu soruları kullanımı ile çocukların yapılan sohbeti detaylandırmaları arasında güçlü bir ilişki olduğunu göstermiştir. Bu bağlamda, bir dizi öğrenme deneyimi aracılığıyla kompostlamayı keşfetmek, çocukların anlayışını şekillendirmek ve çocukların dikkatini ilgili ve ilişkili nesnelere, yerlere, materyallere, oyunlara, ifadelere, eylemlere, insanlara yönlendirmek için annelerin detaylandırıcı konuşma stilinin etkili olduğu söylenebilir. Öğrenme deneyimlerinin göze çarpan ve ilginç yönlerine odaklanarak yapılan sohbetler, çocukların organik atıkların geri dönüşümü hakkında öğrenilenleri hatırlamaları için bir ipucuna dönüştürmüş ve çocukların gelecekte daha erişilebilir olabilecek kendi bilgilerini inşa etmelerine yardımcı olmuş olabilir (Farrant ve Reese, 2000; Celeveland ve Reese, 2005; Haden ve ark., 2009). Buna göre, Farrant ve Reese (2000) annelerin açık uçlu sorularını kullanma sıklığının çocukların ortak geçmişe yönelik hatırladıkları ile olumlu yönde bağlantılı olduğunu doğrulamıştır.

Öyle ki, mevcut çalışma, annelerin sohbet sürecini detaylandırmaları ile çocukların öğrenme faaliyetlerinin tamamlanmasından üç hafta sonra kompostlama öğrenme etkinliklerine ilişkin hatırladıkları detay sayısı arasında güçlü bir pozitif korelasyonu işaret etmektedir. Yani, anneleri daha fazla açık uçlu soru soran ve bağlamsal ifadeler sunan çocuklar, son ve takip

görüşmelerinde açıklayıcı bir dil kullanmış ve nesneler, eylemler ve olayın zamanı hakkında daha doğru ayrıntılar bildirme eğiliminde olmuştur. Annelerin detaylandırmaları ile çocukların doğru detaylar içeren yanıtları arasındaki güçlü korelasyonun, öğrenme faaliyetlerinin uygulanmasından üç hafta sonra yapılan takip araştırmacı-çocuk görüşmelerinde de gözlemlenmeye devam etmesi dikkat çekicidir. Bu bağlamda, annelerin detaylandırmaları çocukların anlamalarına yardımcı olabilir ve sağlanan detaylar çocukların uzun süreli bellekte kodlanmış bilgilerini yeniden yapılandırmalarına ve uzun vadede yapılandırılmış bilgilerini geri getirmelerine yardımcı olmuş olabilir. Bu bulgu, bu çalışma *kompostlama öğrenme etkinliklerine yönelik öğrenme çıktıları rubriği* analizinden elde edilen sonuçlarda da görülmektedir.

5. Öneriler

Mevcut çalışma, katılımcı çocukların ve annelerin sürdürülebilir uygulamaları ve bunlardaki rollerini günlük yaşam aktiviteleri aracılığıyla nasıl keşfettiklerine dair önemli çıkarımlarda bulunulmasına yardımcı olabilir. Çalışmadan elde edilen son bulgular, sürdürülebilirliğin gündelik yaşam ile ilişkilendirilmesinin önemine ve gerekliliğine ışık tutmaktadır. Dolayısıyla, öğretmenler, aileler, program yapımcılar ve araştırmacılar için mevcut çalışmadan çıkarılacak bir öneri başka küçük çocukların çevresel ve sürdürülebilirlik ile ilgili meseleleri anlamlandırmalarına yardımcı olmak için günlük yaşam ile ilgili somut başlıkları gündeme getirmek olabilir.

Mevcut araştırma, ev ve okul ortamı arasındaki güçlü ilişkinin potansiyelini ortaya koyduğu için eğitimciler ve ebeveynler için yol gösterici niteliktedir. Ekolojik sistem teorisinin de vurguladığı gibi, çeşitli çevresel bağlamlar çocukların gelişiminde önemli bir rol oynamaktadır (Bronfenbrenner, 1986). Bu doğrultuda, ev-okul iş birliği; çocukların aile üyeleriyle birlikte yaparak ve yaşayarak öğrenmesi, ebeveynler tarafından bilgilendirilerek ve günlük rutinlerindeki gerçek ve somut deneyimler hakkında herkesle iletişim kurarak yaşadıkları çevreyi öğrenmeleri ve çevresel sistemlerini keşfetmeleri açısından önemli bir potansiyele sahiptir (Tali Tal, 2004; Siraj-Blatchford ve ark., 2010; Engdahl, 2015). Mevcut çalışmadan uygulamaya yönelik olarak sunulacak önerilerden bir tanesi aile üyeleri ile etkileşimde kalarak çocukların sürdürülebilirlik için öğrenme sürecini desteklemek olabilir. Bu noktada, ileriki çalışmalar için sunulacak bir öneri ebeveynlerin çocukların öğrenme sürecine etkin olarak katılmaları ve hatta sürdürülebilir uygulamaları birlikte deneyimleyerek ev içi tüketim alışkanlıklarına birlikte yön vermelerini desteklemek olabilir.

Ayrıca, bundan sonra yürütülecek çalışmalar nesiller arası öğrenmenin önemini ele alarak sürdürülebilirlik hakkında öğrenme ve eyleme geçme önemine odaklanabilir. Bu bağlamda,

sürdürülebilir uygulamalar hakkındaki kolektif farkındalıklarını potansiyel olarak torunlarına aktaran büyükanne ve büyükbabalar, daha sürdürülebilir düşünceye doğru bir değişimi nasıl yarattıklarını ortaya çıkarmak adına çalışma süreçlerine katılımcı olarak dahil edilebilir (Istead & Shapiro, 2014; Spiteri, 2020). Ballantyne ve arkadaşlarının (2001b) yürüttüğü çalışmada da çocuklar çevresel sürdürülebilirliği öğrenmede büyükanne ve büyükbabalarının etkisinin olduğunu belirtmişlerdir. Bu nedenle, gelecekteki araştırmalar nesiller arası öğrenmenin hangi bağlamlarda gerçekleştiğini ve büyükanne ve büyükbabaların, ebeveynlerin ve çocukların birlikte yaşadığı çok kuşaklı hanelerin çocukların sürdürülebilirliği öğrenmeleri üzerindeki etkisini anlamaya odaklanabilir.

Mevcut çalışma kapsamında, öğrenme etkinliklerinin hemen sonrasında yürütülen anne-çocuk konuşmaları çocukların sohbete etkin katılımları, öğrenme deneyimlerini tekrar gözden geçirmeleri ve bir sürdürülebilir uygulama olan kompostlamayı karşılıklı keşfetmek adına etkili olmuştur. Anne-çocuk sohbetleri üzerine yapılan önceki çalışmalar (Leicthman ve ark., 2000; Wang, 2001; Stone, 2015; Pagano ve ark., 2020; Camilleri, 2021) mevcut çalışmadan farklı amaçlara sahip olsa da, bu çalışma ile bir okul ortamında gerçekleşen sürdürülebilirlik temelli etkinlik uygulamalarının annelerin sunduğu açık uçlu sorular ve dayandırıcı betimlemeler ile nasıl destekleyeceğini göstermiştir. Bu nedenle, bu konuda yapılacak çalışmaların farklı yaş gruplarındaki çocuklarla yapılması önerilmektedir. Farklı yaş gruplarına ait okul öncesi dönem çocuklarıyla çalışmalar yürütülebileceği gibi, ilkökul ve ortaokul kademesinde yer alan öğrencilerin katıldığı sürdürülebilir kalkınma başlıkları ile ilgili yapılacak eğitimler, çalışmalar ve projeler sırasında ve sonrasında olacak şekilde anne-çocuk konuşmalarının etkisine bakılabilir.

Ayrıca, farklı ülke ve kültürlerde sürdürülebilirlik ile ilgili konular hakkında ebeveyn-çocuk sohbetlerinin içeriği ve annelerin konuşma çocukların kavramları ele alış üzerine etkisi araştırılabilir. Mevcut çalışma kapsamında ebeveyn-çocuk ikililerin öğrenme etkinliklerine birlikte katıldıktan sonra ortak geçmişlerine yönelik olarak yaptıkları sohbetleri ele almıştır. İleriki zamanlarda yürütülecek çalışmalar, öğrenme etkinlikleri sırasında ebeveyn-çocuk konuşmalarını inceleyebilir. Son olarak, bu çalışmada çocukların öğrenme etkinliklerine ilişkin çocukların ön ve takip çalışmalarında sunduğu bellek raporları iki ve 15 günlük ertelemeler verilerek ele alınmıştır. Bundan sonra yapılacak araştırmalarda öğrenme etkinliklerinin, programların ve projelerin etkililiğini ortaya çıkarmak için daha uzun verilen ertelemeler neticesinde çocukların bellek raporları ve hatırladıkları detaylar incelenebilir.

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TEZİN ADI / TITLE OF THE THESIS (İngilizce / English): Investigating Preschoolers' and Mothers' Self-reported Knowledge of Organic Waste Recycling and the Role of Mothers' Conversational Style on Children's Memory Reports

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