Journal of Turkish Science Education
http://www.tused.org
© ISSN: 1304-6020

Preschool children's mental models of the environment: A cross-level study

Ahmet Taşdere[1], Dilek Erol[2], Sabiha Eren[3]

[1]Uşak University, Türkiye, ORCID ID: 0000-0002-2615-8493

[2]Uşak University, Türkiye, Corresponding author, dilekerol@gmail.com, ORCID ID: 0000-0002-5565-586X

[3] Independent Researcher, Spain, ORCID ID: 0000-0002-2599-3913

ABSTRACT

This study, aiming to reveal preschool children's mental models of their environment, was carried out with the participation of 225 children aged 36–72 months attending 8 different preschool education institutions. It is based on qualitative research designed around a case study. The Word Association Test and Drawing were used as the data collection tools. In the study, it was observed that 36-48-month-old children mostly focused on the visuals they saw in the park (garden) and traffic in their environmental drawings, and in addition to these visuals, 49-60-month-old children included the forest in their environmental drawings, and 61-72-month-old children included home and school in their environmental drawings. The most prominent environments/elements observed with both data collection tools were the house, traffic, park, and sky for the 36–48-month-old children; house, traffic, park, sky, and rural-village for the 49–60-month-old children; and house, traffic, park, sky, rural-village, forest and nearby settlement (market, store, etc.) for the 61–72-month-old children. The common elements that children associate with the environment in their mental models are the concepts of house, traffic, park, and sky.

To cite this article: Taşdere, A., Erol, D., & Eren, S. (2024). Preschool children's mental models of the environment: A cross-level study. *Journal of Turkish Science Education, 21*(3), 512-532. DOI no: 10.36681/tused.2024.027

Introduction

Scientific literacy is the fundamental vision of contemporary science curricula and is among the main objectives that all individuals should acquire, regardless of their differences (MoNE, 2005; 2013; 2018). Specific skills and competencies have been defined to help learners at different levels of education achieve this goal. The efforts focus on developing these various competencies from primary education on. They include educational outcomes such as scientific process skills, scientific method and scientific argumentation. One of the most important learning environments where these competences can be acquired is the natural environment we live in. But this environment we live in has recently been exposed to pollution and needs to be protected and awareness should be raised about it. Therefore, environmental education should be given from an early age (Gülay & Önder, 2011). In this context, environmental education has been integrated directly or indirectly into curricula, regardless of the branch of study. In addition, many governments, institutions, and

organizations, that focus on developing environmental awareness, support research to develop environmental literacy among children (Karatekin & Aksoy, 2012).

Environmental Education in Early Childhood in Turkey

Robertson (1993) made a point of the need to provide children with the necessary knowledge and skills to protect and improve the environment with all its living and non-living components as one of the important goals of environmental education and proceeded to note the importance of understanding the factors that shape children's understanding of the environment. A similar emphasis is inherent in the current curriculum, with the preschool education programme noting the need for instilling environmental awareness and correct attitudes towards the environment, in children (MoNE, 2013).

To ensure that environmental education in Turkey continues in a systematic and programmed manner from preschool to subsequent stages of education, the Ministry of Environment and the Ministry of National Education on 14.10.1999 signed a "Cooperation Protocol on Studies to be Conducted on Environmental Education" (Bakar, 2019). The protocol is particularly noteworthy in the context of this study, given its call for the 'focus on applied environmental education to raise environmental awareness in preschool and primary school children'. Şimşekli (2001), referring to the said protocol's other provisions regarding primary education, stated the importance of addressing issues such as protecting the environment, recycling, and preventing environmental pollution within the scope of applied environmental education at preschool and primary education institutions. Despite the emphasis on environmental education in various reports drawn up in the past few years, no curriculum other than the 'Minik TEMA Education Programme' exists in the environmental education scene in preschool education in Turkey. Still, it is seen that in the Preschool Education Programmes of 2002 and 2006, as well as the updated 2013 version, the subject of environment is covered on certain days and weeks, with emphasis on this element in the outcomes and explanations thereof (Bakar, 2019). In this context, teachers carry out environmental education in various environments and contexts, such as museum visits, picnics, school yards, and house gardens, and stimulate children's pre-existing interest and curiosity on the topic (MoNE, 2006).

Overview of Studies on Environmental Education in Early Childhood

The preschool period is a starting point for the attainment of environmental knowledge, attitudes, awareness, and skills (Ayvacı et al., 2021). For this reason, it is important to plan and implement educational activities that increase children's awareness of the environment, encourage them to take responsibility, and are based on the principle of 'environment first' (Gezgin Vural & Kılıç Mocan, 2022; Kıralioğlu & Ürey, 2023).

The basis of an effective environmental education programme is to know how individuals perceive the environment and the factors affecting these perceptions (Kıvrak & Uyanık, 2020). At birth, the individual perceives his/her environment through environmental stimuli and interactions (Çabuk, Teke & Baş, 2020). However, the perception of the environment depends not only on the characteristics of the environment but also on the needs, actions, motives, and cognitive processes of the individual (Barraza, 1999; Brawn et.al., 1980). Bloom (2012) emphasizes the learner's cognitive input behaviors and prior knowledge about the subject. Ayvacı et al., (2021) also state that for effective environmental education and practice, it is necessary first to determine and reveal the current state of children's mental processes and perceptions about the environment. Therefore, for an effective environmental education program to be prepared for preschool children, it is important to determine the perceptions of children of that age toward the environment.

In the literature, we find studies addressing the views of teachers (Güzelyurt & Özkan, 2018, Türkoğlu, 2019) and pre-service teachers (Güsta-Şahin & Doğu, 2018; Öztürk & Öztürk, 2015) on environmental education and ecological awareness (Okyay et al., 2021; Üstün & Ürey, 2024), primary

school children's awareness-attitudes towards the environment (Çelikler et al., 2019; Çetin & Badem, 2015, Durkan et al., 2015; Kıvrak & Uyanık; 2020, Yurttaş & Erdal-Kartal, 2021) and the impact of environmental education activities/courses on children's ecological awareness were examined (Akbayrak & Kuru Turaşlı, 2017; Emsal Aydın, 2018; Gezgin Vural & Kılıç Mocan, 2022; Kazu & Ödemiş, 2023; Polat & Demirci, 2021; Yılmaz et al., 2020). There are also studies finding that nature-based early childhood programmes develop a basic appreciation for the natural world (Larimore, 2016), that spending time in nature strengthens all areas of children's development (Gill, 2014), contributes to general health (Twohig-Bennett & Jones, 2018) and even to children's emotional regulation (Tillmann et al., 2018). In Turkey, although environmental education studies have been analyzed (Ogelman & Güngör, 2015; Gülay & Ekici, 2010; Alkan et al., 2022) and scale development and adaptation studies on the environment have been conducted (Aslan et al., 2008; Cevher Kalburan, 2009; Koçak Tümer, 2015), and also preschool children's science-related learning needs and their teachers' science activity practices have been investigated (Yıldız Taşdemir & Güler Yıldız, 2024), a limited number of studies examining preschool children's perception of nature (Köşker, 2019) and environment (Ahi, 2017; Ahi & Alisinanoğlu, 2016; Bakar, 2019; Konur & Akyol, 2017; Yurttaş, 2023) have been identified. In the literature, although the mental model is an internal representation of children's conceptual understanding (Batlolona et al., 2020), no longitudinal-comparative study has been encountered to reveal the mental models of children in the preschool period. This study is thought to provide information about 4-5-6-year-old children's mental models of the environment, fill the research literature gap and contribute to environmental education programmes, and may expand the scope of previous studies.

The study also contributes to the literature in terms of data collection tools. Because, in the limited number of studies trying to determine preschool children's mental models of the environment, interviews, and checklists were mostly used to collect children's environmental knowledge (Kara et al., 2015; Yılmaz et al.,, 2020). However, while preschool children have difficulty expressing themselves verbally due to their age, they are more comfortable expressing their feelings and thoughts through artistic activities such as music, dance, and painting. Especially drawing is a particularly important activity where the child does not feel any pressure to understand and express his/her feelings (Minkof & Riley, 2011; Yavuzer, 2005, 2009). Considering the emphases of Franco & Colinvaux (2000), who draw attention to the implicit structure of mental models, and Cronin-Jones (2005), who state that the applications of the drawing technique provide important data about the child's cognitive structure, especially in the preschool period, it can be said that the study will make qualified contributions to the relevant literature in terms of data collection processes. In studies with similar emphasis, children's drawings are accepted as a powerful tool in analysing the images in their minds and are used as an important data collection tool (Ahi & Alisinanoğlu, 2016; Rodari, 2007). Accordingly, this study, in which mental modelling of the environment was determined by drawing and WAT, is also important in terms of data collection tools.

In conclusion, considering the literature on early childhood environmental education and cognitive development processes, it is necessary to determine the level of environmental knowledge to raise environmentally conscious individuals (Yurttaş & Erdaş-Kartal, 2021). This study is thought to make a significant contribution to the field by revealing the mental models of 4-5 and 6-year-old children about the environment separately and providing information about their needs, motives, and cognitive processes. According to the results to be obtained from this study, it will be possible to diagnose the cognitive development towards the concept of environment in the early childhood period, where the educational outcomes between the levels are most visible. In addition, considering the dynamic structure of education programs, the findings of this study will contribute to the shaping of the environmental outcomes aimed to be gained in early childhood. In other words, it is valuable as it will reveal the possible readiness levels of children for the environment before moving on to the next level, primary school. Therefore, the study will pave the way for 4-5-6-year-old children to reach their mental models about the environment, and it is thought that it will provide input to the environmental education programs and policies to be developed in Turkey.

Purpose and Research Questions

The present study aimed to reveal the mental models of preschool children in different age groups towards the environment through the word association test (WAT) and the drawing. The main problem of the study is "What are preschool children's (36–48-month-old, 49–60-month-old, 61–72-month-old) mental models about the environment?"

Methods

Research Design

The method of the study, conducted with 36–72-month-old problem: 72 months takes you to preschool children, is based on a qualitative research pattern designed as a case study. According to Stake (1974) cited by Çepni (2010), case studies can be designed to examine a suitable situation with defined boundaries. In doing so, multiple data collection tools can be used for the research. Yin (2003) defined a case study as the activity of uncovering a social fabric, the individuals who make up this fabric, the patterns, the environment, and individual experiences. By these definitions, the present piece of research was designed as a case study aiming to reveal the mental models of 36-72-month-old preschool children towards the environment, with the help of various data collection tools.

Research Group

The study group was selected by convenience sampling, a non-random sampling method. According to Büyüköztürk et al., (2009) the convenience sampling method is based on selecting the sample from among easily accessible and applicable units due to the limitations in terms of time, money, and labour. In this context, 225 children studying in 8 preschool education groups operating in Uşak province in the academic year 2022-2023 were included.

Data Collection Tools

The data collection tools used to determine 36-72-month-old preschool children's mental models of the environment were the Word Association Test (WAT) and the Drawing.

Word Association Test (WAT)

This is a data collection tool used to examine the schemas, models, concepts, and conceptualisations in children's minds, as well as the relationships between them, often applying labels such as 'cognitive structures', 'mental models', and 'mental images' to refer to these relationships? (Gündoğan & Taşdere, 2021). In WAT, children were asked about the words/phrases that come to mind when they think of the concept of ENVIRONMENT. The words/phrases mentioned by the children were recorded by the researchers. The WAT card prepared for each child, containing the stimulus word and the response words provided by the children, is presented in Figure 1:

Figure 1

WAT for the concept of environment

WAT for the Concept of Environment
ENVIRONMENT...............................   ENVIRONMENT...............................   ENVIRONMENT...............................   ENVIRONMENT...............................   ENVIRONMENT...............................   ENVIRONMENT...............................

Drawing

It is a data collection tool to determine children's mental models regarding the environment. Pridmore and Bendelow (1995) noted the importance of drawing, which is frequently used to reveal children's mental models for various themes at all levels of education, and stated that it serves as a window to children's feelings and thoughts. Rennie and Jarvis (1995) stated that drawing can be an alternative technique for pupils who have difficulty expressing their thoughts verbally. Drawing gives study participants –both adults and children– another way of communicating with each other, which can lead to important findings (Einarsdottir et al., 2009). In this study, drawing was used to complement and complete the findings reached through the WAT, concerning the mental models 36-72-month-old preschool children had about the concept of environment.

Data Collection

During the data collection process, the children enrolled in 8 preschool education institutions were interviewed individually, and the WAT and the drawing activity were conducted. Since the children were not yet able to read and write during the implementation of WAT, each word/phrase they uttered was written on the WAT card by the researcher. Moreover, the words/phrases spoken by the children were recorded with a voice recorder to prevent possible loss of data and to provide a means to check them. In the literature, various time frames (e.g., 30 seconds, 45 seconds) are provided for the subject to respond (Bahar & Özatlı, 2003). Since the research group covered in the present study consisted of younger children compared to other studies in the literature, each child was given 2 minutes for the application of the WAT. In the literature, there are many studies in which varying durations were given depending on the level of education (primary school, secondary school, high school, higher education, etc.). Since the study group of this study consisted of early childhood children of similar age groups at the same educational level, the longest duration of 2 minutes was envisaged. Later, the children were presented with a form asking them to 'Draw the image of the environment in your mind' and were asked to draw the 'Environment' as they imagined it in the space provided in the form. After the drawings, the researchers asked the children what the images they had drawn were and took notes next to each image according to the children's answers. In this process, it was stated that children could use their imagination and creativity, draw anything that came to their minds, draw the objects, beings, environments, etc. they wanted, and instructions were given in this direction. The data collection process was carried out after the environmental activities (environmental pollution, protection of the environment and nature, etc.) were included in the preschool curriculum. In this context, it is thought that children of all age groups have familiarity with and awareness of the concept of environment. The relevant drawing form is attached (Appendix 1). The flowchart (Figure 2) showing how the data collection process was implemented holistically is as follows.

Figure 2

Data collection process
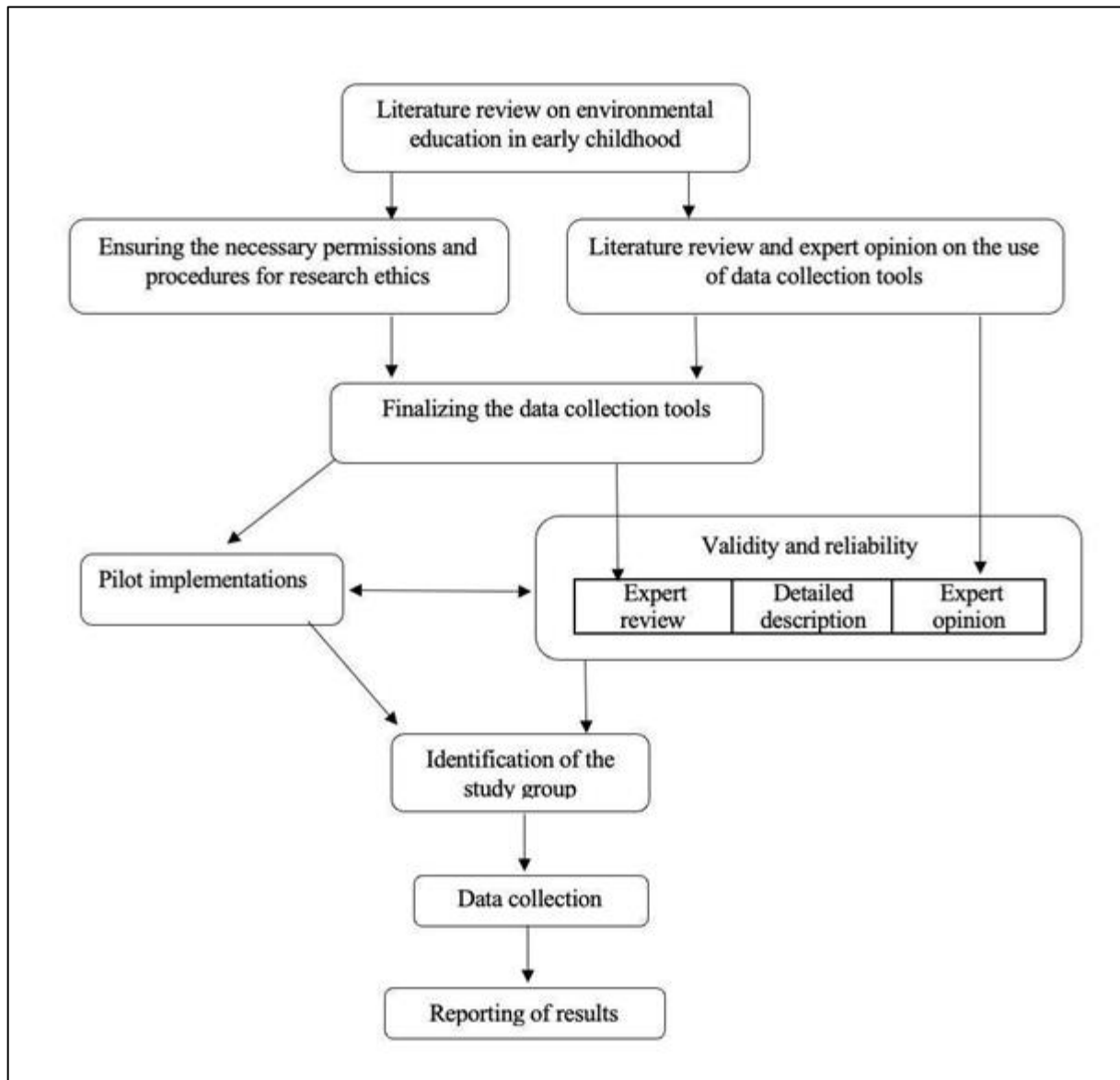
Data Analysis

Analysis of WAT Data

In the analysis of the WAT data, the frequency of children's responses to the stimulus word environment was determined. The response words thus provided were categorised according to similarity and closeness of meaning. The following categories appeared: sky elements, rural Elements, living Elements (plant, human, animal, fruit sub-categories), and non-living elements (park, traffic, house, place, school, and water sub-categories). Words with similar/close meanings comprising each category were visualised with the mind map created by the researchers. The cut-off point (CP) technique introduced by Bahar et al. (1999) was used to visualise children's cognitive structures in the process of constructing mind maps. In this technique, the cut-off point is established at 3 to 5 instances less than the actual frequency of the most frequently mentioned term in response to any given stimulus word. The answers above the said level are recorded in the first part of the mind map (the part with the highest number of responses provided). The cut-off point is then lowered at certain

intervals, and the process continues until all stimulus words appear in the mind map (Ercan et al., 2010).

Analysis of the Drawing Data

In the analysis of the drawing data, each image drawn by the children was subjected to content analysis. The researchers asked questions about the images to verify the children's drawings and took notes on the drawings to examine them during the analysis process. This provided for an assessment of the consistency of children's thoughts and images. Each child's drawing was checked repeatedly, and associated codes were assigned by two researchers. In this process, the first researcher listed 53 codes, and the second researcher listed 49 codes. The researchers concurred or expressed similar assessments concerning 47 codes but disagreed concerning 6, resulting in a consensus rate of 0.88. Miles & Huberman's (1994) formula in the form of Consensus/(Consensus+Disagreement) was used to measure the consensus rate. Since the literature underlines the need for a consensus rate of 0.80 or more, the analysis process is reliable (Miles & Huberman, 1994). The codes that emerged from the analysis of the drawing data were collected in a higher category and presented in a related structure in separate mind maps for each age group. These categories (Environments forming the environment) were grouped and presented in a related structure in mind maps for each age group separately. Some common codes appeared in several distinct categories. For example, some images assigned to the child code included School environments, while others covered Park-Garden environments. Thus, the codes were connected to both the School and the Park-Garden categories in the context of mind maps. Examples of the pictures representing the relevant codes are provided in the findings section. The codes obtained were analysed and comparatively concerning the categories identified with the WAT, to come up with an understanding of the children's mental models.

Findings

Findings are presented under two headings: the findings reached through the WAT, and the data obtained with the help of the drawing, for 36-48, 49-60, and 61-72 months-old children.

Findings on 36-48 Months-old Children's Mental Models of the Environment

Findings Reached through the WAT Data

The words that the concept of environment associated in the minds of 36-48 children were grouped under 3 themes: living elements, non-living elements, and sky elements. The connotation words that make up each theme are shown in the mind map below, which was developed with the Cutt of Points (CP) technique.

Figure 3

36-48 months-old children's mental model throught WAT
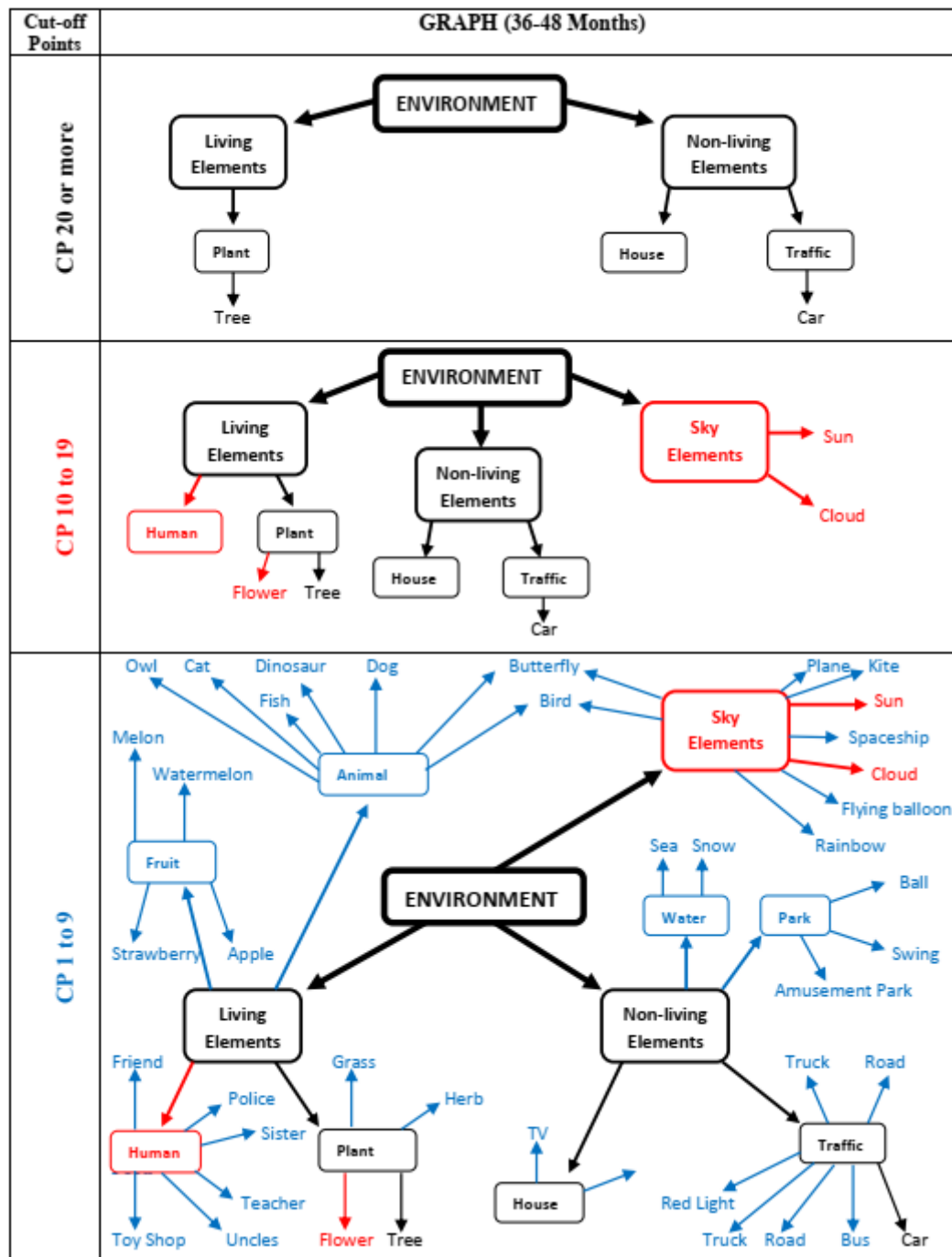
CP 20 or more; in this range, the word "tree" stood out in the Plant category among living elements, and the word "car" and the category "house" appeared in the traffic category, along with the house category among non-living items. To put it differently, tree, house, and car were the words the children most frequently produced.

CP 10 to 19; in this range, the Sky element emerged as a new theme. In this context, the words "sun" and "cloud" were pronounced frequently by the participating children. In addition, the word "flower" in the plant category and the category human also appeared as distinctive elements of the children's cognitive structure in this range.

CP 1 to 9; in this range, all themes, categories, and words appeared. Accordingly, the words "melon", "watermelon", "strawberry", and "apple" were produced for the fruit category; "owl", "cat", "dinosaur", "fish", "dog", "butterfly" and "bird" for the animal category; "friend", "police", "sister", "teacher", "uncle" and "toymaker" for the human category; and "grass" and "turf" for the plant category. Among non-living elements, the words produced by the participants were "television" and "food" for the house category; "truck", "road", "red light", "road" and "bus" for the traffic category; "ball", "swing", "amusement park" for the park category; "sea" and "water" for the water category. The common words produced for each category were as follows: "airplane", "kite", "spaceship", "flying balloon" and "rainbow" for the sky category; "butterfly" and "bird" for the animal category; "snow" for the water category.

Findings Reached with the Help of the Drawing

The analysis of the drawing data entailed an inquiry into the meaning of the images drawn by the children, followed by the coding of each image. The structure of the categories representing the relevant codes in children's minds is presented below with a visualised mind map.

Figure 4

36-48 months-old children's mental model throught drawings
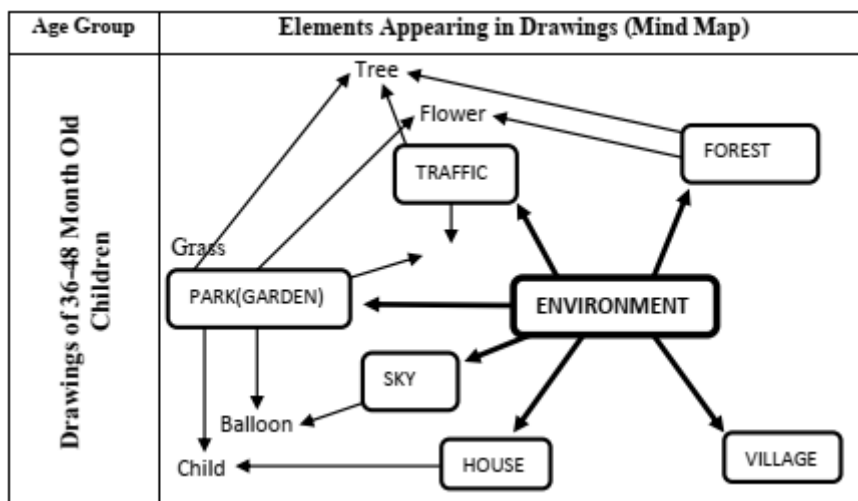
Drawings of 36-48 Month-Old Children: Children in this age group drew images of traffic, parks, forests, sky, houses, and village settings in their environmental drawings. While flower images were found in park (garden) and forest environments, tree images were found in forest, park, and traffic environments. In addition to these, grass images appeared in traffic and park (garden) environments, balloon images were observed in sky and park (Garden) environments, and children's images were noted in house and park (garden) environments. In this context, one can argue that the images drawn by 36-48-month-old children in their environmental drawings focus mostly on park (garden) environments.

## Findings on 49-60 Months-old Children's Mental Models of the Environment

Findings Reached through the WAT Data

The words that the concept of the environment associated in the minds of 49-60 months-old children were grouped into three themes: Living elements, non-living elements, and sky elements. The

connotation words that make up each theme are shown in the mind map below, which was developed with the CP technique.

Figure 5

49-60 months-old children's mental model throught WAT
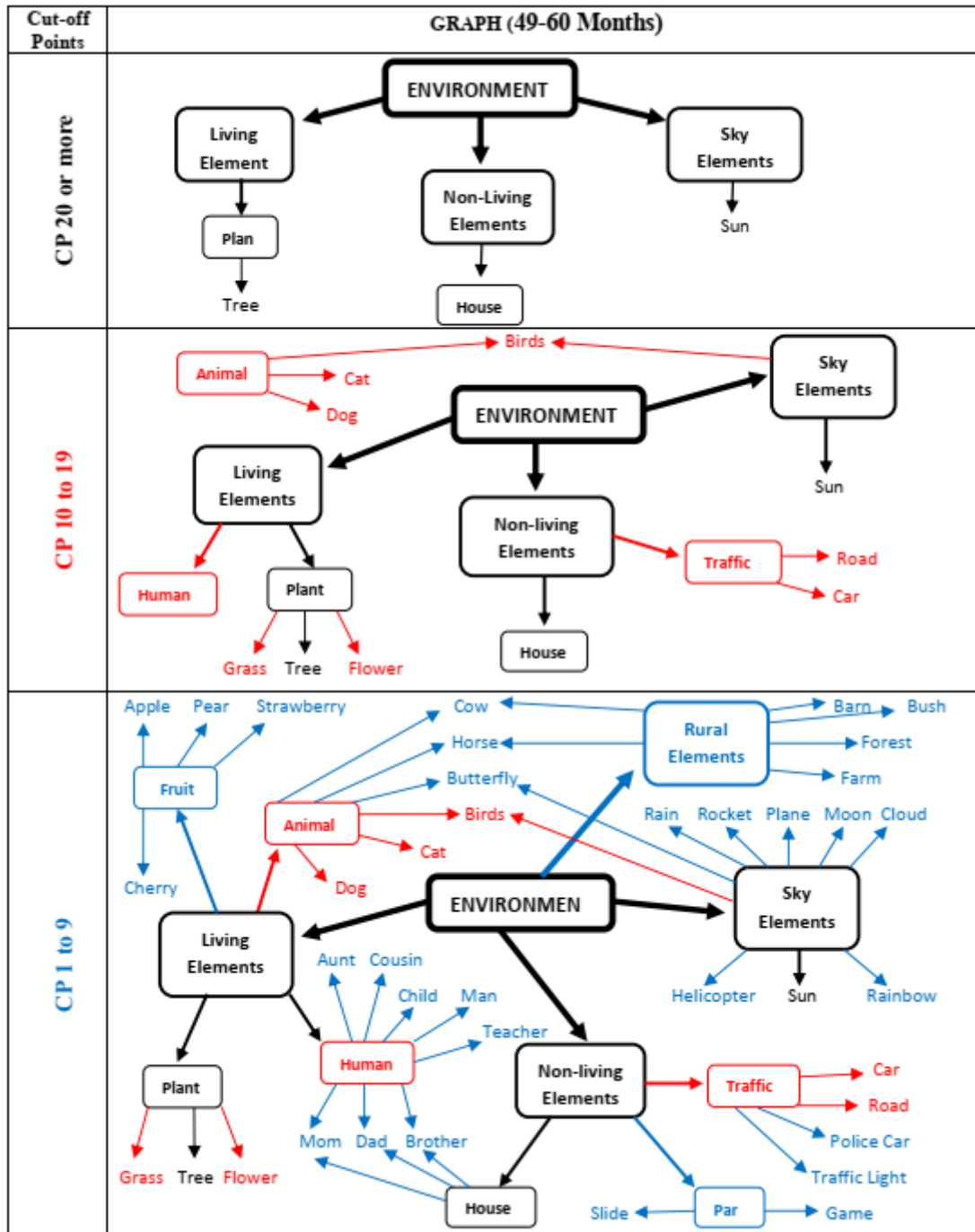
CP 20 or more; in this range, the word "tree" stood out in the Plant category among living elements, and the category "house" appeared among non-living items, along with the word "sun" in the sky elements category. To put it differently, house, car, and sun were the words the children most frequently produced.

CP 10 to 19; in this range, the word "birds" was the common response word produced for the Sky element and the Animal category. For the animal category, the response words "cat" and "dog"

were also generated. Among living items, the Human category, as well as the words "flower" and "grass" in the Plant category drew attention. Within the scope of non-living items, "car" and "road" response words were produced for the Traffic category.

CP 1 to 9; in this range, all themes, categories, and words emerged. In this context, Rural-Village elements emerged as a new theme. The words "cow" and "horse" produced within the scope of Rural-Village elements were also included in the Animal category. Similarly, the word "butterfly" was a common response word for both the Animal category and the Sky item. In addition, the words "barn", "bush", "forest", and "farm" were also produced within the scope of Rural-Village elements. The words "cherry", "apple", "pear" and "strawberry" were produced for the Fruit category, and the words "aunt", "cousin", "child", "man" and "teacher" were produced for the Human category. The response words "mom", "dad" and "brother" were the common response words produced for both the Human and House categories. Within the scope of non-living items, the response words "slide" and "game" were produced for the Park category, and the response words "police car" and "traffic light" were produced for the Traffic category. Within the scope of sky elements, the response words "rain", "rocket", "plane", "moon", "cloud", "rainbow" and "helicopter" were produced in this range.

Findings Reached with the Help of the Drawing

The analysis of the drawing data entailed an inquiry into the meaning of the images drawn by the children, followed by the coding of each image. The structure of the categories representing the relevant codes in children's minds is presented below with a visualised mind map.

Figure 6

49-60 months-old children's mental model throught drawings
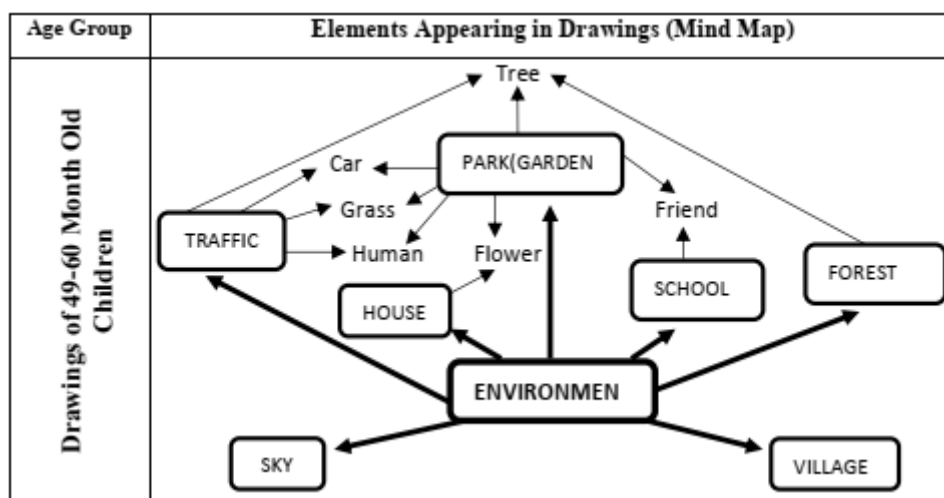
In this age group, children included images from traffic, parks (garden), forests, sky, house, village, and school settings in their environmental drawings. Tree images appeared in Forest, Park (Garden), and Traffic environments, while car, grass, and human images appeared in Park (Garden) and Traffic environments. Similarly, images of flowers were found in the House and Park (Garden) environments, while images of friends were found in the Park (Garden) and School environments. In this context, one can argue that the images drawn by 49-60-month-old children in their environmental drawings focus on park (garden) and traffic environments.

Findings on 61-72 Months-old Children's Mental Models of the Environment

Findings Reached through the WAT Data

The words that the concept of the environment associated in the minds of 61-72 children were grouped under 4 themes: Living Elements, Non-living Elements, Sky Elements and Rural Elements. The connotation words that make up each theme are shown in the mind map below, which was developed with the CP technique.

Figure 7

61-72 months-old children's mental model throught WAT
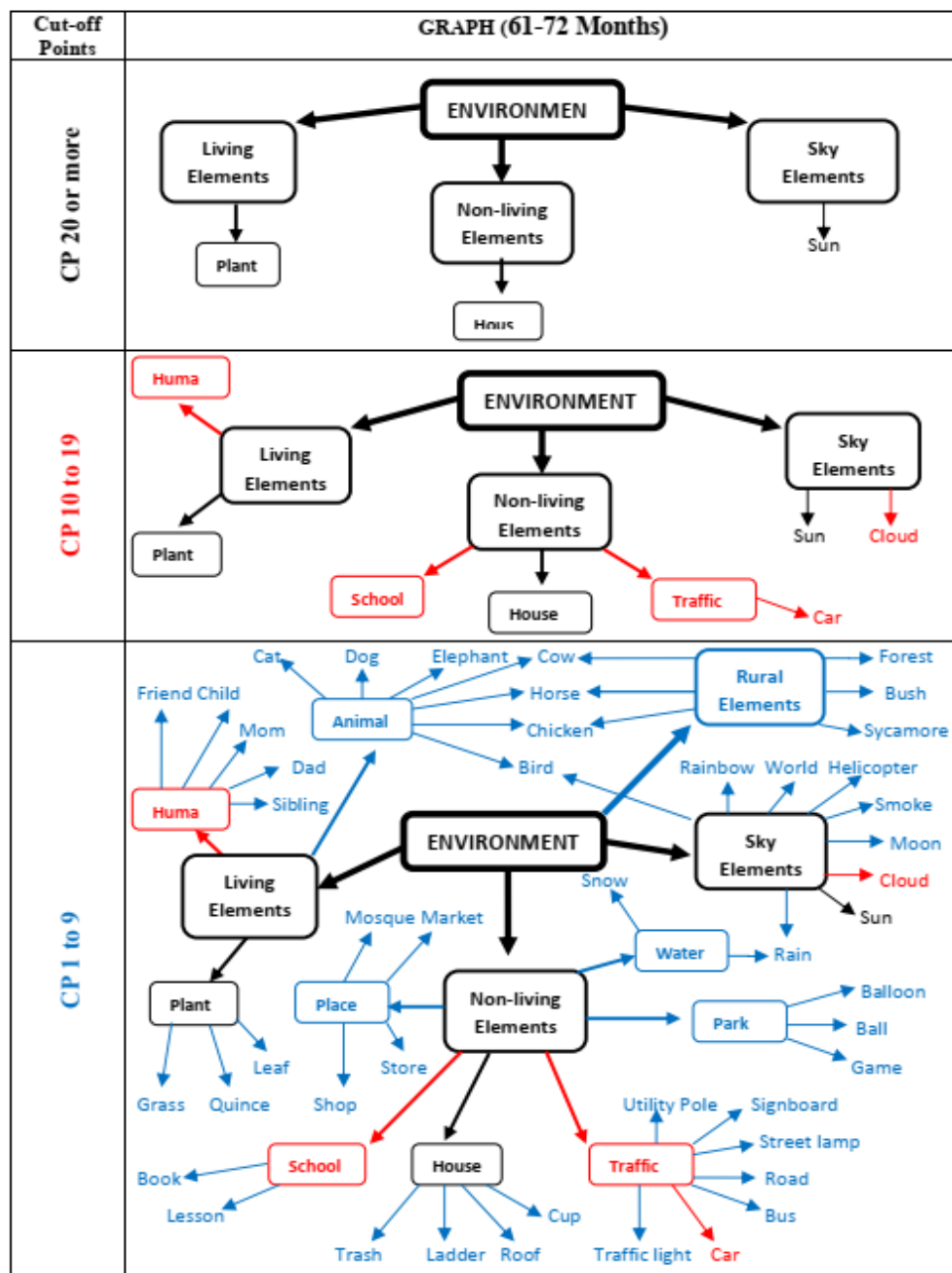
CP 20 or more; in this range, the word "plant" was produced as a response word among living items; the word "house" was produced as a response word among non-living items; and the word

"sun" was produced as a response word among sky items. A mind map quite similar in structure to the cognitive structure of 49-60-month-old children emerged.

CP 10 to 19; in this range, within the scope of living elements, the category "human" stood out. Among non-living elements, the word "car" was produced for the "traffic" category. However, the word cloud was produced for the Sky element.

CP 1 to 9; in this range where all themes, categories, and words emerged, Rural-Village elements appeared in the mind map as a new theme. The words "cow", "horse", and "chicken" produced within the scope of Rural-Village elements were also included in the Animal category. The words "forest", "bush", "forest", and "sycamore" were also produced within the scope of Rural-Village elements. Similarly, the word "bird" was produced for both the Animal category and the Sky item, and the word "rain" was produced as a common response word among the Sky items and the Water category. Within the scope of living elements, the words "cat", "dog", and elephant were produced for the Animal category; the words "friend", "child", "mom", "dad", and "sibling" were produced for the Human category; and the words "grass", "quince", and "leaf" were produced for the Plant category. Within the scope of non-living elements, the response words "balloon", "ball", and "game" were produced for the Park category; the response words "traffic light", "bus", "road", "street light", "street lamp", "signboard" and "lamppost" were produced for the Traffic category; the response words "trashcan", "ladder", "roof", and "glass" were produced for the House category; the response words "book" and "lesson" were produced for the School category; and the response words "mosque", "market", "market", and "shop" were produced for the Place category. Within the scope of sky elements, the response words "rainbow", "world", "helicopter", "smoke" and "moon" were produced in this range.

Findings Reached with the Help of the Drawing

The analysis of the drawing data entailed an inquiry into the meaning of the images drawn by the children, followed by the coding of each image. The structure of the categories representing the relevant codes in children's minds is presented below with a visualized mind map.

Figure 8

61-72 months-old children's mental model throught drawings
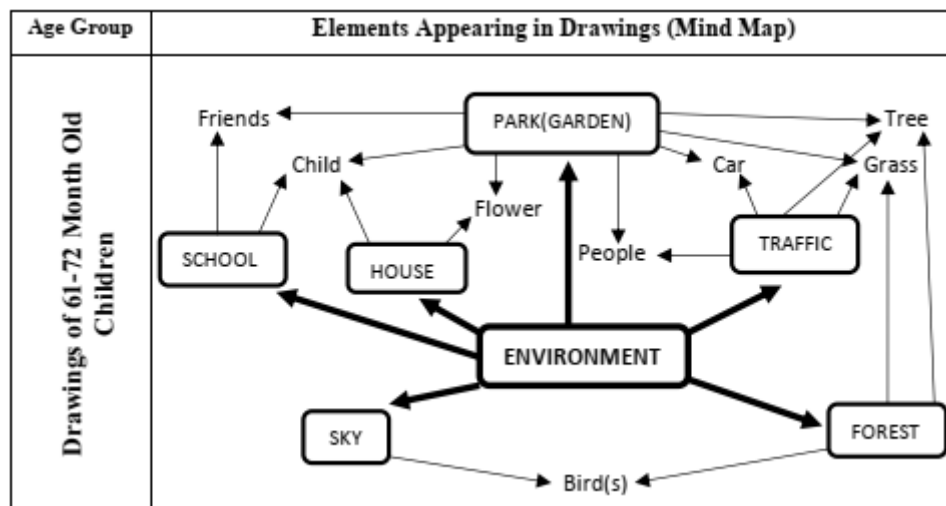
In this age group, children included images from traffic, parks (garden), forests, sky, houses, and school settings in their environmental drawings. Tree and grass images appeared in Forest, Traffic, and Park (Garden) settings, while car and human images appeared in Park (Garden) and Traffic settings. Children included bird images in both Forest and Sky drawings and included friend

images in Park (Garden) and School drawings. Flower images were included in Park (Garden) and House drawings, while children's images were included in Park (Garden), School and House drawings. The focus of the environment drawings of 49-60-month-old children formed a more interrelated and holistic structure compared to those of other age groups. In other words, while the environmental drawings of the children in this age group mostly involved elements from the Park (Garden) and Traffic settings, the images associated with the Forest, House, and School settings were also included in a related and holistic manner, albeit partially. Examples of drawings representing each age group are presented in the Table 1 below.

Table 1

Examples of Drawings

Examples of Drawings by 36-48 Months-old Children	Examples of Drawings by 49-60 Months-old Children	Examples of Drawings by 61-72 Months-old Children

Discussion, Conclusions and Recommendations

In this study, which aims to reveal the 36-72 months-old preschool children's mental models about the environment, the findings are presented and discussed separately for 36-48, 49-60, and 61-72 months-old children.

36-48 Months-old Children's Mental Models of the Environment

In this age range, house, traffic, park, and sky environments/elements emerged as common findings in both data collection tools. Sky-bird and traffic-car were indisputable parts of children's mental models as common and direct associations. However, the words/drawings of human, friend, grass, flower, and tree appeared in both data collection tools, in close but different categories. For example, while "grass" and "tree" were produced as response words for the category of plants in WAT, they appeared in the forest and park (garden) settings in the drawings. On the other hand, different categories/environments without common elements also appeared. For example, the categories of fruit, animal, and water emerged in the WAT, while the school and forest environments emerged in the children's drawings.

49-60 Months-old Children's Mental Models of the Environment

In this age range, house, traffic, park and sky and rural-village environments/elements emerged as common findings in both data collection tools. However, in both data collection tools, images/words associated with rural-village settings, and traffic-car associations emerged as common

and direct associations in children's mental models. Moreover, the words/images of human, grass, flower, and tree elements emerged in different categories with close meanings in both data collection tools. For example, while "tree" and "grass" were produced as response words for the category of Plants in WAT, they appeared in the park (garden) settings in the drawings. On the other hand, different categories/environments without common elements also appeared. For example, the fruit category emerged in the WAT, while the school and forest environments emerged in the drawings.

61-72 Months-old Children's Mental Models of the Environment

In this age range, more interrelated and complex mind maps emerged in the findings obtained from both data collection tools. House, traffic, park, and sky environments/elements emerged as common findings in both data collection tools. Sky-bird and traffic-car were indisputable parts of children's mental models as common and direct associations. However, the words/drawings of human, friend, child, grass, flower, and tree appeared in both data collection tools, in close but different categories. For example, while "flower" was produced as a response word for the category of plants in WAT, it appeared in the house and park (Garden) settings in the drawings. On the other hand, different categories/environments without common elements also appeared. For example, while the categories of place, water, and rural elements emerged in the WAT, the school and forest environments emerged in the drawings.

As a result of the study, it is possible to say that there are common elements in children's mental models, although the details vary according to their age range. "House, traffic, park, and sky" are seen as common concepts that children associate with the environment. Thomson (2008) states that children raised in urban versus rural settings differ in their perception of the environment, while Hart & Moore (1973) notes that in the 4-11 age group, the children's mental models of the environment vary depending on the accessibility of the areas close to their homes. The findings reached in this study conducted in the province center of Uşak concerning the concepts of traffic, park, house, and sky in children's perception of the environment coincide with the findings of other studies. With fewer natural, unstructured outdoor spaces in urban areas today, children's ability to engage in active experiences in natural environments is diminishing (Sobko et al., 2018). Therefore, young children living in urban environments who are more likely to have contact with and participate in activities in nature. Deniz (2020) noted trees as the most pronounced element in children's perceptions of the environment. Again, Bonnett and Williams (2006) and Burgess and Smith (2011) found that plants and animals are the things that children think of when they think of the environment. In the present study, in which each age group was evaluated separately, it was observed that children always included the tree element as part of their expressions of the environment. On the other hand, children exhibited variations based on their age groups: 61-72-month-old children drew more realistic elements, while 49-60-month-old children drew more abstract images, but often provided a narrative alongside their drawings.

It is possible, based on the findings reached, to say that the number of items referred to increases with age. This study underlines the existence of common elements in children's mental models of the environment across different age ranges. These findings also highlight the need for targeted interventions to strengthen children's interactions with nature to promote holistic development and environmental awareness from an early age.

In the drawings by children in the 36-48 months-old age group, house, traffic, park, sky, sky, people, friends, grass, flowers, and trees were the elements that appeared. In the drawings 49-60 and 60-72 months-old children, school, forest, and fruit were added to this set. In the literature on children's perception of the environment, it is seen that children define the environment with inanimate objects (sun, clouds, etc.), and the majority of them focus on objects in their understanding of nature (Köşker, 2019; Yardımcı et al., 2010). When children's responses are analyzed within the

scope of another study on the effects of environmental problems, the frequency of explanations about humans and animals stands out. These elements are followed by air, nature, soil, and water in terms of frequency (Ayvacı et al., 2021). In children's environmental drawings, sun, house, grass, human, cloud, tree, and animal images are the most commonly observed elements (Ahi, 2015; Özsoy & Ahi, 2014; Özsoy, 2012). Another striking point in the drawings is that they define the human being separately from the environment (Shepardson, 2005) and see the environment as a layered perception extending from the near environment to the far environment (Alerby, 2000; Keinath, 2004; Shepardson, et al., 2007). In addition, children's drawings also included the habitats of living things, which is consistent with the conclusions of other studies (Shepardson, 2005, Shepardson 2007). In summary, the analysis of children's drawings reveals a developmental progression in their perception of the environment, with younger children predominantly depicting basic elements such as houses, traffic, and nature, while older children incorporate additional elements such as schools and forests. Moreover, these findings align with existing literature highlighting the multifaceted nature of children's environmental understanding, wherein human presence, habitat depiction, and the hierarchical organisation of environmental elements emerge as recurring themes across studies.

Although the validity of Rousseau's (1969) argument for "No book but the world" for children is still confirmed by experts, there has been a regression in children's lives since the days of that great philosopher, with children being distanced from nature, and left with much fewer opportunities to establish close relationships with the nature, depriving them of valuable experience (Akyüz, 2019). As a result, the relationship between our children and nature has been damaged. For the new generation, nature has become an abstraction rather than reality (Louv, 2012). Looking at children's perceptions of the environment as reported in the literature, it is possible to say that similar elements such as trees, sky, and houses are generally included, and the child's immediate environment is surrounded by artificial elements such as parks, houses and traffic. Since being in touch with nature is an important stimulus for children and has an important place in the subsequent education and development of the individual (Tanner, 1980), one can forcefully argue that the findings of this piece of research reveal an important reality. In this context, the following recommendations are made for early childhood children's environmental education, new research, and curricula.

Recommendations

Recommendations for Early Childhood Environmental Education Research

This study was conducted to reveal the difference between age levels. This study can be carried forward and the mental models of primary school pupils, the next level of education, can be examined comparatively.

The meaning of environmental elements such as parks, traffic, sky, and living and non-living elements for children, which emerged most frequently in this study, can be examined through in-depth case studies.

In the word association test, different stimulus words (nature, sky, forest, etc.) can be used together with the stimulus word environment to examine children's more inclusive mental models of the subject.

The place of environmental education in the recently published preschool curriculum can be critically examined in comparison with the curricula of the past. Thus, the place of environmental education can be revealed through a developmental analysis.

The strongest emphasis in this new curriculum is on the theme of sustainability and children playing every day outdoors. In this context, environmental education can be handled with a

sustainable perspective and new studies can be carried out in early childhood by associating it with current themes such as recycling, nature conservation, living diversity, and waste control. These sustainability themes can be used as stimulus words for WAT.

Recommendations for Educational Practices

In the literature, WAT and drawing, which are frequently used in conceptual change studies at different educational levels, can also be used for early childhood environmental education studies. The WAT and drawing can be used before and after the educational practices to be developed for different themes related to the environment (environmental sensitivity, ecological footprint, environmental problems, etc.).

These practices can take the form of environmental education in out-of-school learning environments, current sustainable environmental education interventions, training of environmental and nature education experts, etc.

Recommendations for Curriculum Developers

Considering the curriculum development studies, which are currently on the agenda in Turkey, drawing activities such as nature, environment, forest, etc. can be recommended as teaching and evaluation activities for the themes within the scope of environmental education for preschool curricula.

Courses on the use of these drawing activities in teaching and evaluation processes can be given in preschool teacher training undergraduate education. These trainings can also be carried out for preschool teachers in in-service processes.

References

Ahi, B. (2015). *The effect of the environmental education program integrated into the preschool education program on the mental model development of the children about the concept of "environment"* [Unpublished doctoral dissertation]. Gazi University.

Ahi, B. (2016). A study to determine the mental models in preschool children's conceptualization of a desert environment. *International Electronic Journal of Elementary Education, 8*(3), 333–350.

Ahi, B., ve Alisinanoğlu, F. (2016). Okul öncesi eğitim programına kaynaştırılan çevre eğitimi programının çocuklarin "çevre" kavramı hakkındaki zihinsel model gelişimine etkisi. *Kafkas Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 18,* 305-329. https://doi.org/10.9775/kausbed.2016.016.

Akbayrak, N., ve Kuru Turaşlı, N. (2017). Oyun temelli çevre etkinliklerinin okul öncesi çocukların çevresel farkındalıklarına etkisinin incelenmesi. *Erken Çocukluk Çalışmaları Dergisi, 1*(2), 239-258. https://doi.org/10.24130/eccd-jecs.196720171240.

Akyüz, Y. (2019). Relationship between child-nature and environmental protection in education. *Ankara University Journal of Faculty of Educational Sciences, 12*(1), 85-96. https://doi.org/10.1501/Egifak_0000000611.

Alerby, E. (2000). A Way of visualising children's and young people's thoughts about the environment: A study of drawings. *Environmental Education Research, 6*(3), 205–222. https://doi.org/10.1080/13504620050076713.

Alkan, Ş., Kuruçay E. N., Aladağ M., Tatar, T., Çolak, Z., ve Cengiz, C. (2022). Okul öncesi çevre eğitimini konu alan çalışmalara yönelik betimsel içerik analizi. *Eğitim Bilim ve Araştırma Dergisi, 3*(2), 328-352. https://doi.org/10.54637/ebad.1141413.

Aslan, O., Sağır, U. S., ve Cansaran, A., (2008). Çevre tutum ölçeği uyarlanması ve ilköğretim öğrencilerinin çevre tutumlarının belirlenmesi. *Selçuk Üniversitesi Ahmet Keleşoğlu Eğitim Fakültesi Dergisi, 25*, 283-295.

Ayvacı, H. Ş., Bülbül, S., ve Bebek, G., (2021). Okul öncesi dönem çocuklarının çevre sorunları kavramına yönelik metaforik algıları ve görüşleri. *Manisa Celal Bayar Üniversitesi Eğitim Fakültesi Dergisi, 9*(1), 117-132. https://doi.org/10.52826/mcbuefd.922632.

Bahar, M., Johnstone, A. H., & Sutcliffe, R. G. (1999). Investigation of students' cognitive structure in elementary genetics through word association tests. *Journal of Biological Education, 33*(3), 134–141. https://doi.org/10.1080/00219266.1999.9655653.

Bahar, M., ve Özatlı, N. S. (2003). Investigation of the cognitive structures of the first-year high school students on the basic components of living things with the word communication test method. *Journal of Balıkesir University Institute of Natural and Applied Sciences, 5*(2), 75-85.

Barraza, L. (1999). Children's drawings about the environment. *Environmental Education Research, 5*(1), 49–66. https://doi.org/10.1080/1350462990050103.

Batlolona, J. R., Diantoro, M., Wartono, & Leasa, M. (2020). Students' mental models of solid elasticity: Mixed method study. *Journal of Turkish Science Education*, *17*(2), 200-210. https://doi.org/10.36681/.

Bay, D. N., Büşra, S. A. Z., Osmanpehlivan, E., ve Demir, İ., (2020). Okul öncesi çocuklarının çevre kirliliği algısının incelenmesi. *Anadolu University Journal of Education Faculty, 4*(3), 191-215. https://doi.org/10.34056/aujef.731982.

Bloom, B. S. (2012). *İnsan nitelikleri ve okulda öğrenme* (2. Baskı). Pegem Akademi Yayıncılık.

Bonnett, M., & Williams, J. (2006). Environmental education and primary children's attitudes towards nature and the environment. *Cambridge Journal of Education, 28*(2), 159–174. https://doi.org/10.1080/0305764980280202.

Bonnett, M., & Williams, J. (2006). Environmental education and primary children's attitudes towards nature and the environment. *Cambridge Journal of Education*, *28*(2), 159–174. https://doi.org/10.1080/0305764980280202.

Burgess, D. J., & Mayer-Smith, J. (2011). Listening to children: Perceptions of nature. *Journal of Natural History Education and Experience, 5*, 27-43.

Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö., Karadeniz, Ş, ve Demirel, F. (2012). *Scientific research methods*. Pegem Academy Publishing.

Çabuk, B., Teke, N., ve Baş, T., (2020). Çocukların kitaplardaki doğal çevre davranışlarına yönelik algıları. *Ankara University Journal of Faculty of Educational Sciences, 53*(3), 953-992. https://doi.org/10.30964/auebfd.682468.

Çelikler, D., Aksan, Z., ve Yenikalaycı, N., (2019). İlkokul öğrencilerinin çevreye yönelik farkındalıklarının belirlenmesi. *İnönü Üniversitesi Eğitim Fakültesi Dergisi, 20*(2), 425-438. https://doi.org/10.17679/inuefd.450030.

Çepni, S. (2010). *Introduction to research and project work*. Celepler Printing Press.

Çetin, G., ve Badem, N., (2015). İlkokul öğrencilerinin temiz ve kirli çevre ile ilgili görüşleri. *Uluslararası Eğitim Bilim ve Teknoloji Dergisi, 1*(1), 26-41.

Cevher Kalburan, F. N. (2009). *"Çocuklar için çevresel tutum ölçeği" ile "yeni ekolojik paradigma ölçeği"nin geçerlik güvenirlik çalışması ve çevre eğitim programının etkisinin incelenmesi* [Yayımlanmamış Doktora Tezi]. Gazi Üniversitesi.

Corinin-Jones, L. L. (2005). Using drawings to assess student perceptions of schoolyard habitats: A case study of reform-based research in the United States. *Canadian Journal of Environmental Education, 10*, 225-240.

Deniz, L. (2020). *The perception of the environment in pre-school (4-6 age group) children's paintings and the features that children's environments should provide* [Unpublished master's thesis]. Karadeniz Technical University.

Durkan, N., Güngör, H., Fetihi, L., Erol, A., ve Gülay Ogelman, H., (2015). Comparison of environmental attitudes and experiences of five-year-old children receiving preschool education in the village and city centre. *Early Child Development and Care, 186*(8), 1327–1341. https://doi.org/10.1080/03004430.2015.1092963.

Einarsdottir, J., Dockett, S., & Perry, B. (2009). Making meaning: children's perspectives expressed through drawings. *Early Child Development and Care, 179*(2), 217–232. https://doi.org/10.1080/03004430802666999.

Emsal Aydın, Ö. (2018). *Minik tema eğitim programı uygulanan ve uygulanmayan okul öncesi öğrencilerinin çevreye yönelik tutumları* [Yayımlanmamış Yüksek Lisans Tezi]. Mersin Üniversitesi.

Ercan, F., Taşdere, A., ve Ercan, N., (2010). Kelime ilişkilendirme testi aracılığıyla bilişsel yapının ve kavramsal değişimin gözlenmesi. *Türk Fen Eğitimi Dergisi [Journal of Turkish Science Education]*, 7(2), 136-154.

Franco, C. & Colinvaux, D. (2000). Grasping mental models. J. K. Gilbert ve C. J. Boulter (Eds.), *Developing models in science education,* (pp.93-118). Kluwer Academic Publishers.

Gezgin Vural, D., ve Kılıç Mocan, D., (2022). Fen etkinliklerinin okul öncesi dönem çocuklarında çevre bilinci kazandırılmasına etkisi. *Erken Çocukluk Çalışmaları Dergisi, 6*(2), 402–423. https://doi.org/10.24130/eccdjecs.1967202262331.

Gill, T. (2014). The benefits of children's engagement with nature: A systematic literature review. *Children Youth and Environments, 24*(2), 10-34. https://doi.org/10.7721/chilyoutenvi.24.2.0010.

Gülay, H., ve Ekici, G. (2010). The analysis of the ministry of national education pre-school education programme in the sense of environmental education. *Journal of Turkish Science Education*, 7(1), 74-84. https://www.tused.org/index.php/tused/article/view/505.

Gülay, H., ve Önder, A. (2011). *Environmental education in preschool for sustainable development.* Nobel Publication Distribution.

Gündoğan, A., ve Taşdere, A. (2021). Woman, man, society and sex: How pre-service teachers perceive basic gender concepts? *International Journal of Progressive Education*, 17(5), 170–191. https://doi.org/10.29329/ijpe.2021.375.12.

Güzelyurt, T. ve Özkan, Ö., (2018). Okul öncesi öğretmenlerinin okul öncesi dönemde çevre eğitimine ilişkin görüşleri: durum çalışması. *Turkish Studies Educational Sciences*, *13*(11), 651-668. http://dx.doi.org/10.7827/TurkishStudies.13425.

Hart, R. A., & Moore, G. T. (1973). The development of spatial cognition. In R. Downs & D. Stea (Eds.), *Image and environment*. Arnold.

Kara, G. E., Aydos, E. H., ve Aydin, O. (2015). Changing pre-school children's attitudes into behavior towards selected environmental issues: An action research study. *International Journal of Education in Mathematics, Science and Technology, 3*(1), 46-63.

Karatekin, K., ve Aksoy, B. (2012). Examination of teacher candidates of Social Studies' environmental literacy level in terms of various variables. *Journal of Turkish Studies*, *1*(7), 1423–1438. https://doi.org/10.7827/turkishstudies.2858.

Kazu, H., ve Yapıcı Ödemiş, F., (2023). Geri dönüşüm etkinliklerinin okul öncesi eğitim kurumu öğrencilerinin farkındalık düzeylerine etkisinin incelenmesi. *Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi, 25*(1), 34-53. https://doi.org/10.32709/akusosbil.1050483.

Keinath, S. D. (2004). *Environmental education and perceptions in eastern nepal: analysis of student drawings* [Unpublished doctoral dissertation]. Michigan Technological University.

Kıralioğlu, F., ve Ürey, M., (2023). Ortaokul öğrencilerinin çevre davranış düzeylerinin değerlendirilmesi. *Uygulamada Eğitim ve Yönetim Bilimleri Dergisi, 3*(2), 155-171.

Kıvrak, A. H., ve Uyanık, G., (2020). İlkokul dördüncü sınıf öğrencilerinin çevre kirliliğine yönelik zihinsel modellerinin belirlenmesi. *Eğitim ve Teknoloji, 2*(1), 1-15.

Koçak Tümer, N. B. (2015). *Okul öncesi çocuklar için "çocuklar için çevre ölçeği"nin geliştirilmesi ve çevre eğitim programının çocukların çevreye karşı tutumlarına etkisinin incelenmesi* [Yayımlanmamış Doktora Tezi]. Gazi Üniversitesi.

Konur, K. B., ve Akyol, N. (2017). Preschool students' perceptions on environmental problems. *International Journal of Environmental & Science Education, 12*(10), 2019-2119.

Köşker, N. (2019). Nature perception in preschool children. *Abant İzzet Baysal University Journal of the Faculty of Education, 19*(1), 294-308. https://doi.org/10.17240/aibuefd.2019.19.43815-443217.

Larimore, R. (2016). Defining nature-based preschools. *International Journal of Early Childhood Environmental Education, 4*(1), 32-36.

Louv, R. (2012). *The last child in nature: the lack of nature in our children and the healing power of nature.* (3rd ed.). (C. Temürcü, Trans.). Ankara: TUBITAK Popular Science Books. (Original work published, 2005-2008).

Marino, M. L., Collins, J., & Brawn, G. (1980).Human perception of the natural environment. Alberta Environment, Research Management Division.

Miles, M. & Huberman, M. (1994). *An expanded sourcebook qualitative data analysis.* Person Education.

Minkoff, Y., & Riley, J. (2011). Perspectives of time-use: Exploring the use of drawings, interviews and rating-scales with children aged 6-7 years. *Journal of Occupational Science, 18*(4), 306–321. https://doi.org/10.1080/14427591.2011.586323.

MoNE, (2013). *Primary education institutions (primary and secondary schools) science course curriculum.* Board of Education and Discipline.

MoNE, (2018). *Science lesson draft curriculum (primary and secondary school 3, 4, 5, 6, 7, 8th grades).* Board of Education and Discipline.

Ogelman, H. G., ve Güngör, H., (2015). Türkiye'deki okul öncesi dönem çevre eğitimi çalışmalarının incelenmesi: 2000-2014 yılları arasındaki tezlerin ve makalelerin incelenmesi. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 12*(32), 180-194.

Okyay, Ö., Demir, Z. G., Sayın, A., ve Özdemir, K., (2021). Ekolojik okuryazarlık eğitiminin okul öncesi öğretmenlerinin ekolojik farkındalığı ve çevreye yönelik motivasyonlarına etkisi. *Başkent University Journal of Education, 8*(1), 129-146.

Özsoy, S. (2012). Examination of the environmental perceptions of primary school students through the pictures they draw. *Educational Sciences in Theory and Practice, 12* (2), 1117-1139.

Özsoy, S., ve Ahi, B., (2014). İlkokul öğrencilerinin geleceğe yönelik çevre algılarının çizdikleri resimler aracılığı ile belirlenmesi. *Educational Sciences: Theory & Practice. 14*(4), 1557-1582.

Öztürk, T., ve Öztürk, F. Z., (2015). Öğretmen adaylarının çevre ve çevre eğitimi ile ilgili görüşleri Ordu Üniversitesi örneği. *Balıkesir Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 18*(33), 115-132. https://doi.org/10.31795/baunsobed.645444.

Polat, Ö., ve Demirci, F. G., (2021). Erken çocukluk döneminde bilişsel gelişime bir uyaran olarak doğa ile temas ve doğa temelli açık alan etkinlikleri. *Muş Alparslan Üniversitesi Eğitim Fakültesi Dergisi, 1*(2), 95-113.

Pridmore, P., & Bendelow, G. (1995). Images of Health: Exploring beliefs of children using the 'draw-and-write' technique. *Health Education Journal, 54*(4), 473–488. https://doi.org/10.1177/001789699505400410.

Rennie, L. J., & Jarvis, T. (1995). Children's choice of drawings to communicate their ideas about technology. *Research in Science Education, 25*(3), 239–252. https://doi.org/10.1007/bf02357399.

Robertson, A. (1993). Eliciting students' understandings: Necessary steps in environmental education. *Australian Journal of Environmental Education, 9*, 95-114.

Rodari, P. (2007). Science and scientists in the drawings of European children. *Journal of Science Communication, 6*(3), 1-12. https://doi.org/10.22323/2.06030304.

Şahin, H. G., ve Doğu, S., (2018). Okul öncesi öğretmen adaylarının çevre sorunlarına ilişkin tutum ve davranışlarının incelenmesi. *İlkogretim Online, 17*(3), 1402-1416.

Shepardson, D. P. (2005). Student ideas: What is an environment?. *The Journal of Environmental Education, 36*(4), 49.

Shepardson, D. P., Wee, B., Priddy, M., & Harbor, J. (2007). Students' mental models of the environment. *Journal of Research in Science Teaching, 44*(2), 327–348. https://doi.org/10.1002/tea.20161.

Şimşekli, Y. (2001). Evaluation of the activities carried out in the schools selected for the "Applied Environmental Education" Project in Bursa in terms of the contribution of school administrators and teachers. *Journal of Uludağ University Faculty of Education 14*(1), 73-84.

Sobko T, Jia Z, Brown G., (2018). Measuring connectedness to nature in preschool children in an urban setting and its relation to psychological functioning. *PLoS ONE 13*(11): e0207057. https://doi.org/10.1371/journal.pone.0207057.

Tanner, T. (1980). Significant life experiences: A new research area in environmental education. *The Journal of Environmental Education*, *11*(4), 20-24.

Tasdemir, C. Y., ve Yildiz, T. G. (2024). Science learning needs of preschool children and science activities carried out by teachers. *Journal of Turkish Science Education*, 21(1), 82-101.

Thomson, P. (2008). *Doing visual research with children and young people*. Routledge.

Tillmann, S., Tobin, D., Avison, W., & Gilliland, J. (2018). Mental health benefits of interactions with nature in children and teenagers: A systematic review. *Journal of Epidemiol Community Health*. *72*(10), 958-966. https://doi.org/10.1136/jech-2018-210436.

Türkoğlu, B. (2019). Opinions of preschool teachers and pre-service teachers on environmental education and environmental awareness for sustainable development in the preschool period. *Sustainability, 11*(18), 4925. https://doi.org/10.3390/su11184925.

Twohig-Bennett, C., & Jones, A. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environmental research, 166*, 628-637. https://doi.org/10.1016/j.envres.2018.06.030.

Üstün, N., ve Ürey, M. (2024). Investigating variables predicting environmental awareness in the context of education for sustainable development: An analysis based on TIMSS 2019 Data. *International Journal of Turkish Education Sciences, 12*(1), 85-129. https://doi.org/10.46778/goputeb.1320538.

Yavuzer, H. (2005). *Çocuğu tanımak ve anlamak*. Remzi Kitabevi.

Yavuzer, H. (2009). *Resimleriyle çocuk* (3. Baskı). Remzi Kitabevi.

Yılmaz, S., Yılmaz-Bolat, E., ve Gölcük, İ., (2020). Erken çocukluk döneminde uygulanan çevre eğitim programının çocukların çevreye karşı tutumları üzerindeki etkisi. *Van Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi, 17*(1), 557-578. https://doi.org/10.33711/yyuefd.693833.

Yin, R. K. (2003). *Case study research: Design and methods*. SAGE Publications.

Yurttaş, A. (2023). Okul öncesi beş yaş grubu çocukların çevre sorunlarına ilişkin algıları, *Trakya Eğitim Dergisi, 13*(1), 695-710. https://doi.org/10.24315/tred.1084475.

Yurttaş, A., ve Erdaş-Kartal, E., (2021). İlkokul öğrencilerinin çevreye yönelik tutumlarının çeşitli değişkenler açısından incelenmesi. *Akademia Doğa ve İnsan Bilimleri Dergisi, 7*(1), 32-51.