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RESEARCH ARTICLE
Landscape Architecture

Tackling Biophobia in Children Through Biophilic Design

Biyofobik Eğilimleri Önlemede Biyofilik Stratejiler

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ABSTRACT

The increasing biophobia (disconnection from and fear of nature) among children in the context of rapid urbanization leads to serious problems such as physical inactivity, attention deficits, emotional disorders, and weakened social skills. This study examines the role of biophilic design in helping children reconnect with nature and reducing biophobia. Biophilic design is a design philosophy that supports humans' innate need to connect with nature (biophilia) by integrating natural elements into the built environment. According to literature review and analysis of international examples, contact with nature significantly enhances children's cognitive development, academic achievement, creativity, psychological resilience, and social adaptation. For instance, learning activities conducted in natural environments extend children's attention spans and increase their motivation to learn. However, factors such as unplanned urbanization, reduction of green spaces, digital addiction, and parents' lack of awareness about nature contribute to children's disconnection from nature and increase biophobic tendencies. As seen in the case of Trabzon, where green space ratios in city centers drop to as low as 2-3%, this issue becomes even more pronounced. In this context, the study advocates for the implementation of biophilic design in schoolyards, playgrounds, parks, and educational programs to enhance children's interaction with nature. Proposed strategies include creating green classrooms based on biophilic design principles in schools, developing nature-based curricula, organizing family-involved nature activities, and expanding child-friendly micro-green spaces in urban planning. In conclusion, biophilic design can improve individual well-being by fostering ecological awareness in children while also instilling the love for nature necessary for a sustainable future.

Keywords: Biophobia, Biophilic design, Nnature-based education

ÖZET

Kentleşmenin hızlanmasıyla birlikte çocuklarda görülen biyofobi (doğadan uzaklaşma ve doğa korkusu), fiziksel hareketsizlik, dikkat eksikliği, duygusal düzensizlikler ve sosyal becerilerde zayıflama gibi ciddi sorunlara yol açmaktadır. Bu çalışma, biyofilik tasarım yaklaşımının çocukların doğayla yeniden bağ kurmasını sağlayarak biyofobiyi azaltmadaki etkisini incelemektedir. Biyofilik tasarım, insanların doğuştan gelen doğa ile bağlantı ihtiyacını (biyofili) destekleyen, yapılı çevreye doğal unsurların entegre edildiği bir tasarım felsefesidir. Literatür taraması ve uluslararası örneklerin analizine göre, doğa ile temas; çocukların bilişsel gelişimini, akademik başarısını, yaratıcılığını, psikolojik sağlamlığını ve sosyal uyumunu önemli ölçüde desteklemektedir. Örneğin, doğa içinde yapılan öğrenme aktiviteleri, çocukların dikkat süresini uzatmakta ve öğrenme motivasyonunu artırmaktadır. Ancak, plansız kentleşme, yeşil alanların azalması, dijital bağımlılık ve ebeveynlerin doğa ile ilgili bilinç eksikliği gibi faktörler, çocukların doğadan kopmasına ve biyofobik eğilimlerin artmasına neden olmaktadır. Trabzon örneğinde olduğu gibi, kent merkezlerinde yeşil alan oranlarının %2-3 gibi düşük seviyelere inmesi, bu sorunu daha da derinleştirmektedir. Bu bağlamda çalışma, biyofilik tasarımın çocukların doğa ile etkileşimini artırmak için okul bahçeleri, oyun alanları, parklar ve eğitim programlarında uygulanması gerektiğini savunmaktadır. Önerilen stratejiler arasında; okullarda biyofilik tasarım prensiplerine uygun yeşil sınıflar oluşturulması, doğa temelli müfredat geliştirilmesi, aile katılımlı doğa etkinlikleri düzenlenmesi ve şehir planlamasında çocuk dostu mikro-yeşil alanların yaygınlaştırılması yer almaktadır. Sonuç olarak, biyofilik tasarım, çocuklarda ekolojik farkındalık geliştirerek hem bireysel sağlığı iyileştirebilir hem de sürdürülebilir bir gelecek için gerekli olan doğa sevgisini aşılayabilir.

Anahtar Kelimeler: Biyofobi, Biyofilik tasarım, Doğa temelli eğitim

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INTRODUCTION

Since the beginning of existence, humankind has used nature without concern for the future and consumed its riches as if they were inexhaustible (Onur, 2023, 2024). This exploitation has led to a reduction in green spaces in cities and has caused numerous problems. These consequences have deeply affected children—the youngest members of society—who make up 30.3% of the global population and approximately 25.5% of the population in Türkiye (Anadolu Agency, 2025). As a result of these impacts, children have become increasingly distanced from nature, developing nature phobia, fear, and deprivation from natural environments (Clements, 2004; Louv, 2008; Driessnack, 2009). Growing up disconnected from nature has led to widespread issues such as obesity, attention deficit disorder, impaired social skills, increased violence, mental health deterioration, and depression (Steinbeck, 2001; Janssen et al., 2006; Louv, 2008; Hinkley, Crawford, Salmon, Okely, Hesketh, 2008; Alat, Akgümüş, Cavalı, 2012; Yüceşir, Bektaş, 2014). At the same time, these children are growing up in a world deprived of joy, creativity, critical thinking, individuality—in essence, many of the very qualities that make being human meaningful (TEMA, 2017).

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Being in contact with nature has numerous benefits: it can increase academic achievement by 5–14%, boost learning speed by 20–26%, and enhance performance in math and science by 10–14% (Heath, 2015). In memory tests, people who took walks in nature showed a 20% increase in memory capacity compared to those who walked in urban environments (Berman et al., 2018). Children who study outdoors demonstrate attention and perception levels twice as high as those studying indoors. Students in classrooms with natural daylight perform 20% better in math and 26% better in reading (Oblinger, 2006). Additionally, students in classrooms with plants show improved comprehension of lessons (Doxey & Waliczek, 2009). These are just a few of the many advantages. Although numerous studies emphasize the necessity of reconnecting children with nature, various factors have distanced them from it and restricted their opportunities to explore freely (Malone, 2007; Hillman et al., 1990). The leading causes of children growing up distanced from nature—becoming nature-phobic, fearful, or deprived—include rural-to-urban migration, the unconscious use of technology, reduction of green spaces due to unplanned urbanization, the obligation to spend time indoors in educational and professional settings, nature education that remains theoretical, parents overwhelmed by busy work schedules, and a general lack of societal awareness regarding the positive impact of nature on human well-being.

In Trabzon, the green space per person is 8.59 m².However, despite this potential, the proportion of green space in the city center drops as low as 2–3%. Considering that 65% of the population lives in city centers, this situation is far from promising. Even in a city like Trabzon, which has a high green space potential, the limited contact with nature is among the concerning outcomes. Given these findings, the increasing number of children who have minimal contact with nature, grow distant from it (biophobic), and even fear it, is not a surprising result. Accordingly, problem analyses and literature studies point to the need for raising individuals who are ecologically aware and in contact with nature (biophilic) as one of the essential requirements for the continuity of a healthy society. To meet this need, ecological awareness must be instilled in children—the smallest members of society—from an early age. In order to nurture healthy, happy, and productive adults, it is crucial to establish an early understanding of raising children who have a strong relationship with nature. Literature shows that even a 20-minute walk in nature positively contributes to both physical and mental well-being (Berman et al., 2018) (Figure 1).

Figure 1: Play with nature activities

The literature reviewed within the scope of this study highlights the numerous psychological and physical benefits of nature on human well-being. The works of leading figures in biophilic design, such as Beatley (2010) and Orr (2002), were examined as part of the study. In his book Biophilic Cities (2010), Beatley emphasizes the stimulating, educational, and various other positive effects of nature. Studies by Burdette & Whitaker (2005), Kellert (2005), and Taylor & Kuo (2006) state that children's contact with nature and opportunities for unstructured play offer numerous cognitive, social, and health benefits. Chawla (2007) describes the relationship between nature and play as a bond that brings joy into children's lives, granting them a unique sense of quality (Stephens, 2009).

Spaces where children can engage with nature offer opportunities that encourage creativity (Lester & Maudsley, 2007). These opportunities help children become creative, independent individuals capable of implementing their ideas (Onur, 2023, 2024), and assist them in discovering their own talents (Rivkin, 1995). Additionally, they contribute to academic success in areas such as science, mathematics, literacy, social studies, and the arts (Wilson, 1995). Drawing on these studies, the present work emphasizes the importance of play and nature interaction in strengthening the bond between children and nature, especially for those who have become disconnected from it. The study's focus on children who have grown distant from nature (biophobic) is supported by existing literature. In Türkiye, there are very few studies that bring together the biophilic design approach and children. The following sources have been essential in shaping the study within this context: Clements (2004); Rosenow (2008); Chawla (1999, 2007); Engleson & Yockers (1994); Samways (2007); Wells & Lekies (2006). Spending long periods of

inactive time in front of the television or computer is among the biggest obstacles to children spending time outdoors (Clements, 2004).

- ✓ Young children are growing up much more familiar with Blackberry phones connected to wireless networks than with blackberries growing in nature (Rosenow, 2008).
- ✓ Even if children want to play outside today, there is not enough space due to urbanisation.
- ✓ When individuals lose their connection to nature, they also lose their feelings of protecting, respecting, and not polluting nature (Chawla 1999; 2007; Engleson and Yockers, 1994; Samways, 2007; Wells and Lekies, 2006).

Cognitive and Academic Contributions of Contact with Nature;The cognitive and academic benefits of contact with nature are quite significant. Research shows that educational environments integrated with nature significantly improve children's learning levels, attention spans and academic achievement. For example, the Project Learning Tree programme implemented in the United States has proven that nature-based learning develops skills such as critical thinking, problem solving and environmental responsibility in children. It has been observed that lessons conducted in nature provide more lasting learning than traditional classroom environments. The Learning Through Landscapes initiative in the United Kingdom has reported a significant increase in students' performance in science, mathematics, and art classes through the redesign of school gardens according to biophilic principles. In this application, it has been determined that observation, experimentation, and play-based activities in nature increase learning motivation.

Natural areas designed by landscape architects according to ecological principles in school gardens and campuses not only reduce students' stress, but also develop their observation skills and curiosity for discovery with the rich stimuli they offer. Such nature-based educational environments make the learning process more enjoyable and effective while also positively influencing academic performance. For this reason, landscape architecture and ecology disciplines play a critical role in the design of educational spaces that provide children with the essential connection to nature for their cognitive and academic development.

The Psychological and Emotional Benefits of Contact with Nature;Findings have shown that children who are in regular contact with nature experience reduced anxiety levels, improved self-regulation skills, and fewer symptoms of depression. Initiatives such as Leave No Child Inside (USA) have shown that participating in weekly nature walks has a positive effect on children's mental well-being. Long-term observations in this project have shown that connecting with nature increases emotional resilience and self-confidence in children. Similarly, in the Nursery Fields Forever project led by architects in the Netherlands and Italy, a farm school model where children play directly with nature and animals has been reported to support children's emotional development and foster more empathetic individuals in social relationships.

The Relationship Between Biophobic Tendencies and Urbanisation; According to the findings of the study, rapid urbanisation, unplanned construction, and the reduction of green spaces significantly limit children's contact with nature and increase their biophobic tendencies. In Turkey, although the amount of green space per person in Trabzon is 8.59 m², which seems positive, it has been determined that this ratio drops to 2-3% in the city centre. This situation leads children in residential areas with reduced direct interaction with nature to perceive nature as a threat or an unknown entity. This finding aligns with studies conducted by Clements (2004) and Louv (2008). It has been observed that children who spend long hours in front of digital screens and lack access to green spaces for play exhibit biophobic symptoms such as fear, avoidance, and disinterest toward nature more frequently.

The Contribution of the Biophilic Approach to Social Sustainability;It has also been demonstrated that nature-integrated educational areas provide not only individual but also social benefits. The US-based Green Hour Initiative project ran a campaign aimed at getting children to spend at least one hour a day in nature, and it was reported that vandalism rates decreased and social solidarity increased in participating regions. These results show that the connection established with nature during childhood develops environmental awareness and social belonging in later years. In Turkey, activities such as Observing the Campus with Routes conducted by the TEMA Foundation have revealed that children gain awareness about plant diversity and ecosystems and develop their empathy skills during nature observation.

Lack of Awareness Regarding Biophilic Design Applications; Another noteworthy finding of the study is that biophilic design in Turkey has been integrated to a limited extent in applications aimed at children. Current applications remain largely theoretical, with very few programmes providing direct interaction with nature in the field. Instead of structured nature education processes for children, limited-time activities are used, which makes it difficult to achieve long-term behavioural change.

There are many projects in Turkey and around the world that organise educational activities and events that take advantage of the benefits of nature on children. Some of these projects are as follows:

Many international initiatives have developed educational models that support children's learning in close contact with nature. The UK-based Learning Through Landscapes initiative aims to bring out children's individual talents through the stimulating power of nature. In this project, school gardens and natural resources are used effectively to ensure that children both enjoy themselves and learn (Learning Through Landscapes, 2025). In Turkey, the TEMA Foundation has been contributing to nature-based learning models since 1992 by conducting children's and youth education and biodiversity conservation projects (Tema, 2017). The Nursery Fields Forever project, run by architects from Italy and the Netherlands, supports children's learning through observation by interacting with animals and nature in a farm environment. This approach has ensured that fauna elements are also included in the activities prepared (The Nursery Fields Forever, 2025). Similarly, the Leave No Child Inside initiative, which argues that children's connection with nature has positive effects on their physical, mental and emotional health, supports education through field trips and tactile learning-based activities (Leave No Child Inside, 2025). The US-based Green Hour (National Wildlife Federation Green Hour Initiative) has developed open classroom practices that encourage children to spend at least one hour a day in nature. Inspired by this initiative, nature-based open space educational activities have been organised (NWF Green Hour, 2025)

Finally, the Project Learning Tree project aims to support children's enjoyment, play and development in nature, viewing nature as the greatest teacher (Learning Tree Project, 2025). The project teaches children about the role of plants in nature and why ecological heritage must be protected through experiential learning. In applications based on this project, the functions of plants in ecosystems and the importance of passing this knowledge on to future generations have been emphasised. These holistic approaches have formed the theoretical basis for the activities developed, highlighting the multifaceted benefits of nature-based education.

Research aim

The main objective of this study is to reveal why and how children should be raised as biophilic (in touch with nature) individuals in the face of increasingly biophobic (nature-averse) tendencies today. Especially in today's conditions, where urbanisation, digitalisation, and modern lifestyles have weakened connections with the natural environment, the biophilic design approach is seen as a critical tool for revitalising human-nature interaction. Building on the work of Orr (2002), Beatley (2010), and Reeve et al. (2012), the study aims to examine the fundamental principles of biophilic design within the context of child development. In this context, the primary questions addressed by the research are as follows (Figure 2):

- ✓ What are the underlying causes of biophobic tendencies in children?
- ✓ How can the biophilic design approach play a role in strengthening children's connection with nature?
- ✓ What are the positive effects of increased contact with nature on children's physical, mental and emotional development?
- ✓ What are some effective biophilic design strategies that can be implemented in educational environments and urban spaces?

In light of these questions, the study aims to improve the quality of children's relationship with nature and to ensure that they gain ecological awareness for a sustainable future. It is envisaged that the solutions offered by biophilic design will not be limited to physical environmental arrangements, but will also be integrated into educational programmes and family participation activities. In this context, the study emphasises how important it is for children to grow up in harmony with the natural environment, not only for their individual health and happiness, but also for the development of social sustainability and environmental awareness. The research findings are expected to serve as a guide for educators, urban planners, architects and policymakers.

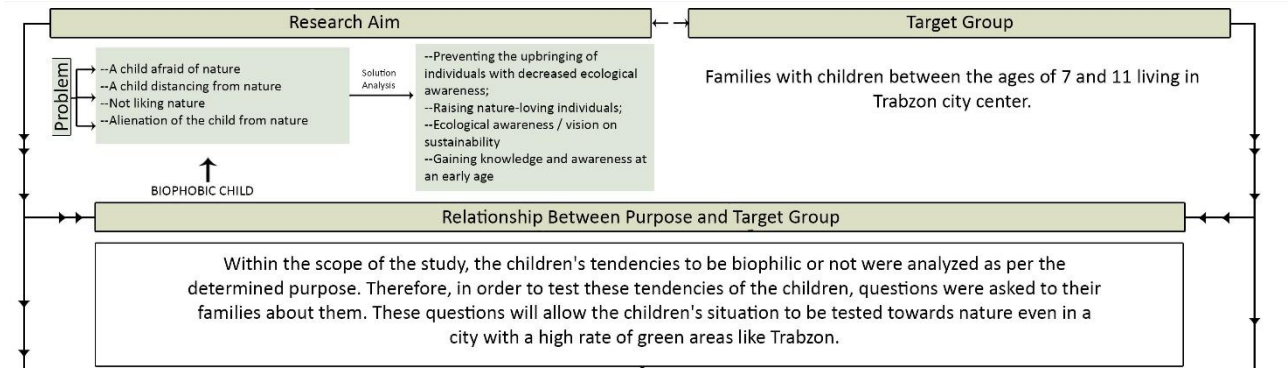

Figure 2: Research aim

METHOD

In this phase of the study, a survey was conducted with families with children living in the city of Trabzon. The survey was conducted with 150 people. The survey consisted of 2 stages. The first 24 questions of the survey were designed with the structure of "answer these questions by thinking of your child". For example, does your child "like playing outside?" In the second part of the survey, there were 2 different questions directed to parents (Figure 3). The purpose of these questions was to question how much time parents spend with their children in nature. The first phase of the survey consisted of a total of 24 items, and each question aimed to measure interest, attitudes and preferences towards nature. Two options were provided for each question, and these options were evaluated with a binary scoring system:

- ✓ Positive options reflecting love and interest in nature were evaluated as +1 point,
- ✓ Options reflecting indifference or negative attitude towards nature were evaluated as –1 point.

In some questions, an option such as "Both" or similar was provided, where the participant could have a neutral attitude, and such answers were accepted as 0 (zero) points. When the scoring range and interpretation are evaluated on a ±1 point basis for each question, the maximum score that can be obtained when a total of 24 questions are taken into account is +24, and the minimum score is –24. +24 points: High interest, love and positive attitude towards nature, 0 points: Neutral or indecisive attitude, –24 points: Low interest, distance or negative attitude towards nature. This scoring system allows for the quantitative analysis of children's relationships with nature and enables comparisons to be made between individuals' attitudes towards nature.

Stage 1	1.Do you enjoy playing outside?	□ Yes (+1) □ No (–1)
	2.Would you rather spend time in nature or go to the mall?	□ Nature (+1) □ Mall (–1)
	3.Do you enjoy indoor games?	□ Yes (+1) □ No (–1)
	4.What gift would you prefer?	□ Phone (–1) □ Dog/Cat (+1)
	5.What do you do if you see a bug?	□ Scared/kill it (–1) □ Catch/play (+1)
	7.6.Do you like digging in soil?	□ Yes (+1) □ No (–1)
	8.Do you enjoy learning about wild animals?	□ Yes (+1) □ No (–1)
	9.Do you like jumping in puddles?	□ Yes (+1) □ No (–1)
	10.Do you enjoy playing by water?	□ Yes (+1) □ No (–1)
	11.Do you like catching and studying bugs?	□ Yes (+1) □ No (–1)
	12.Do you enjoy listening to bird songs?	□ Yes (+1) □ No (–1)
	13.Do you like stargazing?	□ Yes (+1) □ No (–1)
	14.Where do you prefer to play?	□ Outside (+1) □ Inside (–1) □ Both (0)
	15.Which is more interesting to you?	□ Toy store (–1) □ Zoo (+1)
	16.What do you do if you see an injured cat on the street?	□ Help/adopt (+1) □ Leave it (–1)
	17.What do you prefer on weekends?	□ Play at home/computer (+1) □ Picnic in nature (–1)
	18.Which activity is more fun for you?	□ Planting trees, growing flowers (+1) □ Playing tablet/computer games (–1)
	19.Do you enjoy observing animals in nature? (birds flying, spiders spinning webs etc.)	□ Yes (+1) □ No (–1)
	20.Do you like walking barefoot on grass?	□ Yes (+1) □ No (–1)
	21.Would you enjoy planting your own vegetable or flower garden?	□ Yes (+1) □ No (–1)
	22.Do you like collecting leaves, stones, or flowers from nature?	□ Yes (+1) □ No (–1)
	23.Would you rather watch animals in the forest than a cartoon?	□ Yes (+1) □ No (–1)
	24.How do you feel when you're in a forest or park?	□ Happy/peaceful (+1) □ Bored/uncomfortable (–1)
Stage 2	1.Do you let your child play in nature?	□ Yes □ No
	2.How often do you let your child play in nature/green environments?	□ Everyday □ Twice a week □ Once o month □ Once a year □ Never

Figure 3: Survey questions and stages

Within the scope of this system, the minimum score that an individual can receive is determined as -24, and the maximum score is determined as +24. With this scoring, the level of relationship that individuals have with nature can be measured and analyzed quantitatively (Table 1).

Table 1: Survey scoreboard

Total Score Range	Comment
+17 … +24	High love of nature and positive attitude
+9 … +16	Moderate interest in nature
0 … +8	Low love of nature or ambivalence
–1 … –8	Low interest in nature or aloofness
–9 … –24	Marked alienation from nature and negative attitude

FINDINGS

The literature review, local data and project examples conducted within the scope of the study reveal significant differences in the multidimensional development of children who grow up in contact with nature. In this context, the effects of biophilic design on children have been evaluated from various perspectives and analysed with the support of example projects from around the world. The findings are summarised below under thematic headings:

Evaluation of survet results

This survey study, conducted with 150 parents of children in Trabzon province, aims to evaluate children's attitudes towards nature through parental observations. The first 24 questions in the first section of the survey consist of questions that parents should answer by considering their children, and this section reflects children's interest, love and preferences towards natüre (Table 2).

Table 2. Results of survey

Total Score Range	Comment	Number of Participants
+17 … +24	High love of nature and positive attitude	35 people (23%)
+9 … +16	Moderate interest in nature	50 people (33%)
0 … +8	Low interest in nature or indecision	40 people (27%)
–1 … –8	Low interest in nature or distant attitude	15 people (10%)
–9 … –24	Significant distancing from nature and negative attitude	10 people (7%)

Based on the data obtained, children's attitudes towards nature were observed at different levels. Children in the highest score range (+17 to +24) showed a strong interest and love for nature according to their parents' observations, engaging in behaviours such as participating in outdoor games, interacting with animals, and coming into contact with the natural environment. This group has the potential to become nature-sensitive individuals. Children with medium scores (+9 to +16) generally have a positive attitude towards nature; however, this interest may be balanced by urban life, technological activities, or alternative social preferences at times. It is anticipated that nature-based education programmes could be beneficial for individuals in this group. Children with lower scores or neutral attitudes (0 to +8) have a weak connection with nature, suggesting that they may not have sufficient contact with nature or have limited experiences. Children in the lowest score range (–1 to –24) exhibit a distinct lack of interest, fear, or negative attitude toward nature; this situation should be carefully addressed in terms of environmental awareness, cognitive development, and emotional balance. Urbanisation, digitalisation, and limited nature interactions within families are considered significant factors contributing to the development of these negative attitudes (Table 3, Figure 3).

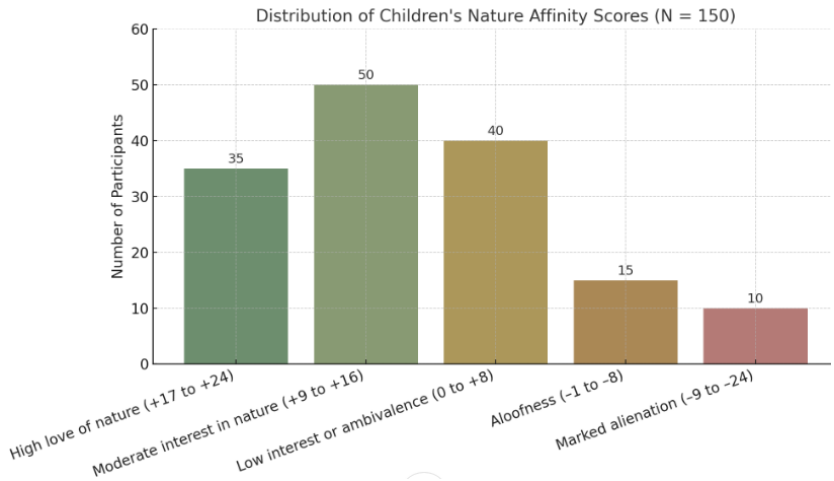

Figure 3. Distribution of childiren's natüre affinity scores

When the distribution of responses to the questions was examined, analysis of the responses to the 24 questions in the survey revealed that children's general attitudes towards nature were predominantly positive. Highly positive responses were given to behaviours involving physical and sensory contact with nature, such as outdoor activities, playing with water, watching the stars, and being in nature; this indicates that children have a natural inclination towards nature. However, it is noteworthy that negative responses increase in situations that require closer contact with nature, such as playing with insects, observing insects, and working with soil. This indicates that although children have a high emotional affinity for nature, some children may be shy or fearful when it comes to physical contact. When asked to choose between technology and nature (e.g., playing with a tablet vs. planting a tree, watching cartoons vs. watching documentaries), a significant proportion of children were found to prefer technology. This suggests that digital habits may have a negative impact on the development of a love of nature. The percentage of positive responses was relatively low in questions reflecting environmental awareness, such as compassion and helping animals. However, it was found that interest was higher in mild nature experiences such as listening to birdsong, walking in nature, and collecting natural materials. In conclusion, it is understood that children have an internal interest in and positive attitude toward nature, but this relationship cannot fully develop due to technology addiction, urbanisation, and limited physical nature experiences. Therefore, it can be said that there is a need for programmes that allow children to interact with nature in more direct and experiential ways.

Table 3: Answers given according to questions

Soru No	Pozitif (%)	Negatif (%)	Yorum
1	80	20	Açık hava oyunlarına yüksek ilgi
2	65	35	Doğada vakit geçirme tercihi baskın
3	60	40	Kapalı alan ilgisi dengede
4	55	45	Evcil hayvan tercihi önde
5	35	65	Doğaya doğrudan temas korkutucu olabilir
6	50	50	Toprakla etkileşim orta düzeyde
7	70	30	Vahşi hayvanlara ilgi yüksek
8	60	40	Doğal oyunlara olumlu yaklaşım
9	75	25	Suyla temas güçlü
10	40	60	Böcekleri gözlem ilgi düşük
11	55	45	Kuş seslerine ilgi orta
12	65	35	Gece doğasına duyarlılık var
13	40	30	Tarafsız tercihler yüksek
14	60	40	Hayvanlara yönelik ilgi fazla
15	45	55	Merhamet gelişimi sınırlı
16	48	52	Ekran başında vakit tercih ediliyor
17	42	58	Doğa temelli üretkenlik geride
18	50	50	Hayvan gözlemi ilgi dengede
19	55	45	Fiziksel temas olumlu
20	60	40	Doğa temelli üretim istekli
21	65	35	Doğal materyallere ilgi yüksek
22	40	60	Belgesel tercih düşük
23	70	30	Doğada bulunmak mutluluk verici

According to the survey results, 55% of families stated that they spent time with their children in nature or outdoors, while 45% stated that they did not engage in such activities. This finding is closely related to children's attitudes towards nature. Children from families who have more contact with nature were found to give more positive responses to questions such as participating in outdoor games, playing with water and soil, collecting natural materials, watching the stars, and enjoying being in nature. In particular, behaviours such as ‘walking barefoot on the grass,’ ‘feeling happy in nature,’ and ‘collecting natural materials’ indicate that children form an emotional bond with nature and that this bond is supported by frequent outdoor experiences. In contrast, children whose parents reported not spending time in nature with them (45%) showed a lower desire to engage in physical contact with nature. Children in this group tend to exhibit attitudes such as ‘fear of insects,’ ‘refusal to help injured animals,’ ‘preference for indoor spaces,’ and ‘preference for watching cartoons over documentaries.’ Additionally, these children's higher inclination toward technology—such as ‘preferring to play on a tablet rather than planting a tree’—suggests that a lack of time spent outdoors may reduce interest in nature. Overall, the findings reveal that children's love for nature is shaped not only by individual tendencies but also by family interactions. It has been observed that

children in families who spend time together in nature develop a more sensitive, interested, and positive attitude towards nature, while in families who do not spend enough time outdoors, more distant attitudes such as distancing themselves from nature, indifference, or turning to technology come to the fore. Therefore, spending time in nature with children can be considered a critical factor in developing a positive attitude toward nature (Figure 4).

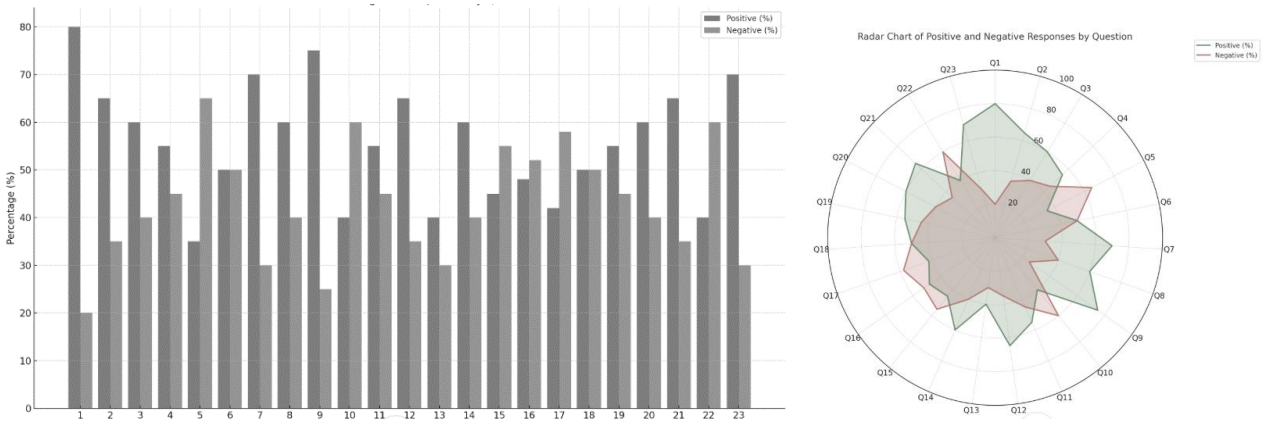

Figure 4: Graph and radar chart of positive and negative responses by questions

When asked how often they spend time in nature with their children, 43 respondents said twice a week, 15 said every day, 55 said once a month, and 37 said once a year, for a total of 150 respondents. Based on these results, it was observed that families have a high level of awareness of the importance of spending time in nature with their children. The survey was conducted with a total of 150 participants who live in Trabzon and have children. 83 families, constituting 55% of the participants, stated that they spend time in nature or outdoors with their children. In addition, 37 families (24.7%) stated that they engage in such activities only once a year. These data reveal that a significant portion of the participants are conscious about spending time with their children in nature and recognise the value of interaction with nature in terms of child development. Although the percentage of families that provide regular contact with nature is not at an ideal level, the fact that such activities are carried out even once a year shows that families understand the necessity of establishing a relationship with nature. The findings indicate that families generally have a high level of awareness regarding nature and are inclined to support their children's interaction with nature. This awareness is considered to have a direct impact on children's love of nature, environmental sensitivity, and attitudes toward outdoor activities. Therefore, policies and social awareness campaigns aimed at increasing the frequency with which families spend time in nature are of critical importance in strengthening children's connection with nature (Figure 5).

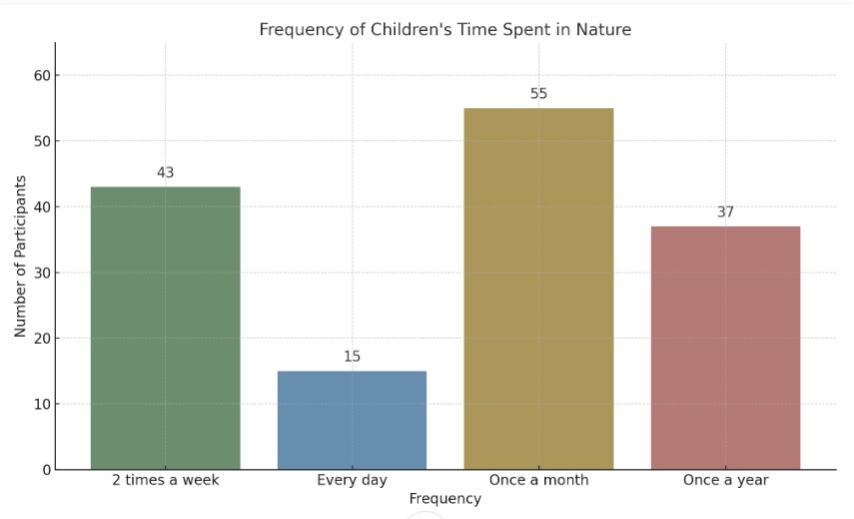

Figure 5: Frequency of children's time spent in natüre with their family

CONCLUSION AND RECOMMADATION

This study highlights the need to rebuild the connection between children and nature through a biophilic design approach at a time when children are becoming increasingly disconnected from nature as a result of urbanisation, technological developments and socio-cultural transformations, leading to an increase in biophobic individuals. In addition to the physical, mental, and emotional benefits frequently emphasised in the literature, contact with nature has long-term effects such as encouraging individuals to adopt sustainable lifestyles, environmental awareness, and

ecological consciousness. In this context, children's early and continuous interaction with nature is of critical importance not only for their individual health but also for society's environmental awareness and sustainability goals. The main findings of the study are as follows:

- ✓ Increase in biophobic tendencies: Factors such as urbanisation, unplanned construction, and the unconscious use of technology prevent children from interacting with nature and cause them to become alienated from it.
- ✓ Lack of educational content: Current education systems explain nature to children theoretically but fail to provide practical, tactile, and experience-based nature education.
- ✓ The potential of biophilic design: Biophilic design increases children's motivation to learn, extends their attention spans, and contributes positively to their emotional well-being.
- ✓ The need for innovative pedagogical approaches: Successful examples from Turkey and abroad show that play-based and nature-focused learning in open spaces leads to significant improvements in children's creativity, social adaptation, and cognitive development.
- ✓ Biophilic school designs will increase student achievement and improve the overall efficiency of the education system.
- ✓ An increase in child-friendly green spaces will enhance families' satisfaction with urban life and reduce migration trends.
- ✓ Biophilic design applications will raise awareness about carbon footprints and help raise climate-friendly generations.
- ✓ Micro-ecosystems created in school gardens will contribute to the protection of local flora and fauna.
- ✓ Applications such as urban butterfly gardens and bird watching areas will raise awareness of biodiversity among children.

The other part of the study, which was conducted with a survey, was conducted with the participation of 150 parents and aims to reveal the relationship between children's attitudes towards nature and the level of interaction between families and nature. In line with the survey study and thematic analysis of the findings, it was determined that children generally developed positive attitudes towards nature, but the level and quality of these attitudes varied depending on various variables. Children's interest in nature was divided into five groups according to the scores obtained from the 24 questions in the first part of the survey. Accordingly:

- ✓ 35 children (23%) have high love of nature and positive attitude (score range +17 to +24),
- ✓ 50 children (33%) have moderate interest in nature (+9 to +16),
- ✓ 40 children (27%) have low interest in nature or ambivalent attitude (0 to +8),
- ✓ 15 children (10%) have low interest or distance towards nature (–1 to –8),
- ✓ 10 children (7%) have marked alienation from nature and negative attitude (–9 to –24).

This distribution shows that approximately two-thirds of children (56%) have a positive tendency towards nature, but a significant portion (44%) have a low or negative attitude. Especially in the groups with low scores, elements such as limited contact with nature, fear, indifference and an orientation towards technology are evident. In addition, the frequency of children spending time in nature was analyzed according to parental responses. 43 children (29%) come into contact with nature twice a week, 15 children (10%) every day, 55 children (37%) once a month and 37 children (24.7%) only once a year. This finding shows that although the rate of those who have regular contact with nature (39%) is low, in general, families are highly aware of the importance of spending time with their children in nature. Indeed, 55% of the participants (83 people) stated that they spend time with their children in nature or outdoors. According to the responses given to the 23 attitude questions of the survey, children show a high level of positive approach to physical-sensory nature experiences, especially outdoor games (80% positive), contact with water (75%), interest in wild animals (70%), being in nature (70%) and curiosity towards natural materials (65%). In contrast, lower levels of positive attitudes were observed in subjects such as insect observation (40% positive), compassion and helping animals (45% positive), preference for watching documentaries (40% positive) and tendency to prefer playing with a tablet to nature (48% positive). These findings show that children have an innate tendency towards nature, but this tendency is not sufficiently supported in areas such as physical contact, developing compassion and combating digital habits. In particular, it was determined that children from families who spend more time in nature develop a stronger emotional bond with nature, while in children from families who have less contact

with nature, indifference, fear and addiction to technology are more dominant. According to the basic findings obtained from the research, the main results can be listed as follows;

Children's Interest in Nature Vary Significantly – While 23% of children exhibited a high level of love for nature, 27% showed low interest or indecisiveness, and 17% showed a significant distance or negative attitude. These differences indicate that the connection established with nature should be supported in childhood.

Direct Nature Experiences Shape Attitudes – Physical and sensory experiences such as playing outdoors, interacting with animals, and contact with natural materials play a critical role in children's development of positive attitudes towards nature. However, shyness or fear has been observed in situations that require closer interaction, such as contact with insects or working with soil.

Technology Use Can Reduce Interest in Nature – A significant portion of children prefer technology use (such as tablet games, watching cartoons) to nature-based activities. This suggests that digital addiction may prevent children from connecting with nature.

The Role of Families is Decisive – Children of families who regularly spend time with their children in nature (55%) have a higher love of nature and environmental awareness. In contrast, indifference or a tendency towards technology is more evident in children of families with limited contact with nature. Social Awareness and Policies are Important – Although families have a high level of awareness about nature, the rate of regular interaction is not at an ideal level. Therefore, expanding nature-based education programs in preschool and primary school periods, increasing urban green areas and awareness-raising activities for families will support children to establish a healthy bond with nature.

As a result, children's relationship with nature is shaped not only by individual preferences but also by family habits, environmental conditions and digital life practices. Therefore, developing policies that increase parental involvement, increase time spent in nature and encourage nature-based education programs in order to strengthen children's attachment to nature is of critical importance for environmental awareness and a sustainable future.In conclusion, children's relationship with nature requires a multidimensional approach. Steps taken at both individual and social levels will contribute to the development of future generations as environmentally sensitive, balanced and nature-harmonious individuals.

In this regard, the following innovative approaches and strategies are recommended:

- ✓ Biophilic Educational Areas Should Be Created: Areas such as school gardens, parks, and campuses should be redesigned according to biophilic design principles; safe, interesting, and diverse micro-natural areas should be designed where children can connect with nature through play.
- ✓ Nature-Based Curriculum Should Be Developed: Modules that increase ecological awareness and integrate experience-based learning with nature should be integrated into education programmes; biophilic values should be interdisciplinary linked with core subjects such as mathematics, science, and social studies.
- ✓ Family Participation Should Be Strengthened: Parents should be made aware of the importance of interacting with nature, and family-based nature activities should be promoted. Parents' attitudes towards nature directly influence children's perceptions.
- ✓ Prioritising Biophilia in Urban Planning: In urban planning, the quality of green spaces should be improved as well as their quantity; micro green spaces, pocket parks, nature trails and discovery areas accessible to children should be created.
- ✓ The Biophilic Schools Project Should Be Implemented: Pilot school projects based on biophilic design should be developed, especially in Turkey, and the psychological, cognitive, and social effects of these schools should be scientifically monitored by regularly measuring the amount of time children spend in contact with nature.
- ✓ Design with Child Participation: Incorporating children's ideas into the design of nature-based spaces will increase their participation in the process as users and strengthen their sense of belonging.
- ✓ Urban Biophobia Indicators Should Be Monitored: As in the example of Trabzon, indicators such as the amount of green space per person, the time children spend in open spaces, and fear of nature (biophobia) should be monitored and reported periodically at the city level.
- ✓ Technological Balance Approach: In the digital age, biophilic design should aim to strike a balance between technology and nature. Digital detox areas can be created. Creating 'technology-free green corners' in schools and offering nature-based games as alternatives to digital games will support this process.

The importance of green spaces in every part of the city is increasing day by day (Gülpınar Sekban, Bekar, Acar 2019; Gülpınar Sekban, 2021; Gülpınar Sekban, Acar 2021a; Gülpınar Sekban, Acar 2021b; Gülpınar Sekban, Acar 2024). The biophilic design approach has been implemented in many projects around the world. Singapore, in particular, is one of the pioneering cities that has placed this approach at the centre of its urban planning strategies. Along with Singapore, Portland, Chicago, Toronto and Berlin are also among the cities that have adopted biophilic principles. The most important reason these cities have become leaders in biophilic design today is their ability to successfully integrate this approach into a 'comprehensive landscape planning' rather than limiting it to specific areas (Onur, 2023).

This comprehensive approach will enable children to adapt to the digital world and establish healthy connections with nature. The adoption of biophilic design should be approached as an interdisciplinary process requiring collaboration not only between educators and architects, but also economists, health professionals, and urban planners. In conclusion, this study highlights the positive effects of the biophilic design approach on children while advocating for the systematic increase of contact with nature to reduce biophobic tendencies. Children's contact with nature is not only critical for individual health but also for fostering a sense of responsibility toward nature in future generations. In this context, it is anticipated that the reconnection with nature will not only promote environmental sustainability but also social sustainability.

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