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Desiring to connect to Nature: The effect of
sustainable surroundings of schools on children's
environmental attitudes&behaviors a case study in
Tabriz, Iran

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Declaration

I hereby declare that the contents and organization of this dissertation constitute my original work and do not compromise the rights of third parties, including those relating to the security of personal data.

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I want to dedicate this achievement to my father and mother, who, with love and

work, have accompanied me in this process without hesitating to see my goals

come true, which are also their dreams.

To my spouse, who has been my support in the hardships, to my dear friend

Negar who helped me through all this process, and to all those who made this

achievement possible: love and Unlimited thanks.

Acknowledgment

Abstract

How can children connect with nature? This study, which focuses on the impacts of school settings, is an interdisciplinary investigation to what extent and in what ways different socio-ecological conditions impact the development of the connection with the Biosphere. It assesses the environmental sensitivity, awareness, and attitudes of 100 Tabriz city children., their biophysical settings, and the environmental ethic of the sociocultural environment with which they have interacted (parents and teachers). In a nutshell, there are two main results. Equality Index (EQi) scores indicate how a child's biophysical environment shapes his or her interaction with nature.

In contrast to youngsters who are more exposed to urban environments, those who are more exposed to rural and natural settings are more concerned with preserving the environment. Second, society's perspective of that location influences children's attitudes regarding an environment. Children's teachers and parents agree that forests are dangerous places to play because of predators. Insight into the mechanisms that underlie the evolution of each emotion is hampered by the lack of empirical data and the complex web of socio-ecological variables that influence it.

However, the research shows that children's relationship with nature may be adapted to their socio-ecological surroundings, regardless of the results. Findings like this demonstrate the potential of numerous sectors to search for a mental reconnection between people and the environment, such as experiential learning or social memory transmission. It is also possible to utilize this scientific knowledge in an ever-growing metropolitan population attributable to urban planning.

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Chapter 1 Introduction

Human activity has long been recognized as the primary source of environmental consequences [1,2] Unsustainable implications of the concept that people are separate from and not a part of nature include climate change, species extinction, and chemical contaminants, to name just a few [2,3] Without a doubt, understanding the underlying causes of such destructive human behavior is critical for a prolonged, especially inability. Moreover, This knowledge is essential in cities, where most of the population lives. There is less time spent in nature due to the lifestyle it promotes, and it mainly has more negative effects on children. For instance, An eight-year-old in the UK spends 16 minutes a day in natural locations, and those minutes decline to 10 by the time these youngsters are 15 [4], .and youngsters are glued to screens [5] They can identify hundreds of business logos but just a handful of local plant and animal species[6]. It is alarming.

The lack of natural encounters in modern childhoods is problematic for three reasons. It is first and foremost beneficial for human health to have contact with nature since it affects all aspects of the human mind and body[7,8] Second, environmental exposure enhances mental and physical development over the short- and long-term [9–11] Third, it is becoming more widely accepted that youthful exposure to nature develops the foundations of sustainable lifestyles in adulthood [12]-[16]. The critical aspect of preserving contact with nature during an ecological catastrophe and the role of humans in a changing world is more relevant than ever. Individuals' increasing alienation from nature is not recent; instead, it results from a long-term shift in social norms that have altered how people relate to one another and the natural world[17] Indeed, estrangement from nature is widely cited as a significant impediment to ecological conservation [18], environmental concern, and various environmentally favorable actions.

The fact that "our view of nature is a result of our encounters with it, which vary as we advance through life phases" [19] is also well recognized. As in childhood, engagement with nature has an even more significant impact. Thus, this thesis' leading focus is on children for two reasons: For one, environmental degradation impairs children's ability to reach their full potential, and for another, research indicates that early beliefs and knowledge have a lasting impact on the thinking of adolescents and adults. We imply that this thesis should be directed at children to have a lasting effect.

Additionally, environmental education must begin in childhood if it is to have a significant influence on raising environmental consciousness. The establishment of a sustainability curriculum and activities has been undertaken by schools worldwide. There are three distinct categories: education about the environment, which emphasizes knowledge acquisition; environmental education, which stresses environmental responsibility; and education in the background, which promotes interactions and experiences in natural environments. According to studies, all of these traits must be made available to children through schooling to promote possibilities for education on environmentally-friendly practices.

Given these points, this thesis examines the effect of school surroundings based on their nature connectedness and environmental education programs and how they can affect children's environmental behaviors and attitudes. The study regards sustainable school environments as a "new typology that provides new locations" for children's environmental education through reconnection with nature. However, spending time in nature and achieving positives like improving environmental attitudes and ecological behaviors does not seem like a simple connection.

1.1. Need to study

Research shows that the gap between pro-environmental attitudes and pro-environmental behavior (PEB) has dramatically increased over the past 50 years. Additionally, there is growing interest in the literature in examining pro-environmental behavior, emphasizing adults, and not enough studies focused on children. Given the critical role of childhood in developing such behaviors, further study concentrating on children is necessary. It is also a somewhat complex process to change individuals' behavior. Hence, it is crucial to understand what motivates or barriers hold before this behavior changes in childhood and adults. Understanding why children participate in PEB and whether or not these behaviors endure into adulthood is essential for predicting environmental behaviors. Children's relationship to nature significantly impacts their physical, emotional, cognitive, and social development, similarly to their environmental attitudes and behavior. People lived in tiny towns and villages in the past. Living in communities with a wide variety of gardens and vast courtyards full of flowers, plants, and trees offered them easy access to outdoor areas and natural habitats. Unfortunately, houses have shrunk due to urbanization and changing lifestyles, leaving less room for outside

space. Also, children have lost connection to nature and mostly spend their time indoors watching TV or playing video games. It is time to reclaim our relationship with the natural world. To foster a bond between children and the natural world, This thesis will examine the potential use of schools and surroundings, where children spend most of their waking hours and are an essential part of their social experience, to explore its effects on children's environmental attitudes and behavior.

1.2. Aim

This project aims to conduct interdisciplinary research on how the relationship with nature evolves, its impact on children's environmental behavior and attitude, and how both might be affected by various educational contexts in a case study of Iran, Tabriz city.

1.3. Objectives

- Recognize children's perceptions of nature and space
- Address the interconnections between the development of children's environmental interactions and their multifaceted environments
- Introduction to several sustainable strategies for reconnecting with nature within the context of the redefined "school surroundings" typology.
- Understanding the impact of different types of school surroundings on children's different dimensions of environmental attitudes and behaviors
- addressing teachers' and parents' more or less favorable opinions of natural settings and how it affects children

1.4. Research question

Questions guiding this exploratory and qualitative investigation include:

- *What influence does the school's surrounding environment have on students' pro-environmental attitudes and behaviors?*
- *How may school environments and their access to environmental qualities in an urban context affect nature-reconnection flourish in children?*
- *Is there any relation between parents' and teachers' environmental ethics and knowledge and children's behavior?*

1.5. Scopes and Limitation

- The research will be conducted within the constraints of the Time Limit.
- The data will be collected with data access constraints during the research.
- Because there are so many different factors, this study does not try to give an all-encompassing explanation of how people connect their minds to the Biosphere. Instead, this study looks into theories and methods that have not been used in this field to develop a scientific concept that can cover essential parts of our connection with nature. The study framework's objective is not to identify factors and indicators but to blend social, geographical, and cognitive disciplines to present a whole picture of feeling connected with nature.

1.6. Working Methodology

This study's methodology combines quantitative and qualitative approaches. Methodology has two main parts.

The first methodological element assesses the setting in which children aged 7 to 13 were raised. Parents and teachers completed questionnaires to measure the child's exposure to natural environments and social contexts. Also, schools were assessed for their environmental quality exposure (i.e., which specific natural habitats have the child experienced?). Parents were also polled for information on their children's exposure to natural areas.

Second, children's environmental consciousness is evaluated. Rather than adopting the traditional, restrictive method, we would use tailored questionnaires to assess each child on the exact EC traits.

As a result, the research has been organized as follows. Two alternative methods were used to evaluate the spatial contexts a 7-13-year-old child has visited. Both are concerned with the places students go to school and places families go to spend time together. Similarly, the social situation is taken into account. Teachers' and parents' impressions of natural habitats are examined in two separate studies.
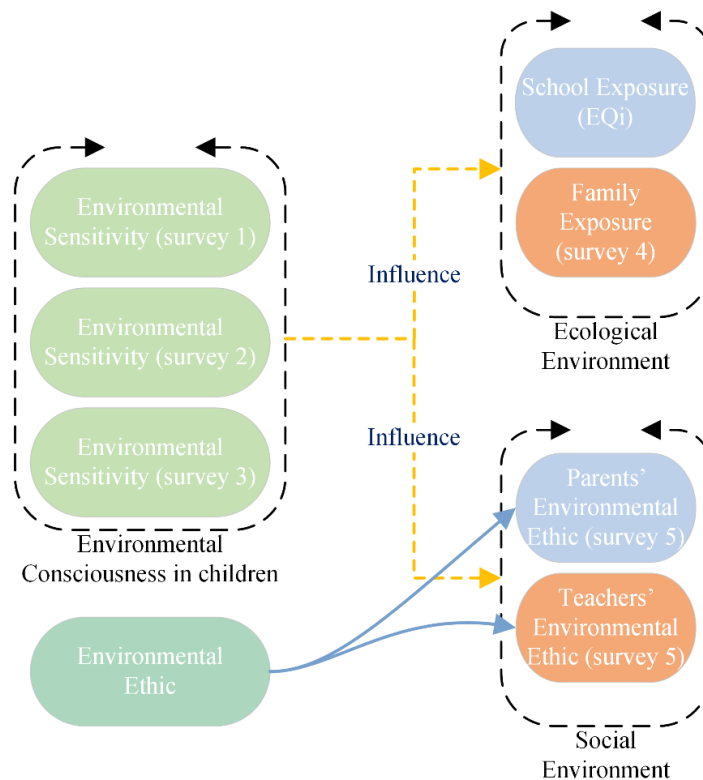
Figure 1: Illustration of research methodology

Source: Author

Selecting schools with varying access to natural surroundings was the initial stage in giving children in the research diverse environmental exposures. After the preliminary selection, those with the most and least access to nature will be evaluated. The Environmental Consciousness examination evaluates children's connection to nature.

Chapter 2 Environment, Children, and human-nature connection

This chapter categorizes the literature relating to the study issue into three sections. The first section comprises nature-connectedness-related subjects and, more significantly, provides a comprehensive picture based on the study of other scholars as to why concentrating on children is necessary. In addition, metrics and methods for assessing nature's connectivity are presented. The second section presents information on environmentally friendly behavior, also known as pro-environmental behavior, and its development during childhood. Additionally, the strengths and limitations of education's involvement in environmental behavior are outlined.

Last but not least, urban solutions relevant to the subject of research have been given, all of which contribute to the urban and city-scale sustainability perspective.

2.1. Glossary

a compilation of relevant definitions and opinions

1. Biosphere and Nature

terms of *Biosphere and Nature* In this study, the following terms are used interchangeably and are defined as follows:

"the global ecological system integrating all living beings and their relationships, including their interaction with the elements of the lithosphere, hydrosphere, atmosphere, and cryosphere ('biosphere' defined as elements of the lithosphere, hydrosphere, atmosphere, and cryosphere themselves." [3]

Unlike humankind or human innovations, the phenomena of the physical world in general, including plants, animals, the landscape, and other elements and products of the planet, are referred to as "nature." Thus, Biosphere and Nature refer to all living and non-living systems and natural processes. It is referred to as some parts' natural settlements and the natural world[20].

2. Nature connectedness

- Nature connectivity refers to people's subjective perception of their interaction with the natural world [21–23].

3. Place

- The place is a location with meanings and associations [24].

4. Childhood

- According to the United Nations definition of childhood, In this study, the term 'childhood' refers to this period in which children and young adults populate.

5. Sustainability

- Avoiding the depletion of natural resources to maintain an ecological balance [20].

6. Sustainable Development

- Development that meets the needs of the present without compromising the ability of future generations to meet their own needs [25].
-

7. Behavior

- How one acts or conducts oneself, especially towards others[20]

8. EQ - Environmental Quality

- the perceived quality of a place which used might foster an emotional affiliation with the Biosphere
- *EQi - Environmental Quality index*

9. Sociotope

- Sociotope mapping – exploring public open space and its multiple-use values in urban and landscape planning practice.

Part 1: Interrelation nature connection and children

2.2. Detachment: Loss of connection to the nature

Detachment from nature is not a phenomenon exclusive to adults; instead, multiple studies have shown indications of disconnection from the environment in children [26–31] Growing up in a more urbanized world, with worried parents and overly regimented schedules, children spend less time outside, harming their sense of emotional connection to the natural world [32] Perhaps the most noticeable difference between this generation of youngsters and their parents is how much time they spend outside. Numerous studies attribute the decline in time spent in nature to developing electronic hobbies, urban life, safety concerns, and tight scheduling. Increased technology breakthroughs and indoor leisure activities imply that natural experiences compete with those inside the built world [33–35] For instance, according to a survey, 12-year-old children spend an average of 19.2 hours per week in front of a computer or television, compared to only 5.6 hours outdoors, as their parents told [36]

Moreover, parents and children mismanaged and overscheduled schedules leaving little opportunity for free outside play [62],[63] As the number of people living in cities grows, so does the difficulty of getting to green areas and parks and worries about children's safety, all of which lead to less time spent outside by children [33,37] Creating negative feedback loops like these is bad for conservation, say Soga and Gaston (2016) [33]. People's interest in nature is likely to fade as their exposure to nature decreases. As a result, people are less inclined to seek out natural regions in the first place. People's disinterest in nature may be passed down through generations, resulting in a decrease in public awareness and appreciation of the natural world and a decrease in public support for its preservation. Many of the papers reviewed in this study reflect these concerns.

Pyle (1993) has coined the term' extinction of experience,' referring to how children's lack of close connection with nature often results in a lack of care for it [38] Children grow detached and afraid and often lose their ability to relate to and sympathize with the natural environment [39] According to Coburn's (1993) research, college students questioned about the environment were exceptionally capable of expressing nature's facts, definitions, and advantages. Still,

when asked to define their emotional connection with the environment, most were at a loss. Many of the pupils exhibited dread and worry and said that they had never really "experienced nature" (p. 942) [67]. Even while children had a good attitude about the environment, Aaron (2011) found they were frequently only able to experience it via artificial methods, such as a trip to the zoo (p. 160). Nevertheless, children's degree of direct nature Experiences indicated discomfort when exposed to "actual" nature (p. 146) [31] Many people now refer to their anxiety and fear of the environment as "biophobia," which is defined as a person's tendency to relate negatively to natural surroundings [41](p. 76).

Since many schools no longer allow much time for outside play, children miss out on meaningful interactions with the natural world [58]. According to studies, schools and childcare institutions may significantly increase possibilities for outdoor play and natural interaction [59]. This lack of relationship creation between children and their surroundings demands role models to assist children in developing a stronger connection to their environment. Teachers and other adult mentors are essential to "create a good perception of nature" throughout the early years of school[27] Moreover, teachers and parents must cultivate a child's feelings about the natural environment since these feelings have "implications well beyond the immediate classroom experience" and should be cultivated [44].

It was coined in 1995 by Sobel in his book Beyond Ecophobia: Reclaiming the Heart in Nature Education. He proposes a gradual introduction of children to the natural world to foster feelings of connection and eventually feelings of love. Similarly, Sobel states, "let us first build a knowledge of chipmunks and milkweed - creatures children could study close at hand" (p. 3), then go on to more challenging ideas to not overwhelm and disengage children from the environment [42] On the other hand, While Louv (2006) acknowledges the need of reintroducing children to the natural environment at both the household and institutional level, he suggests that the first step must begin with a transformation in how the environment is viewed [45].

2.3. Human-nature connection (HNC)

According to Ives and colleagues [46], there has been a dramatic rise in studies published in peer-reviewed journals on the human relationship to nature from 2010 onward. According to van den Bosch and Bird [47], this increase may be linked to growing evidence of the health and well-being advantages that come from connecting with nature, as well as the belief that it is only through a solid connection to nature that people will be motivated to conserve it. Many more

studies, such as Restall and Conrad; Tam (2013); and Zylstra; Esler; Knight; and Le Grange, describe how their experiences with nature's connection influence people's feelings of well-being and support for environmental conservation. There are barely a few mentions of young individuals under 18 or none in these evaluations [48–50].

The definition of HNC Following the previous Research [46,51–53], sustainable human-nature connections are those that permit, encourage or aid lifestyles that gradually reduce their negative influence on the Biosphere. This, we assume, is the Human-Nature Connection (HNC). Moreover, in the area of environmental psychology [20], "connectedness to nature" is expressed as "individual affective experiential connection to nature" by Mayer and Franz [55] Additionally, Restall and Conard [48] stated connection to nature as understanding how people identify with the natural world and their ties with the natural habitat.

When we talk about the human-nature interaction, we talk about how humans or society interprets nature and its surroundings. First and most importantly, it is a way of thinking about the world, an ethical and philosophical issue. In Rossi's point of view [56], Everything that people do to their surroundings, both natural and artificial, as a person or a group, is considered part of the human relationship to the environment. Observations, feelings, experiences, attitudes, and behaviors toward the environment and its results are included in this category. Social structures and ideologies are also reflected in human-environment connections [57].

Scales were having many sorts of answer alternatives be useful as "convenient and valid quantification tools. Over the past 20 years, several researches have focused on developing scales that may assess sentiments of closeness to nature in both adults and children. Musser and Malkus developed one of the first measures that examined children's attitudes toward the environment [58].

Mayer and Frantz [55] developed a comparable scale, which has proved to be popular and used by several writers[28,59,60]. This measure investigates "common views of self-concerning nature" and how these sentiments of connectedness might be helpful to markers of environmental action (p. 504). Cheng and Monroe (2010) and Ernst and Theimer (2011) developed comparable assessment devices: an indicator of children's emotional attitudes toward Nature and a Connection to Nature Index, respectively. The research mentioned above has resulted in a variety of assessment instruments that are, for the most part, relatively similar, with variances mostly in language and tweaked to meet the demographic of the respondents in the intended study [28,61].

Whitburn et al. state that [62] scale items capturing <u>human-nature relationships</u> can be broken down into three <u>domains</u>: <u>First</u>, the affective domain represents feelings towards nature. The <u>second</u> domain is the cognitive part that conveys information and views regarding nature, and <u>lastly</u>, the behavioral (or experiential) field relates to activities and interrelations in nature. It is similar to the definition Nisbet et al. [11] explored; nature-relatedness encompasses a range of qualities that include <u>emotional</u> and <u>cognitive</u> (e.g. [63] "connectedness [to nature] relates to the degree to which a person incorporates nature into his or her cognitive presentation of self."), and <u>experiential</u> dimensions. Furthermore, the HNC relationship has several characteristics previously highlighted in the literature review. For example, the ability to be at ease and interested in nature, feel awe and wonder, ecological literacy, and a sense of connectedness to natural surroundings. These <u>qualities</u> can be <u>grouped into three</u> distinct and sequential <u>abilities</u>: <u>being in nature, with nature, and being for nature</u>.

2.4. Children&nature: Why are children the focus group of this thesis?

The interaction between children and nature has been studied extensively across various fields for an extended time. Opportunities for children to engage with nature are critical for nature's preservation. This is one of the key messages of the report Home to Us All: How Spending Time in Nature Can Help Us Take Care of Ourselves and the Environment [64] In 2018, the International Union for Conservation of Nature, the Children and Nature Network, and other partner groups prepared a report for the Convention on Biological Diversity. The specific focus for a greater emphasis on connecting people with nature in order to inspire action for biodiversity conservation; and, while it provides support for the importance of connecting with nature at all ages, it prioritizes childhood, based on a review of research that shows that childhood experiences often motivate later conservation actions. Within the contexts of nature, culture, and society, Edith Cobb (1959) proposed that throughout infancy, "the natural world is perceived in a very evocative manner, instilling in the child a feeling of fundamental continuity with natural processes" [65] (p. 538). This feeling of continuity with nature is similar to that of an adult, "merely prior, more sensuous, and unencumbered by other sorts of knowledge." Kahn and Kellert (2002) highlighted that children, in particular, seem to have an intrinsic and intuitive affinity for the natural environment [66], based on the concept of biophilia [67] However, the authors reasoned that this biological tendency must be nourished and developed.

When thinking about ways to bring social and natural systems toward sustainability, Ives et al. (2017) [46] believe that emotional ties with nature have the power to influence fundamental social change toward respect and care for nature and that childhood is an excellent time to start forming those relationships. A similar argument is put out by Chan et al. (2016). They claim that individuals typically maintain and repair nature for the sake of 'relational values,' such as a sense of connection with nature, an attachment to a particular location in nature, or the satisfaction that comes from caring for Nature [68] Taylor (2013) [69] established the idea of everyday worlds to dispel the misconception that childhood and nature exist universally and independently of one another. She argued that children and nature are inextricably linked in an imperfect, messy, yet welcoming world [69] In this view, the ordinary world is full of "heterogeneous interactions that occur inside and between a diverse range of entities (living beings) and actants (objects and non-living forces)." [70](p. 112).

Research on children's sense of connection to nature has two parallel streams, each evolving independently without reference to the other. Grasping the meaning of nature's connection in childhood necessitates their integration. According to one stream, being in touch with nature is generally reasonable. Children's experiences with nature often influence how they identify or connect with it. Kellert analyzed children's varied contacts with Nature in Research and determined that children may have three significant natural experiences direct, indirect, or symbolic [66](p. 117). Direct experiences are physical contact with the environment and "nonhuman creatures" (p. 118).

In contrast, indirect experiences involve more staged encounters, such as a zoo or a museum (p. 120). Symbolic encounters are interactions in which the setting is artificial or synthetic, such as viewing a movie or playing an online game (p. 120). Individuals gain from indirect and symbolic experiences when direct nature experiences are absent, but they are increasingly recognized as adequate environmental experiences on their own [31](p. 162). The transition from direct to indirect/symbolic experiences for children needs strategy since just teaching pupils about the environment and developing natural awareness does not always result in nature connectedness.

2.5. Encouraging children to re-connect with nature

Observing children in nature, or having children write, draw, and talk about their experiences with nature, supports the idea that connection with nature is mostly beneficial. Despite this, children's experiences with nature involve seeing and hearing about environmental devastation and destruction and global risks like climate change and species extinction. Young people's concerns and anxieties about environmental threats and losses, according to this article, are also an expression of a sense of attachment to the natural world. As a second line of inquiry, the study also looks at how adults might help young people cope with environmental loss. Helping young people develop the ability to face environmental challenges and uncertainties while finding a positive purpose in taking action is one strategy to assist them in getting support [71].

2.6. Measuring nature connection in childhood

In all reviewed literature, measures of nature connection in children and adolescents span the ages of 2 to 19 together. Researchers frequently began by studying and modifying measures established for adults when constructing quantitative assessments of children's relationship to nature. As a result, research with adults has not produced a single consensus definition of the construct known as "nature connection," and a variety of terms have been used to describe it [48–50]; similarly, studies with children and adolescents have employed a variety of terms and definitions to describe the construct. Quantitative measures of nature connection in adults include asking adults to describe how much they feel a sense of unity and affinity with nature, enjoy, respect, and appreciate. Love nature and recognize the interdependence between human well-being and the welfare of the natural world [48–50] Researchers began by analyzing and modifying measures for adults and focusing similarly on positive remarks when developing quantitative instruments to assess children's relationship to nature.

Studies of childhood nature connection, like adults [48–50] are complex. They include emotional attachment and affinity with nature, cognitive awareness of human–nature interaction and curiosity about natural phenomena, pleasant experiences in nature such as enjoyment and

comfort, and protective behaviors toward nature. Most childhood measurements show that children like being outside [28,59,72–77].

Adult Research has traditionally distinguished between assessing people's connection to nature and eliciting information about their pro-environmental[48–50]. Overall, instruments for assessing children's natural connection preserve this distinction. Cheng and Monroe (2012)[59] retain this distinction by questioning children regarding their feeling of responsibility and capability to act (e.g., 'My actions would change the natural environment'). In contrast, Larson et al. (2011) [78] question intentions to act (e.g. 'I would help wipe up green spaces in my neighborhood'). Elliot et al. (2014)[72] division nature-relatedness and environmentally responsible behavior into distinct subscales. However, Richardson et al. (2019)[77] include a single general behavior ('I always treat nature with respect') in their six-item scale, while Sobko et al. (2018)[79] ask parents whether their kid 'treats plants, animals, and insects with care' and 'enjoys recycling paper and bottles.' The items used to measure a person's relationship to nature change with age. School studies focus on children's appreciation of nature, a desire to participate in nature-based activities, empathy, and curiosity. Middle childhood and adolescence are when questions about identity, oneness, and connection with nature arise. These distinctions are consistent with young children's increasing focus on embodied experiences.

In contrast, by middle childhood and adolescence, young people have developed a more stable self-identity that enables them to compare themselves to broad categories such as 'nature' (Harter, 1999). They can express their emotions with increased self-awareness (Aldwin, 2007). The enjoyment of being in nature is the common thread that runs across all age-related measurements. It encompasses an appreciation for nature's sensory aspects and the opportunity for play, independence, comfort, and solitude that nature provides. Additionally, the methods for assessing one's relationship to nature alter with age. To deal with 5-year-olds who are unable to read and grasp things in a written survey, Elliot et al. (2014) [72] and Giusti, Barthel, et al. (2014) [73] utilized one-on-one interviews in which children were asked to pick between alternatives when they landed on squares on a game board or selected from pictures. Rice and Torquati (2013) [76] performed puppet interviews with 2- to 5-year-olds, while [79] Sobko et al. (2018) obtained parent reports on their children. The researchers reported that amusing tactics successfully maintained the attention of young toddlers. Larson et al. (2011) [78] used a primary language to conduct a written survey with children as young as six years old, referring to 'plants' and 'animals' more frequently than 'nature' and avoiding complex words such as 'environment' Otherwise, written surveys begin with children who can read independently,

aged 7 and older. For later childhood, researchers employ adult scales or more straightforward versions of adult scales, such as the Müller et al. (2009)-[75] adapted Emotional Affinity toward Nature Scale or the Richardson et al. (2019)-adapted Nature Connectedness Index. Bragg, Wood, Barton, and Pretty (2013) concluded from their assessment of three scales completed by 8–12-year-olds that measures developed only with adult samples should be reserved for those aged 12 and above.

Nevertheless, Sobko et al. (2018) 's findings [79] pose critical concerns for studying nature-human interaction. Is the meaning of the nature link context-dependent? To explore children's connections to Nature in Hong Kong, a densely populated metropolitan area, they sampled parents of 2- to 4-year-olds with a mean age of 2.2 years. Because they were skeptical that children this young could respond adequately to questions, they offered parents a Cantonese translation of Cheng and Monroe's (2012) [59] Connection to Nature Index for 9- to 10-year-olds in Florida and asked them to report on behalf of their children. Parents categorized nearly half of the items on the survey as Not Applicable. They revealed in subsequent interviews that the poll frequently failed to accurately reflect Hong Kong's circumstances. For instance, a question regarding whether their child 'likes to go outside and enjoy nature' was irrelevant in a place where getting outside required crossing heavily congested streets. Questions regarding 'a sense of duty' for environment conservation were impracticable in areas where government agencies managed parks and gardens, and the concept of a 'sense of oneness' was perplexing—perhaps because it required peaceful time in nature which urban inhabitants rarely had. The researchers began again by asking parents whether their children possessed feelings for nature, and based their findings on a new index that included young children's enjoyment of seeing flowers, hearing birds, caring for domestic plants and animals, and selecting books about plants and animals, as well as unhappiness when animals were injured, or plants and animals died. This study demonstrates that the term 'nature connection' may signify various things in various regions... but it also demonstrates what parents observe when their young children engage with nature. Barrable and Booth (2020)[80] showed that the same index fit well with parents of nursery children in Scotland, indicating that it reflects some common characteristics of parents' perceptions.

Environmental behavior&role of education

2.7. Children&Environmental behavior (Pro-environmental behavior, PEB)

Recent decades have seen much research on how people may be more environmentally friendly. Earlier studies on pro-environmental behavior assumed it to be a homogenous idea. According to the homogenous understanding, more information about environmental degradation leads to greater environmental consciousness (or concern) and pro-environmental behavior. These models presume that increasing environmental education will result in more pro-environmental behavior among the general population; see the model below (Figure2) [81]. However, more recent research discovered that pro-environmental conduct is not always straightforward, and those models have been proven incorrect.

Consequently, the first issue arises: How may pro-environmental behavior be described? In Kollmuss & Agyeman's 2002 work, the definition of PEB is about Committed behavior that attempts to minimize the harmful influence of one's activities on the natural and built environments (e.g., reduce resource and energy consumption, use of non-toxic substances, reduce waste production) [81], or defined as "conservation behavior" [82] or as conduct that is "meant to contribute to the long-term sustainability of the natural environment." [83] This phrase encompasses a wide range of activities. Doing PEB individually and in a group setting is possible and done regularly or once in a particular event [25]. It may concentrate on direct environmental protection, such as rubbish collection, or indirect environmental consequences, such as political voting decisions [85].

Stern [86] argues that environmental behavior is challenging to study because of its variety and the number of possible causes. An impact-oriented or an intend-oriented approach can be used to study pro-environmental behavior. The impact-oriented approach highlights the significance of how it modifies the availability of resources or energy from the environment or affects the mechanics of ecosystems or the Biosphere itself. Otherwise, the intend-oriented approach is driven by the premise that people desire to preserve nature by their behavior instead of if the action truly influences nature. The impact-oriented definition benefits from classifying actions based on whether they have a detrimental or good influence on nature. However, some activities may have an impact on many aspects of nature. For example, organic food

consumption reduces biodiversity loss, chemical fertilizers degradation, and human health issues.

On the other hand, some evidence shows that eating organic food reduces greenhouse gas emissions. However, scientists have not proven it so far [30]. As a result, a comprehensive evaluation of the influence on the nature of behavior may thus be critical in certain situations.

Figure 2: Pro-environmental behavior linear model

Source: adapted from Kollmuss and Agyeman, 2002:241, Drawn by Author

2.8. Environmental behavior and childhood nature experience

Various studies have shown that positive early interactions with nature, and their early family values, are connected with pro-environmental behavior later in life [88,89] Similarly, children raised by more environmentally conscious moms are more likely to participate in environmentally-friendly practices as adults [31]. However, based on the limited effect sizes researchers obtained, it seems that family values perceived by kids do not significantly influence adult PEB and can be only motivational and, as mentioned before, should be nourished and strengthed through other methods. For instance, Chawla [33]. Explained that some alterations in behavior brought on by wildlife experience programs might only last a short time. Even though people exposed to nature may experience a temporary increase in their sense

of connection to it. [63],the human relationship to nature has been considered a feature that does not alter much through time or under different circumstances [7]. However, additional moderating variables were obviously at play in longer-term retrospective research, which found links between childhood environmental experiences and adult pro-environmental behavior [37], [38]. Exposure to wild nature (camping, hiking) was more strongly linked to later pro-environmental views and actions than childhood exposure to domesticated nature (e.g., gardening) [93] In her Research, Rosa suggests that people's present engagement with nature may explain the correlation identified in earlier studies between time spent outside as a kid and current PEBs [94].

2.9. Emphasizing the "Why?" to increase environmental behavior

identifying strategies to improve and promote children's participation in environmental efforts related to the 'volunteering language employed' in activating such a group. Children may be curious about the 'why' of initiatives, which is the initiative's intention and how it helps improve the condition of the environment. Participants in environmental management projects will be frustrated if they do not understand how their actions affect the status of the environment. It is desired to have a measurable consequence of activity. As a result, strengthening the language around the "why" of environmental actions is critical for environmental organizations and individuals to attract volunteers.

According to Asah et al. (2014), leaders of environmental initiatives should tap into people's motives and think beyond just the environmental benefit of the activity; instead, all of the social and cultural benefits gained from participating in an environmental initiative should be clearly articulated. Using this strategy, Seymour built environmental projects that matched participants' motives and intended degree of participation[95] Seymour and Haklay (2017) also state that this will impact more long-term involvement than one-time engagement [96].

2.10. Environmental Education

1. Existing environmental education programs

Schools often seek environmental education (EE) programs to help their students "better comprehend the complexities of the environment" and eventually create a more harmonious interaction between students and nature [97](p. 12). Field visits and lectures to students and websites and community gardens are just ways EE programs are delivered. Many schools and

teachers have tried various methods to help children develop stronger relationships with the natural world, but some have been more successful than others [28,30,98,99]

2. Strengths of current EE programs

Environmental education programs may have improved students' knowledge and attitude toward their environment [100](p. 299). Children in most countries with western education systems often learn about the environment via textbooks and in-class activities. However, environmental programs allow kids to leave the classroom and explore the natural world through place-based learning. Environmental programs give experiences, frequently in field trips, school gardens, and other outdoor activities, that enable students to learn via their senses and hands-on activities, allowing for a stronger connection with the environment.

3. EE programs limitations

There are also significant constraints on the ability of specific contemporary EE programs to engage schoolchildren with nature effectively. The predominance of negative messages is a significant flaw. To evoke an emotional connection to the environment, a lot of EE programs use fear and negative tones in their programs, such as the repeated reminder that children must save a dying world [26,45,60] Children typically reject building a connection with the natural world through this technique out of fear. As a result, they are unlikely to be interested in environmental protection later in life [32](p. 6). A similar communication problem often done in EE programming is known as 'premature abstraction,' which Sobel invented (1995)[42] Premature abstraction refers to teaching children topics beyond their cognitive level too early in their development, which often results in disengagement from the subject or the development of phobias [42] (p.5). While attempting to provoke worry, educators must first develop the necessary foundations of connectedness to the natural world to draw sympathetic concern. Unsuitable timescales are another failure of many EE efforts. Environmental programs are sometimes overburdened with activities and information, leaving children with little (if any) opportunity for contemplation and investigation. Although understandably, these programs appeal to instructors because their expanded material often allows for just a superficial connection between children and the outdoors, sacrificing the quality of experience for "curriculum coverage and goals" [101] (p.665). Is there a way for environmental educators to start

bringing children back to the outdoors in a way that fosters connection rather than greater separation? While physically restoring them to nature is generally possible, the problem is engaging them with their environment and evoking an emotional connection. White (2004) discovered that this issue arises because many EE programs approach environmental learning from an adult's viewpoint rather than a child's [32] (p. 6). To address the problem of different learning styles and developmental stages, many educators have resorted to EE techniques, including place-based learning, innovative teaching strategies, and time for pupils to inquire [98] (p. 106).

Allocating more time outside to less-structured activities can provide students with the opportunity to learn through imagination and inquiry; however, programmers must be mindful of balancing creative learning with curriculum concepts to ensure the program effectively supplements classroom learning [102] (p. 12).

Urban solutions for increasing nature connectedness

2.11. Urban Biodiversity

Strong biodiversity awareness is connected with education in environmental topic areas, indicating a knowledge gap for people studying non-environmental subjects or not attending university. Furthermore, young people selected university education as the source of most information and social media. However, biodiversity education does not have to come from formal schooling; it may be as easy as expanding the availability of direct interactions with biodiversity in the city [33] this research considers education to be a social concept among cognitively and emotionally engaged individuals, especially children, interacting with the physical environment [103,104] It is necessary to raise awareness through improved education options for all young people. Raising biodiversity efforts to educate young people may be accomplished by lectures, activities, and exposure. Increasing young people's exposure to biodiversity is especially essential in urban areas, exceptionally school surroundings. This may lead to increased urban greening for habitat restoration, including signs detailing the environment and the types of animals drawn to it.

2.12. Green infrastructure planning

Green infrastructure is "a linked network of green areas that helps preserve natural ecosystem values and functions and offers linked benefits to human populations." 12 pages [105]. This urban nature network, made up of forests, wetlands, parks, meadows, trees, flower beds, green court yards, and green roofs, is the biophysical green component of a green-gray continuum [106].This network is connected to the idea of urban nature in the current strategy for Copenhagen. It is a representation of decades' worth of work put into the design of green space and green infrastructure in Nordic towns.(Copenhagen 2015a). The EU Green Infrastructure Strategy for 2013–2020 acknowledges that green infrastructure may contribute to biodiversity, human well-being, and quality of life (European Commission 2013). [107]Sandifer et al. (2015) characterize multifunctional green infrastructure as placing human health and well-being at the center, therefore allowing human engagement with the environment and guaranteeing that "...people are surrounded by and have access to ecologically varied natural ecosystems" (p. 12). This approach to green infrastructure is aligned with the concept of biophilic cities, which promote regular and high-quality everyday interaction with Nature [108]. We suggest that daily living activities (such as the movement for work, school, and necessities) inside a network of green infrastructure give significant opportunities for both purposeful and accidental environmental contact.

Part 2: Establishing environmental factors increasing nature connectedness

2.13. Enhancing Environmental Quality: Natural reconnecting areas

Investigating spatial features and the feelings of such environments are critical in this subject. Therefore, Spaces have been categorized according to the perceptions of connectedness with nature they may offer to children. This classification is based on earlier regression research that determined the most significant and practical experiences for multiple connections with nature [12,13,109].

Based on these assumptions, Tabriz, Iran, where the case studies were conducted, has not been studied according to the ability of various places to create experiences of natural reconnection in children. In this study, environmental quality refers to the quality of a location's environment. Sociotopes [110] are places where people assemble and develop a strong connection with the Biosphere. Environmental Quality (EQ) is based on past evaluations of events that impact children's emotional interaction with nature and where such experiences occur.[12,13,109]. Environmental quality is a two-way street between a person's ability to appreciate the natural world and the environment where such enjoyment might occur. As well as Spencer and Woolley's 2000 coines, Group spaces are not only described as physical locations but as a place that offers a variety of opportunities for children to grow [111].

Four distinct environmental experiences have been created to represent the experiences of natural surroundings that significantly impact children's emotional attachment to Nature[12,13,112]. Because this notion is based on how the social fabric utilizes a specific location, each EQ was created by combining numerous sociotopes.

1. Recreation

The importance of outdoor recreational activities in children's development of a favorable attitude toward the environment cannot be overstated [12], [13], [76], [79], [80]. Under this EQ, several aggregation spaces in Tabriz promote entertainment in natural settings.

a. "Waterplay": area: appropriate for swimming or just playing with water poodles.
b. "Nature play": a place suitable for playing in the natural environment.

c. "Picnic": place suited for picnics, where people congregate in small groups and often have the chance to sunbathe.

d. "Riding" refers to where you can ride a bike, skateboard, or even horseback riding!

2. Natural beauty

Natural beauty can directly affect one's attitude about a particular environment or entity. It enabled the human species to flourish by cultivating an appreciation for attractive and healthy settings [81], [82]. Moreover, it fascinates children much more than adults [83]. By this EQ, Tabriz's natural beauty is nurtured in locations designated.

a. "Flower display": region abundant with flowers and lovely gardens.

b. "Water contact": region directly next to significant water basins.

c. "Green spaces": areas with abundant vegetation, different kind of trees and plants

d. "Landform": area with significant amounts of vegetation or natural components.

e. "Panoramas": a region with a panoramic view of the landscape that provides a sense of depth.

3. Wilderness

In addition to influencing children's environmental concerns and interests [12,13], Children benefit from a limitless range of fresh experiences and an infinite supply of knowledge in wild environments because of their inherent complexity [45,66] Under this EQ, are aggregation spaces in Tabriz promote wilderness experiences in natural settings.

a. "Forest feeling": a region where one may enjoy the peace and vastness of the forest.

b. "Wild nature" refers to a location where one may experience nature's wildness and diversity.

c. "Peacefulness": a profoundly soothing environment in which seclusion and stillness encourage enjoyment of the surroundings.

4. Rurality

This EQ was created to recognize regions that demonstrate a beneficial integration of the human and natural environments and to raise awareness of nature's dependence on humankind. When children are exposed to these settings, they may have a difficult time distinguishing between personal beliefs of their behaviors and aid in the development of respect for the natural world [12,13,81] This EQ aggregates Tabriz areas that leverage rurality to generate experiences.

a. "Domesticated animal presence": area with farm animals, or animal presence.
b. "Cultivation": a designated area with plots or shared public gardens for food cultivation.
c. "Market": a lively farmer's market area.

2.1. Considerations on the Evaluation of Environmental Consciousness

As a critical first point, the study is not looking for one-of-a-kind instances of spectacular spontaneous reconnection, as has been done in previous research [13,112]. This study emphasizes the importance of everyday socio-ecological contexts in forming a perceptual and cognitive connection with nature. The ECa's approach is still prone to the same criticisms common to many other life experiences research, despite the great diversity of input [12]. For example, the ability of visuals to depict activities and feelings that children claim to judge limits the coherence of the ECa (see Appendix 1). This assessment's completion is also limited by student attention spans, instructors' ability to fit it into their already jam-packed schedules, and parental enthusiasm for involvement.

Furthermore, teachers' contributions to student achievement are essential because the ECa has been carried out solely by them. However, this is not a problem for the accuracy of the results but rather a benefit. Frequent challenges in interviewing children have been solved by allowing instructors to conduct the interviews themselves. Teacher-student EC (EC) relationships have developed over time, allowing them to understand students' needs better.

Furthermore, a well-known caregiver has an advantage in engaging children in conversation and keeping their attention during the ECa.

2.2. Environmental Consciousness: four factors in the connection to nature

It is necessary to create a notion capable of freezing the ever-evolving interdependencies between developing children's relationships with the Biosphere and their various social-ecological surroundings. In this study, the term "Environmental Consciousness" was proposed. O'Sullivan and Taylor (2004) elaborate on the idea of "consciousness":

"What we mean here by 'consciousness' is the 'frames' or mental structures through which we interpret our world, understand ourselves, and find meaning." [116].

Environmental Consciousness (EC) also occurs in the literature in several different tones, each focusing on the psychical aspects of a healthy relationship with nature [81,115,117].EC is used to assess five different factors in this study:

- Environmental Sensitivity
- Environmental Awareness
- Environmental Attitude
- Environmental literacy
- Environmental Ethic

A person's long-term relationship with nature is formed in childhood via the development of these four psychological characteristics [12,13,112] The same psychological characteristics have significantly impacted environmental conservation [118] When representing our connection to nature, we utilize this collection of four variables as a starting point. In the following sections, the main concepts of each EC variable are explained.

1. Environmental Sensitivity

At its beginning, a primary goal of environmental education was enhancing environmental sensitivity [97] As a result of this case, the theory of environmental sensitivity was only developed after that [119,120] Environmental sensitivity was initially defined in an unpublished Master's thesis released in 1982:

"A set of affective attributes results in an individual viewing the environment from an empathetic perspective. It differs from environmental ethics. Individual's sensitivity to the environment possesses a basic appreciation and concern for the natural environment." [119]

Subsequent studies have shown that this idea is further developed and is a significant predictor of environmentally responsible behavior [118,121] and essential in children's environmental education [81,120]. Environmental sensitivity combines empathy and worry since caring for someone entails being worried about their health.

2. Environmental Awareness

In Kollmuss & Agyeman (2002), Environmental Awareness is defined as knowledge of the influence of human actions on the environment" is characterized as environmental awareness. There are both cognitive and emotive components to environmental awareness[81] However, environmental awareness in this study is not confined to the "effect of human activity on the environment," as in previous studies evaluated [66] Still, it includes information on the impact of humans on the natural world and the importance of ecosystem services [122] Understanding one's place in nature is known as environmental awareness.

3. Environmental attitude

"an established way of thinking or feeling about something" is often referred to as "attitude" [20] This concept has long been regarded as one of the most reliable psychological indicators of long-term commitment to environmental behavior [81,120] It is also a vital component of a well-known environmental orientation evaluation method [123], and it has a significant impact on children's pro-environmental behavior development [15,124] A positive

or negative attitude toward the environment is described as a long-lasting happy or negative sensation, independent of the underlying behavior.

4. Environmental literacy

Environmental literacy [125] is defined as an individual's knowledge of and attitudes toward the environment and environmental challenges, skill sets and willingness toward environmental problem resolution, and active participation in collaborating toward the maintenance of a perfect balance between the quality of life and the quality of the environment.

5. Environmental Ethic

Environmental ethics are ethical thoughts and opinions about nature that can influence individual and community pro-environmental behavior.[81] it is a set of ideas about environmental behavior that people have, whether or not they have changed because of personal convictions or because they are considered acceptable by society. These eventually influence the way environmental behaviors are viewed as proper or improper.[126] By contrast, value-based conduct toward natural environments is often unrelated to long-term commitments [118,127].

Part 3: Theoretical framework

Theories supporting the research

Developing a cohesive theoretical framework is difficult due to PEB's complexity and the interplay of several current and new elements. Both exploratory and holistic approaches are used in this investigation. This research study is a cross-disciplinary effort to describe the development of the psychological human-nature connection without detailing all of the involved variables. While presenting one mechanism and oversimplifying general functioning, this study describes every aspect. There is a recognition of the scope and depth of the research topic. It was impossible to focus on a single theory because of this. Cutting-edge theoretical and methodological advances have been included to provide the reader with a comprehensive picture, including geographic, social, and cognitive contexts. As a result, the study is exploratory and descriptive in Nature [128].

Then, this study takes a comprehensive approach to the problem. As a result of a complicated connection, neither people nor nature are intrinsically responsible for the attributes being evaluated in this research [82]. People and nature cannot be studied separately since their purpose is to understand these traits; instead, they must be understood as part of a more significant structural relationship [129] Children's connection to nature and the socio-ecological contexts to which they have been exposed may be described using this holistic and exploratory paradigm, even if it can never be complete. Several hypotheses must now be presented.

The Biophilia theory is the first. This concept was created by Edward Wilson (Wilson 1984) to emphasize that human attachment to nature has an evolutionary origin. Research in developmental psychology has utilized this idea better to understand children's and adolescents' attachments to nature.

The second theory is the biological theory of cognition. This theory's primary focus is the biological interaction of all living kinds with their surroundings [129] Feelings and perceptions of the Biosphere may be seen from a new perspective because of this theory's neurological explanation of how people biologically learn from social-ecological surroundings.

The third theory, the social theory of space, helps better understand social context's impact on children's perception of a natural environment [130] Simultaneously, this theory offers a theoretical foundation for assessing children's exposure to natural environments in cities and their urban context.

2.3. The biophilia theory and nature connection

The genetic development of any living species mirrors a vast web of linkages with the rest of creation [113], and humans are no exception. In addition to our physical development, our mental evolution has been influenced by the environments in which our ancestors lived throughout their evolutionary process [113] The biophilia theory evolved to have a fundamental urge to connect with nature and the natural world [67] It explains why humans prefer nature over urban settings [67,131] Evolutionary connections with nature, both good and negative (i.e., admiring flowers and enjoying trees' shades), have helped our species survive, reproduce, flourish, and finally, better tune our biological and mental lives in harmony with the ecological surroundings.[132] While the biophilia theory suggests that humans are born with an innate connection to nature, psychology suggests that emotional attachments to nature are partly learned through dialogues with their environments (social and ecological). These perspectives argue that an emotional connection to nature can generate environmental concerns [47]. This means that, in addition to the fact that the human body is physically developed from and hence related to the Biosphere, the human emotional awareness is also a historically structured organization of the evolutionary connection with nature [67,114,115,132] In a study done by Adevi & Grahn (2012), <u>researchers found that people tend to grow attracted to the landscapes they grew up in during their childhood.</u> The safety of natural components, such as water and vast landscapes, encourages this attachment [133].

<u>The degree to which individuals believe they are a part of nature has been termed "connectedness with nature."</u> [63] This expansive interpretation of the notion means that connection to nature 1) can improve well-being and contribute to emotions of satisfaction and purpose, and 2) has been demonstrated to be a consistent predictor and motivator of pro-environmental behavior, like stewardship practices [48,50].

2.4. The biology of cognition: how life learns from the environment

Maturana and Varela's biological theory [129] explains cognition as an ecosystem of worlds generated by mutually consistent cognitive activities. Separate living systems become a part of one other's worlds by communicating and coordinating their behaviors. This hypothesis is founded on scientific knowledge of neural systems and explains how we learn about our surroundings (cognition). In this theory, the word "environment" refers to the world outside the living form; this phrase encompasses both social and natural environments in a human context. Thus, the cognitive process refers to any living form's adaptive relationship with its living and non-living environment. In this interaction, the biological form and the environment are mutually beneficial; they adapt to one another so long as their respective roles are maintained. Specifically, because living organisms are operationally condensed, their identities are determined only by internal processes. The cognitive process continues until the environmental disruption becomes pervasive enough to affect the functional identity of the living organism or until the environment alters the functional identity of the living form. Consequently, the interaction between a living thing and its surroundings is viewed as more than mutual disturbance; it is understood as the "thumping of all life."

A second and more extreme consequence of this hypothesis is that the qualities of an environment determine any neurological alteration in any living organism. Nonetheless, The existence of the environment is similarly dependent on the relationship it has with living things. Maturana and Varela's research suggests that (1998) [134] an environment exists primarily because an organism is capable of interacting with it. In the same way, an organism must interact with its environment to be deemed alive.

To put it simply, the theory of biological cognition asserts that not only does a human being exist in a socio-ecological world, but that this world also originates in every person from the context of that environment. We share these worlds to function in a shared reality as a species. This is not a transcendental statement assuming that the Earth system exists exclusively inside living organisms. Even the universe's very existence is being called into question without its many manifestations in all life forms. Following these theoretical premises, being a part of nature takes on a new dimension. Indeed, it is inextricably linked to the very nature of being alive. Additionally, the human-nature interaction is not simply mutual disruption but mutual inclusion. With this hypothesis, we get a new perspective on our connection to nature and

reassurance that being a part of nature is neurologically inevitable in all living forms, including humans.

2.5. The social logic of space

Surprisingly, Hillier and Hanson's fundamental study "The Social Logic of Space" (1984) parallels the biological theory of cognition with a spatial study of social contexts. According to this view, a place comprises physical territory and neurological experiences of the social fabric interacting with it [130] Additionally, cultural identities are preserved and maintained by establishing valuable and meaningful spaces. Daily social routine is ultimately recreated in a space that facilitates that habit while also institutionalizing that space as a place for that routine [135].

Culture and territory are intertwined to allow both to exist simultaneously. Interconnectedness can be seen in a marketplace. It is an excellent example of where individuals purchase and sell goods because the territory permits it, creating a market-friendly environment that attracts more people to buy and sell.

This theory and the hypothesis mentioned beforehand inspired the methodologies used to assess children's connection to nature. The adopted mapping methodology to categorize areas was based upon their citizens, especially children's use of that place and their perception of it. They are called "sociotopes" because they show how a particular culture or community perceives the direct usage values [136] The second strategy derived from this field is employed in this study to examine the accessibility of locations in terms of how pedestrians perceive space. This method effectively forecasts human mobility in urban spaces [130]. By employing human movement as an intermediary cause, various links between urban form and social phenomena have been established. If this is the case, an urban system cannot be seen as a collection of discrete functional zones but rather a dynamic, adaptable organism that includes people and their culture in significant ways.

Chapter 3 Tabriz city: a case study

3.1. Methodological approach

The approach may be roughly split into two primary sections. The first section of the methodology examines the environment to which children were exposed throughout their first 7 to 12 years. Whether or not the child was raised in a social setting that appreciates the natural surroundings. This is the evaluation of the social environment. It was conducted using questionnaires distributed to parents and schools. In addition, the assessment of exposure to the ecological environment - i.e., the natural surroundings the child has been exposed to - has been conducted in elementary schools based on their access to Environmental Qualities. The parents of children have also been individually polled for further information on their children's exposure to natural settings.

The second branch of this study's approach focuses on assessing children's Environmental Consciousness (EC). Constructing a questionnaire that can accurately measure EC in children 7-12 years old has been a remarkable task, given that the existing methodological frameworks do not satisfactorily meet the study criteria. The research might have utilized the New Ecological Paradigm scale [123] regarded as the gold standard for ecological attitude evaluations [15]. However, it is founded on cognitive assumptions that are much above the cognitive capabilities of youngsters. In addition, while discovering patterns of general ecological behavior is a significant study emphasis [118,120,137], Only a little amount of research has been done to pinpoint the specific emotive factors that motivate people's interactions with nature [66]. Instead of adopting a pre-existing but inflexible approach, the research focuses on individualized questionnaires to interview each kid about the same characteristics gathered in the EC.

It has been necessary to identify schools with different access to natural environments as the first step in obtaining students with a wide range of environmental experiences for the study. After this first decision, the Environmental Consciousness evaluation was used to analyze children's feelings toward the Biosphere.

3.2. Participants

The target group for the data collection was elementary school children, who vary in age from 7 to 12 years old. 100 children participated in surveys devoted to them, their parents, and their class instructors as the specifics of school choice will be explored.

All participants were locals of Tabriz city because Tabriz is the case study location in Iran. Hence the written questionnaires were translated into Persian for clarity.

One hundred children completed the surveys for this study. 82 students completed the procedure online using a link from their parents following their school administrator and instructors. Other 18 youngsters were personally questioned at three schools. I aided them in filling out the surveys, which were printed on paper.

Parents were instructed not to express their opinions on the questions or to help their children complete the questionnaire. The link was generated in Google Forms, and the data was exported for additional examination in SPSS using tests and regression analysis.

3.3. Location of case study Tabriz city, Iran

1. Why Tabriz city?

The first thing that has to be done is to look for schools in Tabriz that meet the requirements established for this study project. Tabriz was selected as the location for the research since it is my hometown and where I spent most of my childhood. As a result, I am more familiar with the city's diverse collection of physical traits and environmental features. In addition, the capacity to conduct direct interviews with students, as well as to complete questionnaires and organize appointments with the school counselor, was essential.

Figure 3: panorama view of Tabriz city

Source: Panorama of Tabriz.jpg - Wikimedia Commons. (n.d.). Retrieved from
https://commons.wikimedia.org/wiki/File:Panorama_of_Tabriz.jpg

Following a study of the literature on the nature connection between children and pro-environmental behavior, most research has been conducted in the social context of the western world. As it advances, studying the relationship between humans and nature must go beyond Western societies. Few featured research originated in Asia, Latin America, or indigenous societies. Most population increase occurs in Asia, Africa, and Latin America, and most of the world's children reside on these continents. They also contain biodiversity protection hotspots [123]. Diverse countries and cultures must be included in research on young people's relationship with nature, actions for nature, and creative optimism.

Direct experience is essential when connecting with nature, according to both quantitative and qualitative studies discussed in this article. There is a need for all children to be able to

access nature, from resettling residential yards and multi-family housing locations to mosaics of public parks, to implementing green the grounds of schools and similar facilities, to ensuring that children are provided with nature establishments, camping, and group activities. Even in highly populated and resource-constrained areas of the world, such as Asia and chosen context of the city Tabriz, bringing nature to children appears vital to fostering a sense of belonging. Implementing these methods is a great way to go about it for biodiversity and children's involvement in nature conservation and restoration.

2. Primary information about Tabriz city

Geographical information/Location

Tabriz, the provincial capital of Eastern Azarbaijan, is located at an elevation of 1,340 meters (38 degrees 4 minutes north latitude and 46 degrees 25 minutes east longitude). The city has a total land area of around 2054 square kilometers, it is located 619 kilometers to the west of Tehran, the capital of the Islamic Republic of Iran, and it borders Urmia Lake to the northeast. Tabriz is hemmed in on all sides by the solitary, towering mountains of Sahand and Own-ibn-Ali (called Einali in the local dialect), which are located to the city's northeast, and Population
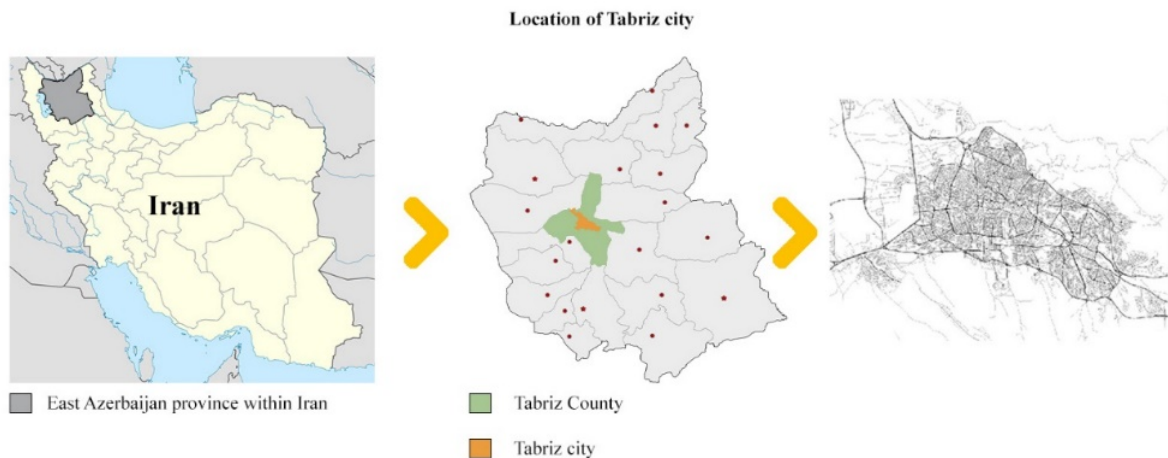
Figure 4: Location of Tabriz city, Iran

Source: Author

Approximately 1,644,000 people live in Tabriz, which has a population of 420,000, with children making up about a quarter of that number [138].
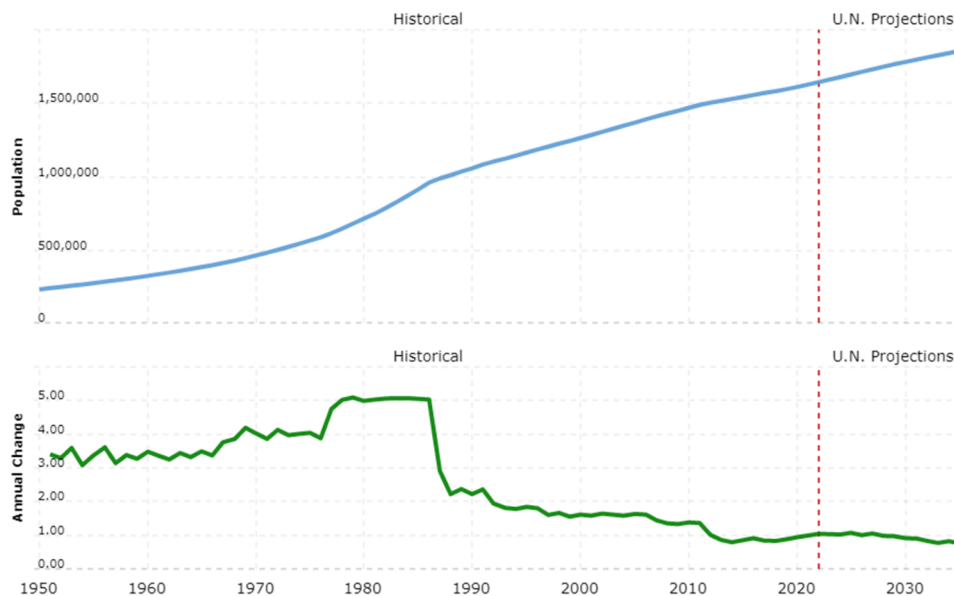
Figure 5:Tabriz, Iran Metro Area Population 1950-2022

Source: Tabriz, Iran Metro Area Population 1950-2022 | MacroTrends. (n.d.). Retrieved from https://www.macrotrends.net/cities/21522/tabriz/population

UNICEF conducted pilot research in 12 locations, with Tabriz being one of them. The plan was due to the city's enormous population of children. Following a meeting of the CFCI's National Coordination Committee, held on June 2, 2020, as part of the collaborative engagement between the Ministry of Interior and UNICEF, 12 Iranian cities have been selected as pilot cities for the worldwide deployment of the CFCI [139].

<u>Climate</u>

Tabriz leads from the north, south, and east to high mountains and from the west to the flat and desert plains of the Tabriz plain and the salt marshes of Talkhehrood. This unique condition has resulted in the transformation of Tabriz into a mountainous-desert plain. Tabriz is one of the coldest cities in Iran, having a cold and dry highland climate due to its natural and geographical position.

The average temperature ranges from 10.5 ° C in April to 25.4 ° C in July (the warmest month of the year) to 14.1 ° C in October to -2.5 ° C in January (the coldest month of the year). Based on these characteristics, the ideal time to visit Tabriz based on weather conditions is during the summer; the weather in Tabriz is quite cool and pleasant. However, it is freezing and ice during the winter.

Green areas in an urban context

Urban expansions to peri-urban regions, notably in green areas and orchards, have significantly changed urban green spaces in Tabriz from 1976 to 2016. The assessment of green space areas showed a decrease from 5,916.53 to 4,373.96 hectares. In thirty-year intervals, 1,542 hectares of green space were lost in Tabriz, and the proportion of green space declined from 23.31 to 17.1 percent. The rate of change in land utilization throughout this era has been slow. In 1395, urban green spaces covered 1,709.02 hectares or 6.73 percent of city boundaries; nonetheless, the rate of green deterioration over the past decade has been too quick (25000 hectares city limit). In the previous decade, 2,664 hectares of Tabriz's green spaces were changed to other land uses, with the rate of conversion rising between 1385 and 1390 when more than fifty percent of the city's green spaces were lost. According to ANN modeling, Tabriz would lose 1076 hectares of the green area between 1395 and 1410. The results indicate that the lack of proper planning of Tabriz's urban development over the past fifty years, especially over the past decade, has caused irreparable damage to the city's green spaces and will continue to threaten sustainable urban development and ecological balance in the coming years.[140].

Tabriz has the most significant urban expansion in Iran's northwest. It is one of the country's most extensive and diversified cities regarding population, economic activity, industry, and transportation alternatives. In recent decades, agricultural lands and spaces have expanded to accommodate the city's growth. Green has transformed its surroundings into urban infrastructure that is drab and non-green.This land conversion and land-use change have diminished open and green spaces. The city is now confronted with problems such as high and dense population density, the growth of informal settlements, air pollution, and the establishment of hazardous natural zones. Due to the significance of spatial justice in the equitable distribution of green space in 10 regions of Tabriz, it is necessary to investigate the problem at hand. Turning to the study mentioned above on assessing green space distribution

and placement for future development in the Tabriz metropolitan area from the perspective of spatial justice, the following is said.

Based on climate-related studies, the per capita space of parks and green spaces for each person in Iran has been calculated to be between 7-12 square meters. Consequently, there is a significant disparity between the country and the city of Tabriz. As a result, the metropolis of Tabriz lacks green space and urban parks, and the distribution of this use is unbalanced; for instance, region 9, with its 0.067hectares of green space, has the least amount, and region 2 is with the greenest area equal to 185.033 hectares. Therefore, the distribution of green space around the city does not adhere to the principles of spatial justice and is not equitable.
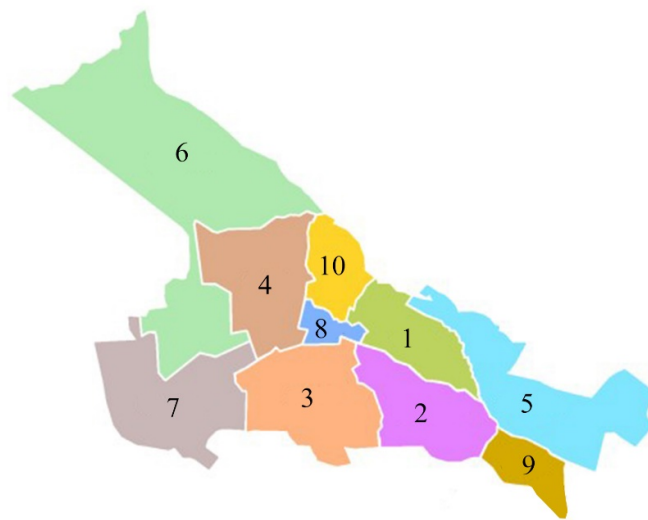
Figure 6: Tabriz city municipal zones

Retrieved from اداره کل راه و شهرسازی استان آذربایجان شرقی *(n.d.).* تقسیم بندی مناطق دهگانه شهرداری تبریز
https://azarsharghi.mrud.ir/Portals/13/FilesUp/tarhe%20tabriz.pdf?ver=1396-03-29-094056-537

Figure 7: Distribution of green areas in Tabriz city

Source: Municipality of Tabriz, Tabriz city development plan 2019

Tabriz's urban parks comprise more than 30 percent of the city's overall green space, with 134 small and large parks dispersed among several zones [141]Some parks span a massive area in the city setting, and it is worthwhile to mention them to get a deeper comprehension of the city.

One of the most popular parks for locals is **<u>El-Goli park</u>** (see figure 8 below) in zone 2 of the city. According to Tabriz's historical records, Elgoli Park was constructed in the city's east in 1785. It has a square artificial lake bordered on all four sides by sidewalks. There is also a structure with traditional Iranian Azerbaijani architecture in the midst of the lake. A slope south of the lake is covered with trees. Two aesthetically pleasing staircases connect the walkway to the summit of the hill. At the summit of the hill lies a building of contemporary architecture (Hotel Pars building).[142] This park is 61 hectares in size, and its central lake is 20 meters by 20 meters Tabriz Elgoli Park welcomes many visitors and tourists on holidays and typical days.
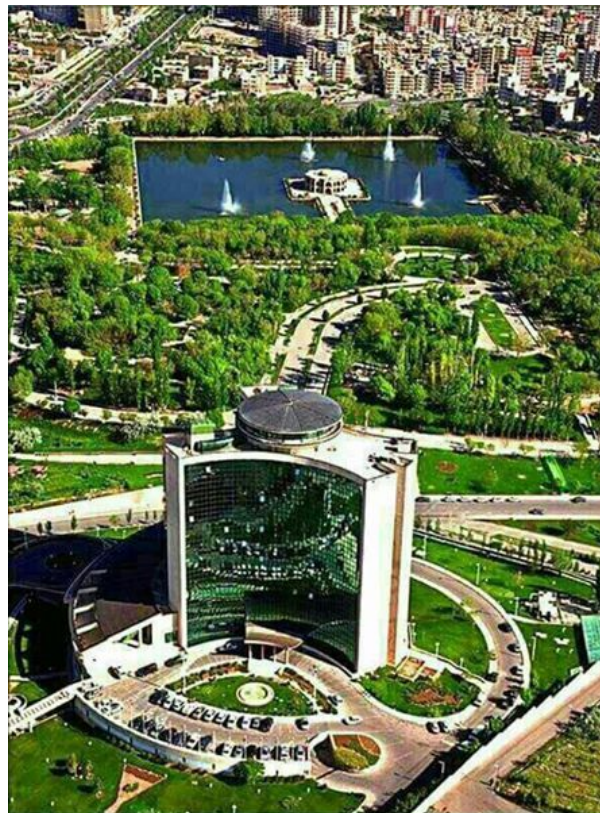
Figure 8: Elgoli park panorama view

بهترین پارک های تبریز / معرفی 20 پارک + عکس و آدرس - کجارو (n.d.). Retrieved from https://www.kojaro.com/2021/9/6/192276/the-best-parks-in-tabriz/

Another famous one, **<u>Eynali mountain park</u>**, is located north-northwest of Tabriz. It is equipped with a picnic place in the forest of the hills. In antiquity, this was a fire temple and a place of worship. In addition to being a holy site, it has also been a place of amusement for the people of Tabriz. In addition to the mausoleum and tomb in the park, the mountaineering and rock climbing path has contributed to the park's popularity among athletes. You may walk over the asphalt to reach the woodland park and the summit. There is an opportunity to escape city life and spend a whole day here.

Figure 9: Eynali mountain park panorama view

بهترین پارک های تبریز / معرفی 20 پارک + عکس و آدرس - کجارو (n.d.). Retrieved June 29, 2022, from https://www.kojaro.com/2021/9/6/192276/the-best-parks-in-tabriz/

Figure 10: Eynali mountain park lake

بهترین پارک های تبریز / معرفی 20 پارک + عکس و آدرس - کجارو (n.d.). Retrieved June 29, 2022, from https://www.kojaro.com/2021/9/6/192276/the-best-parks-in-tabriz/

El Baghi 230-hectare promenade is one of the new parks in Tabriz, built on the south side of Ail Goli as a development plan for Ail Goli. When you visit Ail Goli Park in Tabriz, on the south side, you can see Ail Baghi Park, also known as Ail Daghi. This park is located on the side of Shahid Kasaei Highway. Its beautiful scenery, unique nature, artificial waterfall, and stylish and straightforward pavilions can make you spend several memorable hours. You can also take a four-kilometer walk to the top of the mountain and ride a sled after climbing a tree-lined hillside. Another of the park's most famous attractions is the large, artificial waterfall along the way. You can be located above Tabriz and see a unique view of the city.

Figure 11:El baghi park in Tabriz

اِئل باغی ؛ تفرجگاه کوهستانی ۲۳۰ هکتاری تبریز - تبریز پدیا (n.d.). Retrieved from https://tabrizpedia.ir

Figure 12L picnic areas in El baghi park in Tabriz

اِئل باغی ؛ تفرجگاه کوهستانی ۲۳۰ هکتاری تبریز - تبریز پدیا (n.d.). Retrieved from https://tabrizpedia.ir

3.4. Data collection

1. School selecting method in Tabriz city

First, only municipality schools were evaluated since, in addition to being the most numerous and hence the best representation of the ordinary school scenario, their instructional programs, schedules, and extracurricular activities are constrained by the national and local school system. In addition, a standardized methodological approach has been used to increase uniformity in the school sample and diminish the variability of environmental education. The Reggio Emilia approach was chosen for this research because its underlying principles emphasize the relevance of the learning environment for children [143]. This educational method believes the environment to be a "third teacher" since exploring the environment offers a variety of learning opportunities .This is consistent with the research premise and adds a few additional benefits to the investigation. For example, they are aware of the formative impact of outdoor activities and are frequently genuinely engaged in the initiative.

The other schools were then ranked based on their accessibility to EQs following these two initial picks. The 13 schools with the highest and lowest rankings on this index are chosen as study cases because they show the most significant disparity in children's exposure to natural surroundings during outdoor educational activities. The top 3 schools have numerous and accessible natural habitats near their location, whereas the worst 3 have few and distant natural areas.

2. Environmental Qualities index: ranking of schools in Tabriz

Similar to prior Research [144] the Environmental Qualities index (EQi) assesses accessibility to an ad hoc aggregate of characteristics that reflect distinct features of a more complex indicator. In this instance, EQi is defined by the aggregate of four distinct Environmental Qualities (EQs) categorizing the city of Tabriz's natural settings. The EQs are four unique features of a site that may create a connection with Nature, as detailed in detail in the theory section. Therefore, the EQi indicates the accessibility of various EQs from a particular geographic place, in this case, a school. In conclusion, the EQi is the index of the selected Tabriz schools' accessibility to the natural surroundings as measured by the four EQs: Recreation, Natural Beauty, Wilderness, and Rurality.

Table 1: Environmental Qualities and a compiled list of sociotopes found in each

Environmental Qualities	Recreation	Natural Beauty	Wilderness	Rurality
***Sociotopes* (Stockhom Stad 2003)**	-Waterplay -Nature play -Picnic -riding	-Flower display -Water contact -Green areas -Landform -panoramas	-Forest feeling -Wild Nature -peacefulness	-Domesticated animal presence -Cultivation -market

Source: Stockhom Stad. 2003. *sociotophandboken: Planering av det offentliga uterummet med Stockholmarna och sociotopkartan*

Based on this aggregation of natural habitats, the accessibility study has been conducted using various attraction distance studies to evaluate the accessibility from the schools to each EQ item. The estimates, i.e., the minimum perceived walking distances to each item included in EQ values from the schools, have been grouped into five values based on their importance to school outdoor activities.

Examples will aid in the comprehension of these characteristics. Recreational spaces are primarily designed for playing and enjoying leisure activities such as picnicking and bike riding. Water play involves not just access to a location where water occurs in many forms but also the ability to swim or play while getting wet. You get the sensation of water by engaging in an activity. The same holds for urban and suburban natural spaces where you may play among threes, touch the earth, plants, and even insect.

Figure 13: EQ value, recreation

Source: Author

Most outdoor green spaces are characterized by their natural beauty, including beautiful landscapes of vegetation, flowers, and various types of trees. Any water view counts. In addition to having a panoramic view from an elevation, these locations are also a part of natural beauty.
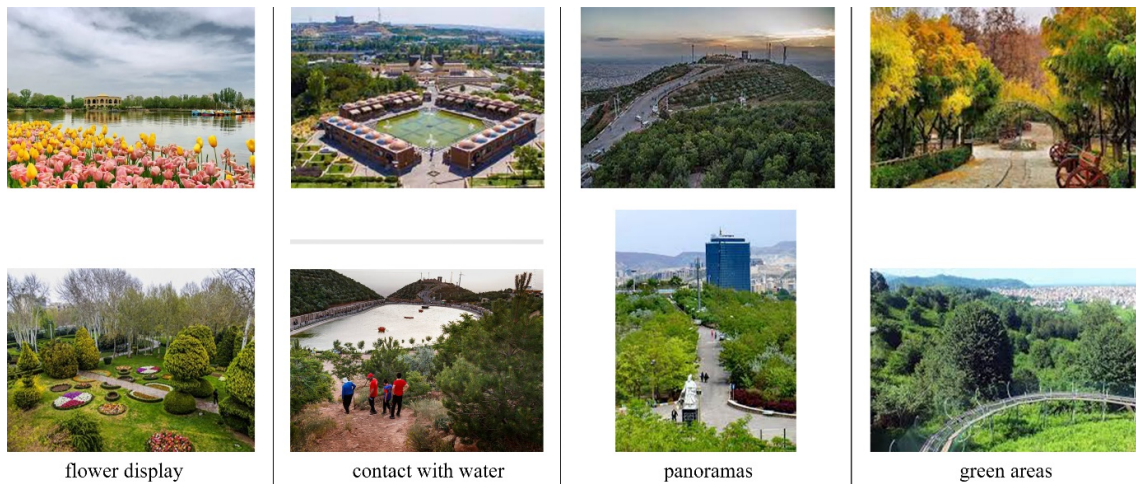
Figure 14: EQ value, natural beauty

Source: Author

The wilderness atmosphere is characterized by a feeling of being surrounded by natural elements and separation from urban areas. It may be in an urban setting, but in a large enough space to shield you from car noise! The ambiance of a forest is created by the abundance of trees and variety of plants, as well as the tranquility that allows you to escape for an hour or two from your daily routine. However, it may also be a wilderness remote from the city with untamed nature.

| forest feeling | wild nature | peacefulness |

Figure 15: EQ value, Wilderness

Source: Author

There are no more dense structures and flats in rural areas. Typically, farmlands contain domesticated animals such as cows, horses, and chickens. Markets are one of the most vibrant places in rural communities, where residents interact and sell daily fresh produce. These are the distinguishing characteristics of urban and rural areas.

domesticated animal   cultivation   markets

Figure 16L EQ value, Rurality

Source: Author

According to initial interviews, teachers have identified five unique walkable ranges based on how much they participate in outdoor activities. Outdoor activities are more common near the school than far away. As a result, EQs closer to the school significantly impact children's interaction with the Biosphere because they are used more regularly. The five proximity ranges established by the instructors were used to evaluate all the measured distances from schools and sociotopes:

<u>0-25 meters</u>

Daily contact. Constantly playing in and surrounded by nature right adjacent to the school, children are enveloped by it. Evaluations have been conducted on sociotopes within this distance assesed 5.

25-100 meters

Three to four times each week, outdoor activities occur within this distance range. Therefore, sociotopes within this distance range were assessed 4.

100-500 meters

Within this distance range, outdoor activities occur two to three times each week. Therefore, sociotopes within this distance range were assessed 3.

500-1000 meters

Outside activities within this range occur three to four times each month. Consequently, sociotopes within this distance range have been assessed 2.

1,000 to 2,000 meters

Within this category, outdoor activities occur three to four times each year. Consequently, sociotopes within this distance range have been assessed 1.

>2000 meters

Regarding children, it is impractical to go for daily walking. EQi excluded sociotopes greater than 2,000 meters from the school from consideration. Because of this, they have been given a 0 rating at this distance.

Following this evaluation, each value in the related EQ has been totaled. Since no EQ may be deemed a priori more significant in building a connection with Nature than another, the EQi was formed by combining the scores for each EQ. So to sum it up: the EQi provides the greatest opportunity for a school to provide kids with opportunities to engage in outdoor activities in environments where they can interact with nature.

3. Considerations on the Evaluation of Environmental Consciousness (survey 1, 2, and 3)

Three semi-structured surveys based on photographs and written questions, the Environmental Consciousness assessment (ECa) examines children's psychical relationship with nature in line with the concept of Environmental Consciousness (EC). EC includes environmental ethics as an overall favorable. The problem is that children's values are not yet developed enough to

properly evaluate this factor [66,145]. Parents and instructors, not children, have focused on environmental ethics research. Environmental Sensitivity, Awareness, and Attitude (ECa) is a test only for children.

First and foremost, various conditions have been created to limit the heterogeneity in the group of children evaluated. First, despite previous research finding parallels in ecological and ethical cognition across cultures [114,146], solely children with native parents were considered. Second, children have been invited to participate during their last two or three years of elementary school. Only those who have been at the same school for at least three years have been engaged in the experiment to establish a significant effect from the biological area around the school. These measures attempt to improve the overall accuracy and coherence of the study by supplying the research with a dataset of children who have only attended one school and its associated teachers.

For the ECa, Peter Kahn's semistructured interviews with children [66,114], and other research that examine pro-environmental psychical characteristics inspired the overall form of this questionnaire [58,123,137].

For as long as the ECa has been, it has relied on simple images to provoke emotions and memories in children. An Italian pilot experiment investigated this decision's feasibility and effectiveness and found it critical in establishing a common ground for feeling assessment. The first official version has been translated into Persian to execute independently, and it was provided in April 2022 to numerous schools in Tabriz City. The final version of the surveys was created following this second testing session. It has now been given and explained to the teachers at every school participating in the study. The results have either been obtained from the schools directly or emailed.

3.5. Surveys

1. : Ecological Consciousness evaluation (ECa): surveys 1, 2, and 3 for children

<u>Variables analyzed</u>

1. Environmental sensitivity is the sensitivity, care, and heightened perception of natural settings. Surveys 1a, 1b, and 1c done with children are evaluated.

2. environmental awareness: the understanding of the interdependence of social and ecological processes surveys 2a, 2b, and 2c conducted with children are evaluated.

3. Environmental attitude: admiration of natural qualities. Surveys 3a, 3b, and 3c done with children are evaluated.

<u>Environmental Sensitivity: survey 1 on children</u>

The Environmental Sensitivity assessment evaluates the child's potential to sense life and compassion for environmental components. Hence, the first component of this survey appraises children's degree of empathy for non-human life forms, that is, the capacity of a kid to see life above human borders and feel for other living natural elements. The second portion of the poll examines children's awareness and worry about more or less environmentally responsible activities. As in earlier research [66,114], this survey component aims at understanding if destroying natural systems breaches a moral responsibility by concentrating on the children's opinion of the rightness or wrongness of various activities. In the complete poll, the answers are two, one signifies a suitable identification with Nature, and one represents a negative. Hence, the data have been consolidated on a general survey score from 0 to 1. Several 1 signifies the most extraordinary Environmental Sensitivity while a value of 0 represents minimal Environmental Sensitivity.

The environmental sensitivity variable was assessed using two main components.

<u>1. Empathic behavior</u>

This survey's objective is to determine children's empathy towards other ecological living elements, i.e., their view of life and their ability to put themselves "in the shoes" of

natural elements. This ability is essential for children to acquire an appreciation for Nature and a respectful attitude toward it.

2. <u>Care and sensibility</u>

This survey aims to examine the degree of sensitivity and care for ecological actions. The game explores children's perceptions of pollution and the moral implications of damaging natural systems. The survey focuses not on understanding children's behavior but on the individual's judgment of the morality of various behaviors.

Survey 1a. Emphatic behavioral requirements

The child will be shown the images in the table below, one after another. For each image, he or she will be asked, "Does (this image) cause uncomfortable feelings?"

"Does a tree experience uncomfortable feelings?"

The child must respond with a simple yes or no. Consequently, the survey result will be a simple list of "yes" and "no" corresponding to each image in the table below.

| Tree | Chopped tree | Hens | Bicycle | Birds |
| Reindeer | Car | Fish | Airplane | Dinosaur |

Figure 17: survey 1a related pictures

Source: Author

Survey 1b. Concern and sensitivity instructions

As to answer possibilities, the child will be shown with both visuals of smiles ("happy grin" and "sad smile") 🙁🙂. The pictures in the table below will be displayed sequentially. No explanation of the image's meaning will be provided.

Water pollution	Real chopped forest	Watering plants	Ground pollution
Deserted forest	Planting trees	Cleaning trash	Air pollution

Figure 18: survey 1b related pictures

Source: Author

Environmental Sensitivity: survey 2 on children

This survey examines the child's awareness of human and nature's interconnection. Part one of this lesson focuses on teaching kids about the connection between human needs and the essential natural resources they rely on (e.g., wood, water, food, etc.). If children believe pollution is harmful to animals, machines (as an example), and people (and even themselves), then the second section of the study is for them. There are two options, one of which is good and one of which is harmful, in this survey 2 on Environmental Sensitivity. Consequently, a survey score ranging from 0 to 1 was used to summarize the findings. A rating of 1 indicates the highest level of Environmental Awareness, while a value of 0 indicates the lowest level.

The environmental sensitivity variable is evaluated for two items:

1. <u>Provision of environmental resources</u>

Environmental awareness has both a cognitive component and an affective domain; consequently, its core components are the comprehension and experience of natural processes. To that end, this survey teaches students about the link between human requirements (inputs) and the natural resources provided by an ecosystem.

2. <u>Environmental awareness</u>

This survey aims to determine whether or not the child considers pollution a threat to the lives of animals, humans, and himself/herself, and consequently, whether or not he/she is aware of the relationship between anthropogenic pollution (outputs) and natural processes.

2a. Instructions for the provision of ecosystem services

All photos will be shown in "List 2" of the table below to the child. All images must be evident at all-time to answer this set of questions. Show the kid one photo from "List 1" and ask him/her to pick a picture among the ones already on display ("List 2"), then ask him/her to respond:

"Why do you need (this photograph)?"

What are the requirements for a wooden table?

The youngster chooses the picture of "wood."

If a picture portrays a wooden table or berries, children must be specifically taught what the picture depicts to understand it.

This method must be repeated for each image in "List 1" without removing the images from List 2 from the individual's view. "List 2" contains more images than "List 1" for experimental purposes. The game outcomes will be a table where, for each image in "List 1," the child's selection from "List 2" will be displayed (see table below as figure 19).

Figure 19: survey 2a related pictures

Source: Author

List 1		List 2	
Wooden table	Eggs	Wood	Forest
Tuna can	Paper sheets	Tuna	Cow
Carrot	Glass of milk	Chickens	Sheep
Tap water	Chops of meat	Vegetable garden	Industry
Wool hat	Berries	Tractor	Money

2b. Pollution awareness requirements

Display one image from "List 1" (representing various sorts of pollution) and place it in plain view for the youngster. It is not permissible to convey to the youngster the significance of this image. Then, consecutively display to the youngster each group of photos from "List 2" and ask him or her to identify each pair..

(animals/vehicle/you/individuals): Are (the first picture) and (the second image) in danger from one another?

Show the child the following picture from "List 1" and continue the method stated above after presenting each pair of images from "List 2" for one image from "List 1."

What does this picture do to you (without mentioning air pollution)? What does this picture do to humans (without mentioning air pollution)? What does this picture do to animals (without mentioning ground pollution)? Etc. Each picture in "List 1" correlates to a group of photographs in "List 2," and the game results in a simple list of four "yes" and "no" answers for each group.

List 1

Figure 20: survey 2b related pictures

Source: Author

List2

Figure 21: survey 2b related pictures

Source: Author

children's environmental attitudes: Survey 3 on children

There is little disagreement that children's development is enhanced when they play in natural surroundings (Chawla 2006a; Moore 1997; Miller 2005). Furthermore, a secure, kid-friendly atmosphere for free play appears essential to developing the child's personality (Kytta 2006). As a result, this study aims to find out where kids prefer to play, feel comfortable, and have the freedom to do so. As a result of these features, youngsters are more likely to appreciate their surroundings and have meaningful interactions with nature (Louv 2005:129). Environmental Attitude differs from surveys 1 and 2 in that the findings are not averaged into a single number for each kid.

The environmental attitude of a kid is evaluated by determining where he or she enjoys playing, feels safe, and is free from parental supervision.

The variable environmental attitude is investigated using two components.

1. Favorite environmental quality: The child enjoys playing and feels free and safe.

2. Disfavored environmental quality: Where the children dislike to play, feel free and safe.

After students have completed these two sets of questions, their explanations for their choices in answering the "why?" question have been grouped into the five to seven most frequent answer types for evaluation. They can be treated such that they are connected with children's other evaluated environmental attributes.

3a . Favorite environmental quality instructions

each set of images will be shown to the child, and ask him or her to choose ONE image to answer the questions. The kid is not required to pick an image in response to the question "Why?"; thus, instructors must synthesize and record the children's responses.

1. Where do you play the most?

2. Where do you like to play and why?

3. Where do you feel the most at liberty to play? then "Why?"

4. Where do you feel the safest while playing, and why?

Recreational	Indoor videogames	Playground	Farm
Indoor toys	Green area	Outdoor street	Forest

Figure 22: survey 3a related pictures

Source: Author

3b. Disfavored environmental quality requirements

The child will be shown the above picture sets and instructed to choose ONE to answer the following questions.

Where do you NOT typically play?

"Where do you NOT enjoy playing?" and "Why?"

Where DO YOU NOT feel at liberty to play, and why?

Where do you NOT feel comfortable playing, and why?

2. Parents' and teachers' perceptions of their children's social environments and their connection to nature were gathered through questionnaires (surveys 4 and 5)

Children's social interactions are facilitated mainly by their parents and teachers [145]. It is also important to emphasize the essential function they play in developing children's environmental value systems [66]. In order to provide a whole picture of how children's attitudes toward Nature evolve, the study also considers the role of the social environment. In Survey 5 on Environmental Ethics, such an issue is addressed. Using a Likert scale, the survey asks parents and teachers how essential and secure natural environments are to them. Social views of natural surroundings impact children's growth, and this survey will help us understand how these social perceptions have shaped this development.

Survey 4 is unique in that it was created only for parents. Children's time spent in urban, outdoor, and indoor surroundings owing to family activities is the focus of this survey.

3. Environmental ethics and private exposure: Surveys 4 and 5 for parents and educators

variables studied

1. Private exposure to natural characteristics:

Parents take children into natural areas. They were assessed using a poll of parents.

2. Environmental ethics:

 parental and educational ideals Assessed by a poll of parents and teachers.

Survey 4: Private exposure to natural qualities

The following questions are posed **only to parents** in order to comprehend their children's exposure to Nature outside of kindergarten:

How many hours per week does my child play in (the following environments), excluding time spent in school? Example: "How many hours a week does my child play in parks, excluding time spent at school?" Answer: "1-2 hours each week"

☐ Parks

☐ Indoor with videogames

☐ Playgrounds

☐ Agricultural environments with animals

☐ Indoor with toys

☐ Green area with animals, water, flowers, etc....…

☐ Streets near home

☐ Forest

Survey 5: Environmental ethics

This questionnaire is designed for parents and teachers; for each item in the bullet points below, respondents must rate their response on the scale provided.

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. I Strongly agree

The following assertions shall be evaluated:

Children exploration constrains

"I am tolerant of the child's knee and arm scratching."

"I am tolerant of the child's dirty clothing and shoes."

"I accept the child is outside barefoot walking."

"I permit the youngster to gather stuff from the ground."

"I allow the youngster to put stuff from the ground in his/her mouth."

Environmental values

"I am committed to maintaining the environment in which I reside."

"The splendor of natural elements fascinates me."

"I enjoy spending time in nature rather than urban areas (for example, on vacation)"

Practicing safety in natural settings

"It is safe for children to play in parks."

"Playing video games inside is safe for children."

"Children are safe when playing at playgrounds."

"Playing with animals in agricultural settings is safe for children."

Indoor play with toys is safe for children.

"It is safe for children to play in green places with animals, water, flowers, etc."

"A youngster can safely play on the street near his or her home."

The youngster is safe while playing in the wild.

contributing significantly to natural ecosystems

"Playing in parks is essential for children."

"Playing video games inside is important for children."

"Children benefit from playing in playgrounds."

"Playing with animals in agricultural settings is good for children."

Indoor play with toys is vital for children.

"The youngster should play in green settings with animals, water, flowers, etc."

"It is vital for the youngster to play on a nearby roadway."

"It is essential that the youngster play in the wild."

Chapter 4 :Results

4.1. The results in brief

The results of all the analyses between interdependencies of environmental consciousness and the exposure children were exposed to in the city of Tabriz revealed exciting relations. One of the most strong correlations was between Environmental awareness and environmental sensitivity.

Another essential component was the EQ index of the schools in Tabriz city. The final selected schools of minimum and maximum EQi value were also related to children's environmental consciousness, meaning the urban context they encounter daily affects their level of awareness and sensitivity. Further results indicate that the encounters categorized as urban, indoor, and natural exposure with a closer look were beneficial to have a detailed comprehension of the results.

After a quantitive assessment of gathered data and analysis of meaningful relationships between factors, the qualitative method can reveal what is potentially missed from quantitative methods. In detail, qualitative assessment can give clues on how most children feel and explain their ideas in their own words and what it means compared to their environmental values and social context.

4.2. Environmental Qualities index of Tabriz schools

The Environmental Qualities Index (EQi) has been investigated as far as attraction distance analysis goes. An initial study was conducted to determine the distance between Tabriz city and the designated EQ zones (Recreation, Natural Beauty, Wilderness, and Rurality). According to research, Tabriz's municipal schools are located in areas with different EQi values (i.e., how close they are to a sure EQ) and in sociotope zones of the city (which are places where sociotopes have been assessed). The maps indicating selected school locations and their approximate EQ values are below seen in Figures 23&24.

Schools in the top 6 and bottom 7 spots on the EQi have the most significant disparity in their students' chances to connect with nature while participating in outdoor educational activities. These 13 schools were chosen as case studies in the initial step of review.

According to the parameters given for the study, only three high and three low schools had at least 10 native children aged 7/12 who had attended the same school for at least two years. Finally, the final edition of the EQi was made available to chosen schools from the top and lowest tiers (see figure 25).

For the purpose of illustrating maps of EQ values, the range of colors displayed on the map shifts gradually, as the influence of environmental characteristics on their surroundings diminishes with distance.

The reason that red and orange signify the highest scores on most maps is because the city's urban attributes were not particularly good in any evaluation of environmental quality criteria.

The range of distances between each EQ value and each school site (shown with red pins on the maps) was accumulated and considered the school's EQi value.

a)

b)
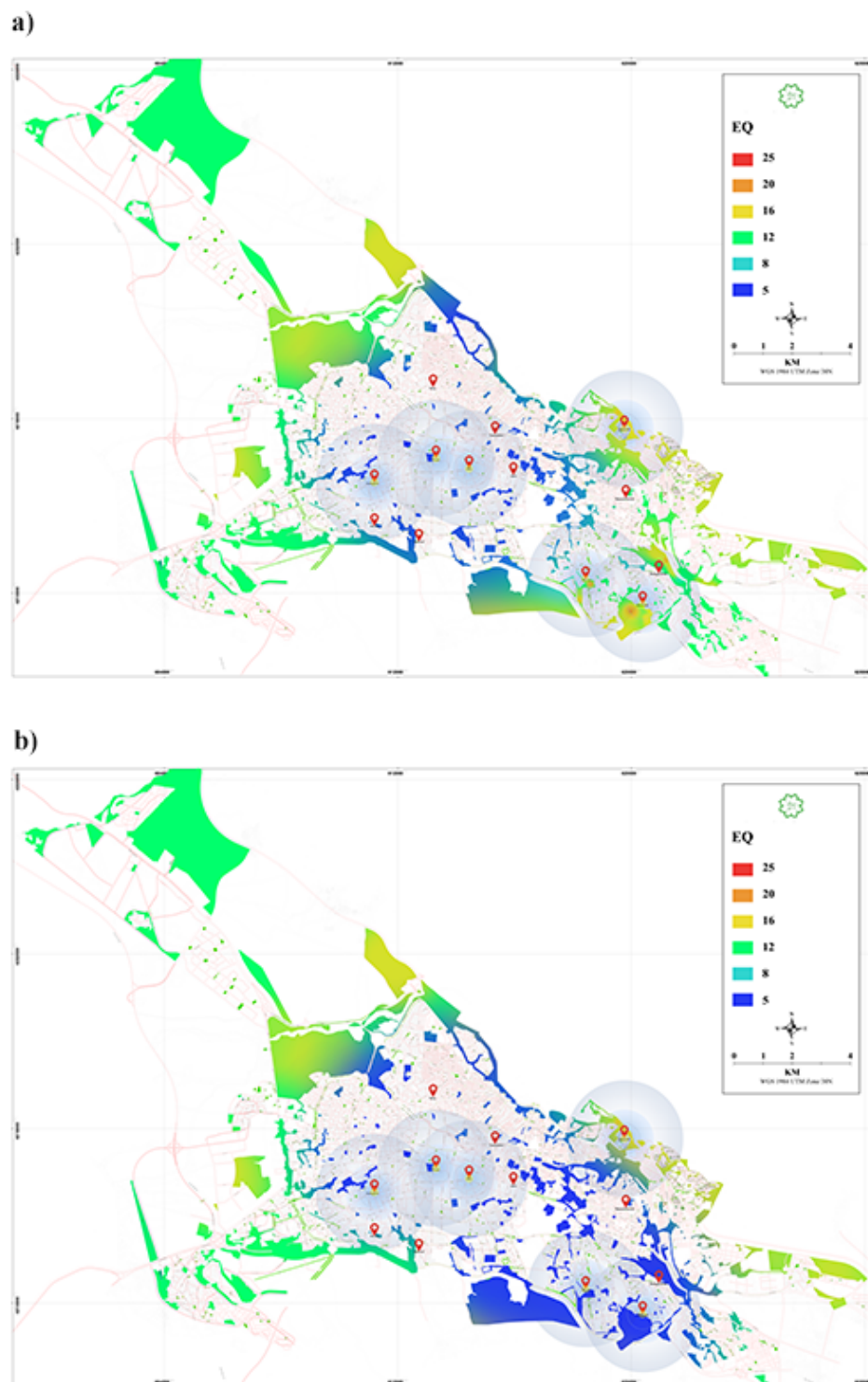
Figure 23Distribution of EQi In Tabriz, locations of municipal schools in Tabriz city are identified with a Red icon map a)EQ wilderness map b)EQ rurality

c)

d)
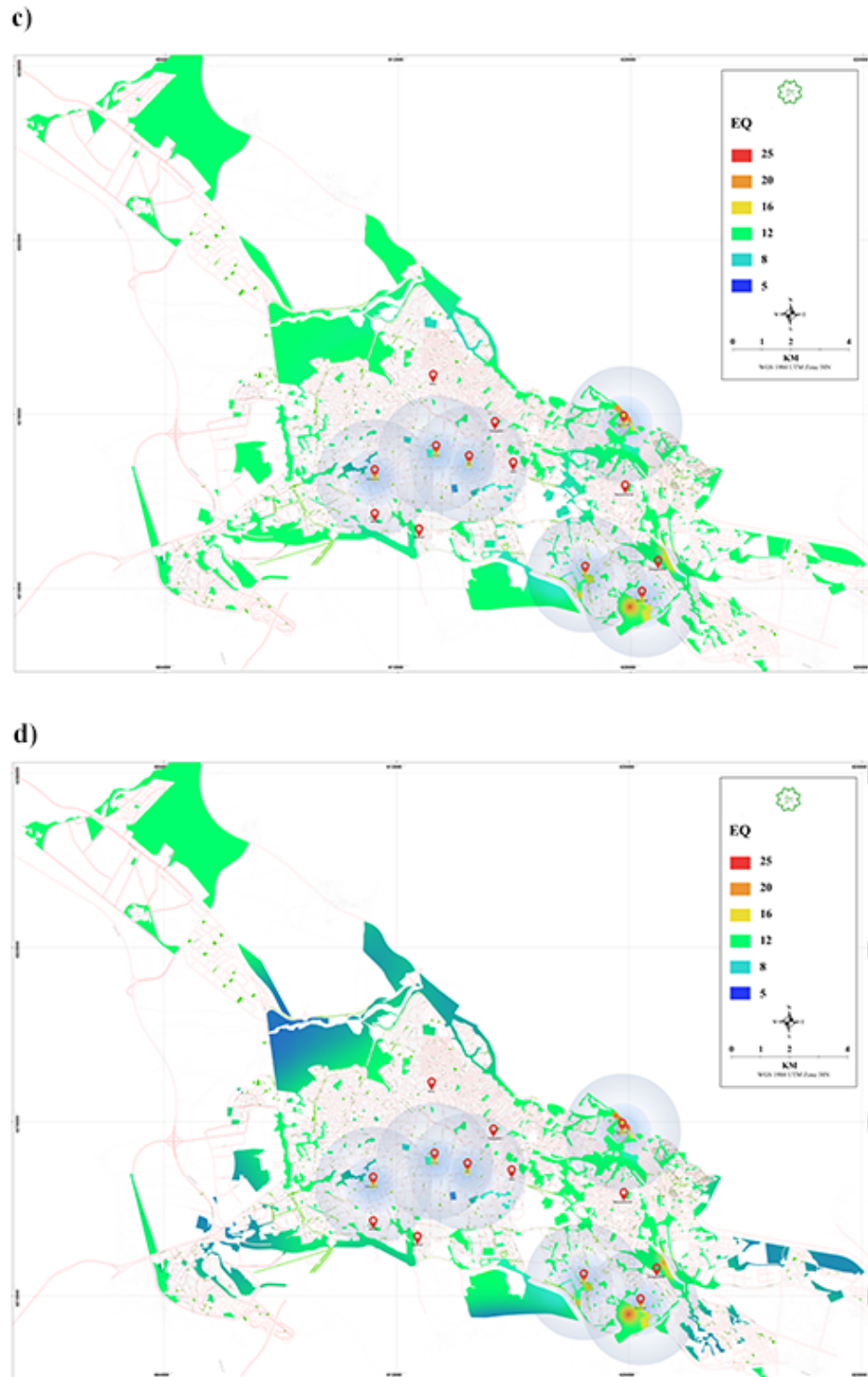
Figure 24: Distribution of EQi In Tabriz, locations of municipal schools in Tabriz city are identified with a Red icon map c)EQ natural beauty, map d) EQ recreation
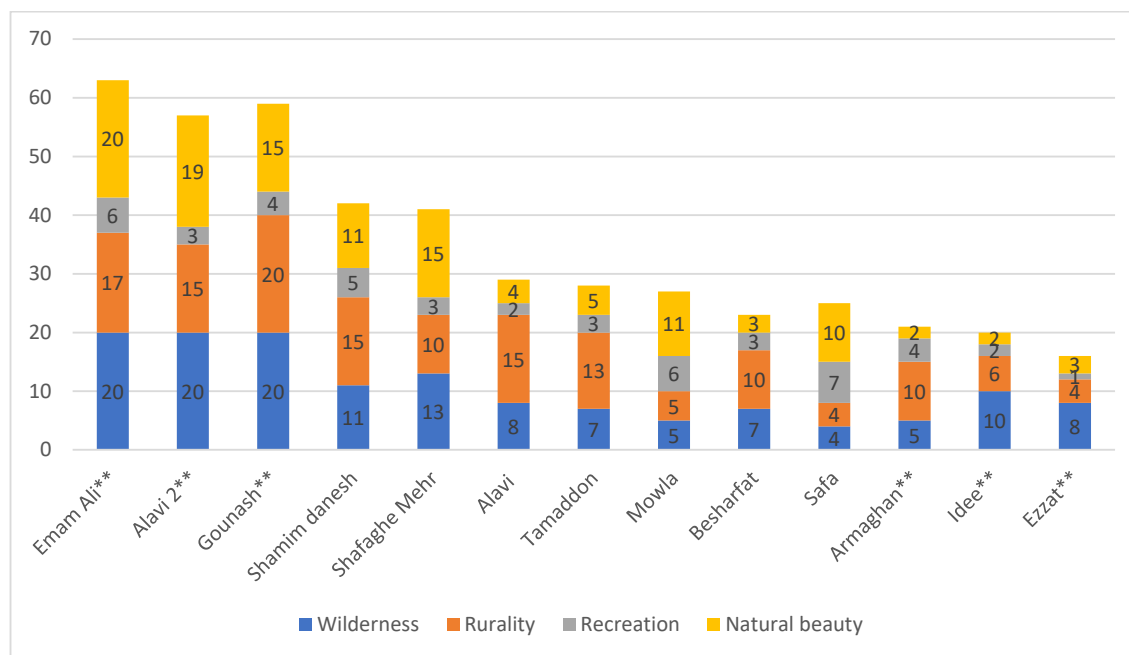
Figure 25: EQi of selected schools in Tabriz city

Source: Author

As shown in the chart above, based on the distribution and distance of schools from EQi qualities, the selected schools to evaluate are marked (**) beside the school's name.

4.3. Evaluation of children's ecological consciousness: surveys 1, 2, and 3

ECa was administered to a minimum of ten pupils in six schools contacted; three schools had the highest EQi, and three had the lowest EQi. Only concerning other parts of the study are statistically significant findings of Environmental Sensitivity/Awareness Surveys 1 and 2. This study highlights the intricate relationships between the EC and the socio-ecological context is developed by first analyzing the variables in isolation. All EC and social-ecological environment elements and variables were subject to this statistical study.

The results of the Environmental Attitude semi-structured interviews contribute to a debate on how children perceive natural settings (see Tables2,3 below).
Children believe they spend the majority of their time playing indoors (N:62, 62 percent) and in natural environments (N:20, 20 percent) rather than in urban environments (N:18, 18

percent), even though natural environments are highly valued (N:42, 42 percent) but largely deemed unsafe for play (N:20, 20 percent) (N:11, 11 percent). Although kids spend most of their time indoors, it is not their choice; instead, it is imposed upon them by their living circumstances or social contexts, such as school and parents.

However, children see indoor (N:77, 77%) and urban (N:12, 12%) surroundings as the safest places to play, whereas just three children believe streets to be safe. The primary motivations of children that affected the decision on the safest setting will be examined in further detail, along with the number of children who responded to the relevant questions.

Table 2: Results from the 3a survey on children's environmental attitudes

Survey 3a results	Where do you play the most?	Where do you like to play?	Where do you feel safe playing?
	%	*%*	*%*
Indoor Spaces	62	25	77
Play with toys	35	9	69
Videogames	27	16	8
Urban Environments	18	33	12
Playground	15	28	9
Street	3	5	3
Natural environments	20	42	11
Garden	6	18	5
Park	14	16	3
Forest	0	8	3

Source: Author

In the second section of Survey 3 (Survey 3b), children were asked to identify the most detesting surroundings (Table 3). The findings of survey 3b indicate that children have no unfavorable attitudes about indoor play, whereas the street environment yields the most damaging results. The woodland is thought to be the least played (N:23, 23 percent), the least loved in the street (N:47, 47 percent), the street is the most dangerous (N:47, 47 percent), and the least playing environment is the forest (N:43, 43 percent). However, woodland habitats are not regarded as the most dangerous. Indeed, 44 percent of the children identified natural surroundings as the least safe for play (N:44), and as with the street, anxiety tends to diminish the attractiveness of such settings. Children were asked why they dread outdoor areas, and the two most prevalent responses were "Because there are deadly animals: wolves, bears, and

foxes" and "Because you can get lost or lose your mother." In a systemic study of interdependencies, the repercussions of such variations in motivation are studied further.

Table 3: Results from survey 3b of children's unfavorable environmental attitudes

Survey 3b results	Where do you play the LEAST?	Where do you NOT like to play?	Where do you NOT feel safe to play?
	%	*%*	*%*
Indoor Spaces	18	20	3
Play with toys	5	8	1
Videogames	13	12	2
Urban Environments	45	50	49
Playground	4	3	2
Street	43	47	47
Natural environments	50	30	48
Garden	4	2	3
Park	3	5	1
Forest	28	23	44

Source: Author

4.4. Environmental Ethics & Family Exposure of Parents and Teachers: Surveys 4 and 5

In survey 4, only parents were asked to estimate how much time their children spent in environments other than their school time. These questions refer to 3 leading groups of settings as indoor, urban, and natural environments. Parents were asked to select five options of 1-5, 5-10, 10-15, and 20-25 hours per week. As a result, the questions related to indoors having the maximum amount of time children spend during the week. As you see, 35% of all parents perceive their children spent 20-25 hours indoors, a considerable number in comparison with only 7.5% spending this much time in urban environments or only 10.5% in natural environments. Looking into details of these results shows how looking at screens and playing video games get the highest amount of time.
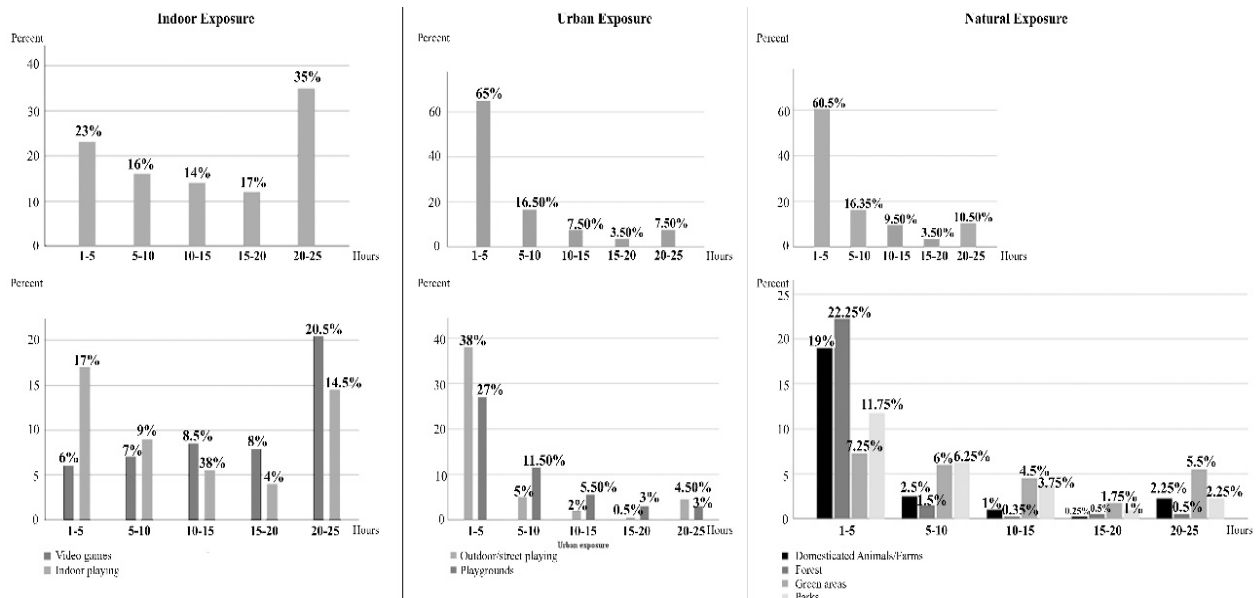
Figure 26: Hours per week that children spend playing indoors, in urban or nature settings

Source: Author

4.5. An Analysis of Interrelations: Environmental Sensitivity, Environmental Awareness, and the Socio-Ecological Environment

After examining the variables in their own right, this research aims to illustrate the interdependencies between the EC and the social-ecological environment in which it originated. This statistical analysis was performed on all components and variables analyzed for EC in the social-ecological context. The following chart shows the results following the relation number shown in Figure 27.
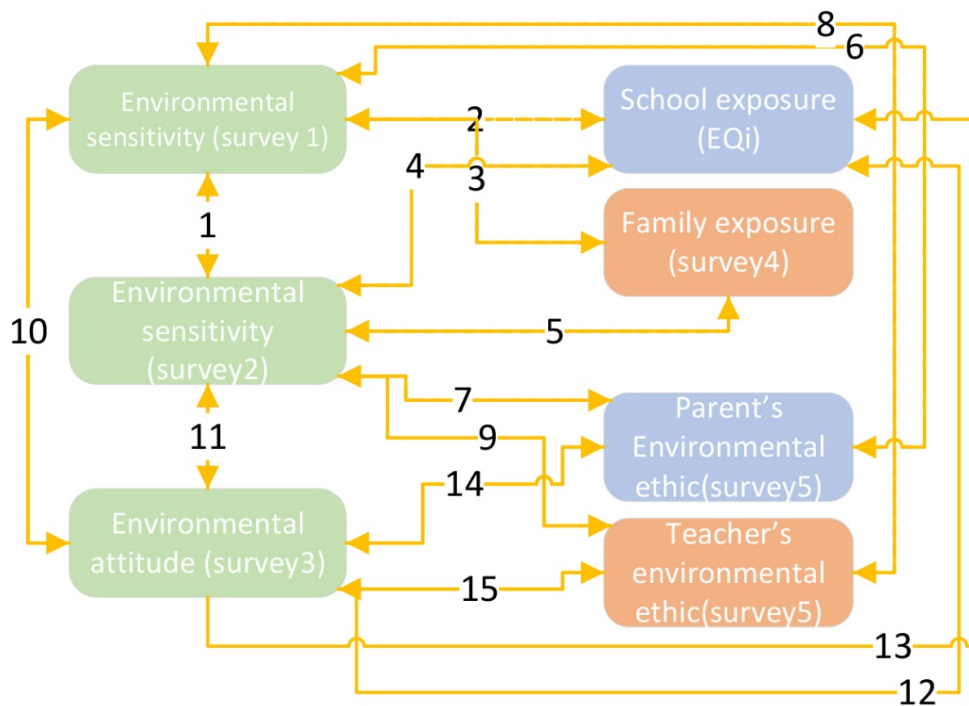
Figure 27: relations between Environmental consciousness and the environmental factors are interconnection

Source: Author

1. <u>Relation 1:</u> **Environmental Sensitivity & Environmental Awareness**

A moderately correlated and statistically significant connection (Pearson) exists between Environmental Sensitivity and Environmental Awareness (r=.576). Children who scored in the top for Environmental Sensitivity also scored considerably better on average for Environmental Awareness. Similarly, the children with the lowest Environmental Sensitivity scores performed considerably below the mean Environmental Awareness score

Table 4: Pearson correlation analysis result between Environmental Sensitivity&Awarness

Correlations

		Sensitivity Mean	Awareness Mean
Environmental sensitivity Mean	Pearson Correlation	1	.576**
	Sig. (2-tailed)		.000
	N	100	100
Environmental awareness mean	Pearson Correlation	.576**	1
	Sig. (2-tailed)	.000	
	N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Author

As shown in the preceding scatterplot, the distribution of datasets is linear. The R^2=0.388 in this scatterplot shows that the distribution of the Environmental awareness factor can be predicted by 38%, in line with how the Environmental sensitivity factor occurs. The relationship is significant and strong between the two factors.
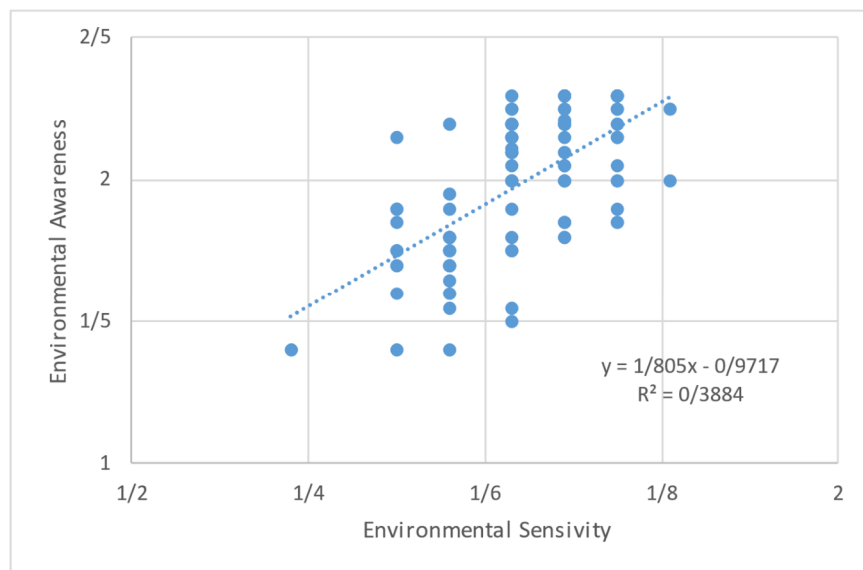
Figure 28: scatterplot of correlation analysis for relation 1

Source: Author

2. <u>Relation2&4:</u> **Environmental sensitivity and Environmental awareness interrelation with EQi (wilderness, rurality, recreation, natural beauty)**

Environmental Quality Index (EQi) and Environmental Sensitivities have a significant and strong relationship (r=.260, p=.000). Further research between each Environmental Quality and Environmental Sensitivity highlights the strength and relevance of ecosystems characterized by Wilderness (r=.243, p=.015) and natural beauty (r=.283, p=.004). In contrast, the Recreation (r =.146, p =.147) and rurality (r =.094, p =.354) settings do not suggest a favorable relationship between Environmental Sensitivity and EQi (Table 4). Since only the greatest and lowest EQi values are reflected in the investigated schools, the datasets cannot be considered normally distributed. This link was analyzed with nonparametric techniques. (S. S. Shapiro and Wilk 1965).

Furthermore, results show that environmental awareness and Environmental Quality index (EQi)Are also significantly correlated (r =.199, p =.048). Moreover, similar to environmental sensitivity, the correlation between Environmental awareness and wilderness is significant and strong (r =.234, p =.019) and natural beauty (r =.289, p =.199).

Table 5:results of relations 2&4, EQi& environmental sensitivity and awareness mean correlation

Spearman's Rho		Wilderness	Rurality	Recreation	Natural beauty	EQi Index
Sensitivity mean	Correlation Coefficient	.243*	.094	.146	.283**	.260**
	Sig.(2tailed)	.015	.354	.147	.004	.009
	N	100	100	100	100	100
Awareness MEAN	Correlation Coefficient	.234*	.041	.174	.289**	.199*
	Sig. (2tailed)	.019	.683	.084	.003	.048
	N	100	100	100	100	100

Source: Author

3. <u>Relation 3&5:</u> Environmental sensitivity and Environmental awareness interrelation with Family Exposure (indoor, urban, and natural environments)

The Spearman correlation between private exposure to indoor, urban, and natural environments and Environmental Sensitivity is insignificant. Private exposure to urban interior environments does not have a significant relationship with Environmental Awareness. However, it does demonstrate a modest link between Environmental awareness and natural exposure (r =.3.01, p =.002).

Table 6: Results of relations 3&5, environmental awareness and sensitivity correlation with family exposure

Spearman's rho		Natural Exposure	Indoor Exposure	Urban Exposure
Sensitivity Mean	Correlation Coefficient	.207*	-.062	-.021
	Sig. (2-tailed)	.039	.537	.835
	N	100	100	100
Awarness Mean	Correlation Coefficient	.301**	-.026	-.003
	Sig. (2-tailed)	.002	.794	.977
	N	100	100	100

Source: Author

4. <u>Relation 6, 7, 8, 9</u>: Environmental sensitivity and awareness & Environmental ethic

As shown in table 6, The Spearman correlation is only significantly correlated with Environmental sensitivity and Environmental value mean (r =.277, p =.005) and does not show a significant correlation with other parameters of environmental ethics.

On the other hand, Environmental Awareness shows a strong and significant relationship with environmental value (r =.407, p =.000) and a significant correlation to the constraints parameter (r =.244, p =.015).

Table 7:Results of realtion6, 7, 8, 9 correlation environmental Sensitivity&Awarness&Ethic

Spearman's rho		constraints	Environm ental value Mean	Safety perception	Play Importance mean
Sensitivity Mean	Correlation Coefficient	.089	.277**	.068	.117
	Sig. (2-tailed)	.378	.005	.500	.245
	N	100	100	100	100
Awareness Mean	Correlation Coefficient	.244*	.407**	-.049	-.024
	Sig. (2-tailed)	.015	.000	.626	.815
	N	100	100	100	100

Source: Author

5. <u>**Relation 10**</u>**: Environmental&Social attributes of the majority of children who chose the same category of reasons where they mostly play in comparison with all data gathered**

As demonstrated in Table 8, the answer to the question "Where do you play the most?" in assessing children's environmental attitudes in survey3, indoors playing where the highest selected option, but the answer to Why? ***38 children*** answered by reasoning that they <u>had to stay indoors</u> due to <u>where they live in the city</u> or <u>how their parents do not have enough free time to take them outdoors to play</u>.

Table 8: Categorized most repeated to answer "why?" question of most favorable place to play

Categorized most repeated to answer "why?" question of most favorable place to play

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Long hours indoors due to no green area accessible, living in a city, apartments, or my parents do not have enough time	38	38.0	43.2	43.2
	I enjoy parks playing in parks, making new friends	15	15.0	17.0	60.2
	I like being outdoors among Trees, nature, and animals	12	12.0	13.6	73.9
	I Like playing video games; they are always accessible	17	17.0	19.3	93.2
	We mostly like to go on holidays and weekends with my family	6	6.0	6.8	100.0
	Total	88	88.0	100.0	
Missing	System	12	12.0		
Total		100	100.0		

Source: Author

Table 9: comparison of 38 children in the majority of selecting the same reasoning for question number 1 of survey 3, with all data from 100 children filled surveys

		Results of 38 children selected from answers to the question above						Results of all 100 children					
		sensitivity	awareness	EQi	Indoor exposure	Urban exposure	Natural exposure	SENSIV mean	Awaren mean	EQI	Indoor exposure	Urban exposure	Natural exposure
N	Valid	38	38	38	38	38	38	100	100	100	100	100	100
	Missing	62	62	62	62	62	62	0	0	0	0	0	0
Mean		1.6299	1.9857	39.5000	3.1842	1.5263	2.2145	1.6375	1.9866	42.7900	3.2000	1.7200	2.4550
Mode		1.63	1.70ª	16.00	3.00	1.00	3.00	1.63	2.20	67.00	3.00	1.00	3.00
Minimum		1.50	1.40	16.00	1.50	1.00	1.00	1.38	1.40	16.00	1.00	1.00	1.00
Maximum		1.75	2.30	67.00	5.00	5.00	4.25	1.81	2.30	67.00	5.00	5.00	5.00

a. Multiple modes exist. The smallest value is shown

Source: Author

As highlighted parts with light and dark yellow colors in table 9, Children who mentioned staying indoors as the most repeated answer for playing, were high in environmental awareness mean (1.985) and sensitivity (1.629) (compared to the mean of all dataset awareness mean=1.986, sensitivity mean=1.637), Also spent less than average time in urban settings (1.52≤1.72) and natural environments(2.21≤2.45). More importantly, the EQi Index of their schools was considerably lower than the maximum EQi index of selected schools in the city(39.5≤67) and also less than the mean of the EQi index (39.5≤42.7).

6. Relation 11: Environmental&Social attributes of the majority of children who chose the same category of reasons where they like to play the MOST in comparison with all data gathered

As demonstrated in Table 10, in answer to the question "Where do you like to play the most?" in assessing children's environmental attitudes in the survey3, the playgrounds and parks were the highest selected option, but the answer to Why? ***21 children*** answered by reasoning that they Like to play outdoors among trees and green areas due to the opportunity to play with their friends and having playing types of equipment in the park's playgrounds.

Table 10: Categorized most repeated to answer "why?" question of was like to play the MOST

Categorized most repeated to answer "why?" question of were like to play the MOST

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Like playing indoors with toys	8	8.0	12.7	12.7
	I like to play in parks and playgrounds with my friends, lots of equipment in playgrounds	17	17.0	27.0	39.7
	I like to be among trees and outdoors. Clean air and sunshine make me happy.	21	21.0	33.3	73.0
	I like videogames, and I can play by myself	11	11.0	17.5	90.5
	I like to go to gardens nearby on holidays and weekends	6	6.0	9.5	100.0
	Total	63	63.0	100.0	
Missing	System	37	37.0		
Total		100	100.0		

Source: Author

As highlighted parts with light and dark yellow colors in table 9, Children who mentioned staying indoors as the most repeated answer for playing, were high in environmental awareness mean (1.985) and sensitivity (1.629) (compared to the mean of all dataset awareness mean=1.986, sensitivity mean=1.637), Also spent less than average time in urban settings (1.52≤1.72) and natural environments(2.21≤2.45). More importantly, the EQi Index of their schools was considerably lower than the maximum EQi index of selected schools in the city(39.5≤67) and also less than the mean of the EQi index (39.5≤42.7)

Table 11:comparison of 21 children in the majority of selecting the same reasoning for question number 2 of survey 3, with all data from 100 children filled surveys

		Results of 21 children selected from answers to the question above						Results of all 100 children					
		sensitivity	Awarness	EQINDEX_21	Natural_21	Indoor_21	Urban_21	SENSITIVITY MEAN	Awareness MEAN	EQINDEX	Natural EXPOSURE	Indoor EXPOSURE	Urban EXPOSURE
N	Valid	21	21	21	21	21	21	100	100	100	100	100	100
	Missing	79	79	79	79	79	79	0	0	0	0	0	0
Mean		1.6786	2.0690	54.9048	2.5595	3.2619	1.4762	1.6375	1.9866	42.7900	2.4550	3.2000	1.7200
Mode		1.69	2.20	63.00	2.00	3.00[a]	1.00	1.63	2.20	67.00	3.00	3.00	1.00
Minimum		1.50	1.40	16.00	1.00	1.50	1.00	1.38	1.40	16.00	1.00	1.00	1.00
Maximum		1.75	2.30	67.00	4.00	5.00	3.50	1.81	2.30	67.00	5.00	5.00	5.00

a. Multiple modes exist. The smallest value is shown

Source: Author

7. <u>Relation 12</u>: Environmental&Social attributes of the majority of children who chose the same category of reasons where they feel SAFE to play the most in comparison with all data gathered

As demonstrated in Table 12, the answer to the question "Where do you feel safe to play the most?" in assessing children's environmental attitudes in the survey3, that Indoor playing means staying at home and playing with toys or videogames mostly perceived as safe. The highest selected option, but the answer to Why? ***12 children*** answered by reasoning that they <u>feel safe at home because they are near to their family members and that they protect them.</u>

Also, in almost the exact numbers, **13 children** mentioned the reason for considering staying at home safely <u>because there are no thieves or strangers.</u>

Table 12: Categorized most repeated to answer "why?" question of where feel SAFE to play the most

Categorized most repeated to answer "why?" question of where feel SAFE to play the most

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At home, I am near family, feel safe, and there is no risk of harm.	12	12.0	29.3	29.3
	Home is safe, and there are no thieves or strangers there.	13	13.0	31.7	61.0
	I like parks because I can take my dog with me and it protects me.	1	1.0	2.4	63.4
	I Like being in nature	8	8.0	19.5	82.9
	I am safe at home and not afraid of getting lost there.	7	7.0	17.1	100.0
	Total	41	41.0	100.0	
Missing	System	59	59.0		
	Total	100	100.0		

Source: Author

As highlighted parts with light and dark yellow colors in table 13, Children who mentioned staying <u>indoors</u> as the most repeated answer for a safe place to play, were high in environmental awareness mean (2.043). Sensitivity average (compared to the mean of all dataset awareness mean=1.986, sensitivity mean=1.637), Also spent less than average time in urban settings (1.52≤1.72) other exposure criteria similar to average. More importantly, the EQi Index of their schools was the average (EQi=42)EQi index of selected schools.

Table 13: comparison of 13 children in the majority of selecting the same reasoning for question number3 of survey 3, with all data from 100 children filled surveys

		Results of13 children selected from answers to the question above						**Results of all 100 children**					
		sensitivity	Awareness	EQi	Natural exposure	Indoor exposure	Urban exposure	SENSIVITY MEAN	AwarenessMEAN	EQi	Natural exposure	Indoor exposure	Urban exposure
N	Valid	13	13	13	13	13	13	100	100	100	100	100	100
	Missing	87	87	87	87	87	87	0	0	0	0	0	0
Mean		1.6394	2.0431	42.0769	2.8462	3.1923	1.4615	1.6375	1.9866	42.7900	2.4550	3.2000	1.7200
Mode		1.63ª	2.20	59.00	3.00	3.50	1.00	1.63	2.20	67.00	3.00	3.00	1.00
Minimum		1.50	1.50	16.00	1.00	1.50	1.00	1.38	1.40	16.00	1.00	1.00	1.00
Maximum		1.75	2.30	67.00	5.00	5.00	2.50	1.81	2.30	67.00	5.00	5.00	5.00

a. Multiple modes exist. The smallest value is shown

Source: Author

8. <u>Relation 13</u>: Environmental&Social attributes of the majority of children who chose the same category of reasons where they <u>DO NOT LIKE</u> to play the most in comparison with all data gathered

As demonstrated in Table 14, the answer to the question "Where do you NOT LIKE to play the most?" in assessing children's environmental attitudes in the survey3b, Forest and wild natural environments were least favorable amongst children. The highest selected option for their reasoning, ***32 children*** answered by reasoning that they are <u>not safe and they are afraid of getting lost</u>. <u>Also afraid of animals.</u> Moreover, in almost high numbers, **19 children** mentioned the reason for considering playing video games as their least favorable option <u>because it is boring and harmful to their health. Their eyes hurt when they play video games for hours.</u>

Table 14: Categorized results for most repeated to answer "why?" question of where do you NOT LIKE to play the most

Categorized results for most repeated to answer "why?" question of where do you NOT LIKE to play the most

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Harming health, boring	19	19.0	24.4	24.4
	Get lost,is not safe	32	32.0	41.0	65.4
	Afraid, animals	12	12.0	15.4	80.8
	Unpleasant feeling	7	7.0	9.0	89.7
	dangerous	8	8.0	10.3	100.0
	Total	78	78.0	100.0	
Missing	System	22	22.0		
	Total	100	100.0		

Source: Author

Due to table 15, Children who mentioned <u>Forests</u> as the most repeated answer for the place they <u>do not like to play</u> were high in environmental sensitivity mean (1.88≥1.63). Awareness average (compared to the mean of all dataset awareness mean=1.986, sensitivity mean=1.637), Also spent less than average time in natural settings (1.51≤2.45) other exposure criteria similar to average. More importantly, the EQi Index of their schools was <u>lower than the average</u> (EQi=35)EQi index of selected schools(EQi=42)

Table 15: comparison of 32 children in the majority of selecting the same reasoning for question number1 of survey 3b, with all data from 100 children filled surveys

		Results of 32 children selected from answers to the question above						Results of all 100 children					
		Sensitivity	Awareness	EQI	Natural exposure	Indoor exposure	Urban exposure	SENSIVITY _MEAN	Awareness_ MEAN	EQi	Natural exposure	Indoor exposure	Urban exposure
N	Valid	32	32	32	32	32	32	100	100	100	100	100	100
	Missing	68	68	68	68	68	68	0	0	0	0	0	0
Mean		1.884	2.1453	35.0000	1.5156	3.4719	1.5000	1.6375	1.9866	42.7900	2.4550	3.2000	1.7200
Mode		1.69	2.20	67.00	3.00	3.00ᵃ	1.00	1.63	2.20	67.00	3.00	3.00	1.00
Minimum		1.38	1.40	16.00	1.00	1.50	1.00	1.38	1.40	16.00	1.00	1.00	1.00
Maximum		1.75	2.30	67.00	4.50	5.00	5.00	1.81	2.30	67.00	5.00	5.00	5.00

a. Multiple modes exist. The smallest value is shown

Source: Author

9. <u>Relation 14</u>: Environmental&Social attributes of the majority of children who chose the same category of reasons where they <u>DO NOT FEEL SAFE</u> to play the most in comparison with all data gathered

As demonstrated in Table 16, the answer to the question "Where do you NOT FEEL SAFE to play the most?" in assessing children's environmental attitudes in the survey3b, Forest and wild natural environments were considered unsafe amongst children. The highest selected option for their reasoning, ***16 children*** answered by reasoning that they are <u>not safe and they are afraid of getting lost</u>. Moreover, in almost high numbers, **15 children** mentioned they feel they are not safe <u>because they are afraid of animals in the forests.</u>

Table 16:Categorized results for most repeated to answer "why?" question of where do you NOT FEEL SAFE to play the most

Categorized results for most repeated to answer "why?" question of where do you NOT FEEL SAFE to play the most

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Harming health, boring	1	1.0	2.5	2.5
	Get lost,is not safe	15	15.0	37.5	40.0
	Afraid, animals	16	16.0	40.0	80.0
	Unpleasant feeling	4	4.0	10.0	90.0
	dangerous	4	4.0	10.0	100.0
	Total	40	40.0	100.0	
Missing	System	60	60.0		
Total		100	100.0		

Source: Author

Due to table 17, Children who mentioned <u>Forests</u> as the most repeated answer for the place they <u>do not feel safe to play</u> were high in environmental awareness (2.18≥1.98). Sensitivity average (compared to the mean of all dataset awareness mean=1.986, sensitivity mean=1.637), Also spent <u>more than average</u> time indoors (3.93≥3.2) other exposure criteria similar to average. More importantly, the EQi Index of their schools was <u>lower than average</u> (EQi=30.91)EQi index of selected schools(EQi=42).

Table 17:comparison of 16 children in the majority of selecting the same reasoning for question number2 of survey 3b, with all data from 100 children filled surveys

		SENSIVITY _16	Awareness_ 16	EQINDEX_ 16	Natural_1 6	Indoor_1 6	SENSIVITY _MEAN	Awareness_ MEAN	EQIND EX	Natural_EX POSURE	Indoor_EXP OSURE	Urban_EXP OSURE
N	Valid	16	16	16	16	16	100	100	100	100	100	100
	Missin g	84	84	84	84	84	0	0	0	0	0	0
Mean		1.6367	2.1875	30.910	1.9531	3.9375	1.6375	1.9866	42.7900	2.4550	3.2000	1.7200
Mode		1.63	21.00	2.00	3.00[a]	3.00	1.63	2.20	67.00	3.00	3.00	1.00
Minimum		1.50	16.00	1.50	1.25	1.50	1.38	1.40	16.00	1.00	1.00	1.00
Maximum		1.75	67.00	2.30	4.00	5.00	1.81	2.30	67.00	5.00	5.00	5.00

Source: Author

10. <u>Relation 15</u>**: Summary of Parent's Environmental ethics and children's private exposure based on their answers to surveys 4, 5**

Most parents strongly disagree with the safety of the forests and streets near home, leading them to prefer the indoors and to stay at home to play in the safest place for children. Nevertheless, interestingly the average percentage of answers from this survey demonstrates that averagely parents agree that parks and green areas are safe to play in (see figure 20).
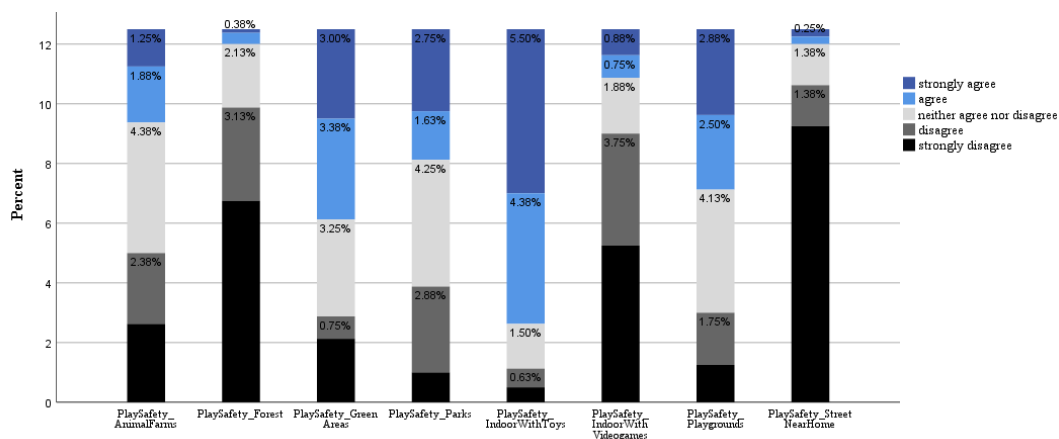
Figure 29: Summary of parents and teachers' answers to survey 5, environmental ethics

Source: Author

Chapter 5 :Discussion&Conclusion

In this study, we want to characterize the development of Environmental Consciousness, a connection with nature, in children (EC). In light of the empirical findings presented previously, the extent to which kids are exposed to varied socio-ecological contexts, they acquire environmental sensitivities and awareness as well as an environmental attitude.is discussed below, with a focus on family exposure and also exposure due to school surroundings.

In a mixed-method that has been used in this research, There are many various activities and feelings that may be evoked in nature, and qualitative viewpoints can highlight how nature connection might appear and feel. When it comes to quantifying experiences, we may distinguish between those linked with a high or low level of connection using quantitative methodologies.. This review addressed replies when 100 children were asked questions about what linked them with nature. Many children shared anecdotes of their encounters with nature, how they felt empowered to take action to protect it, and how they felt at ease being outside in all kinds of weather. Promotes for introducing children to the natural world were questioned, and they helped the research to have a more comprehensive list of resources. The vast majority of poll participants agreed that this lengthy list was thorough.

There is growing evidence demonstrating the positive effects on a young person's overall well-being of exposure to nature. This research shows that when children have access to nature in their homes, schools, and communities, it improves their physical and emotional health as well as their cognitive abilities [147–152]. Several research supports the notion that being in touch with nature offers comparable advantages. Nussbaum (2011) [153], an Aristotelian philosopher who developed the concept of eudaimonia, asserts that humans flourish when given a chance to use all of their good skills. Being able to care for animals, plants, and the world around us is a fundamental value in and of itself, as well as fostering healthy growth in other aspects of life, according to Nusbaum.

5.1. Environmental Sensitivity and Environmental Awareness&Attitude and their relationship with natural connection in the urban ecological environments

When it comes to EC, environmental sensitivity (ES) is defined by empathy. and individual appreciation of Nature in all its manifestations [119]. While on the contrary, environmental awareness contains a substantial component of knowledge [81].The results indicate that these two EC characteristics are highly connected despite their differences. It cannot be determined if the former promotes the latter, the latter fosters the former, or if this relationship is due to extrinsic incentives, a more realistic intellect, for example [154]. The ecological environments in which children grew to allow for more serious considerations when exploring interrelations between Environmental Sensitivity and Environmental Awareness.

Children's Environmental Sensitivity, the affective component of EC, is positively impacted by the Environmental Qualities (EQs) of Wilderness and natural beauty. In other words, children with direct sensory experiences of wildness and natural beauty display greater empathy and care for the Biosphere than those without. In this study, the EQs of Recreation and Rurality did not have such a favorable effect. This work's fantastic range of impacts in the context of spatial analysis is a crucial result.

 In answer to one of the main questions of this research about the influence of school surroundings in an urban context on children's natural connection, It is evident that not all-natural urban environments have the same effect on forming a mental re-connection with the nature in childhood. Spending time in areas of recreational activity and rurality does not appear to aid in developing an empathic understanding of Nature in children. However, time spent in places of Wilderness and natural beauty does so considerably. These findings should be considered when designing urban areas that attempt to reduce the divide between humans and the Biosphere.

It is crucial to note that this study does attempt to focus on the positive aspects of ECs, and the goal has been to illustrate the motives for their diversity. Because of this, the results shown previously can be rephrased. Children with less access to natural habitats for school activities and surroundings interact considerably differently with wild natural environments than children with an average amount of access to natural environments for their school activities.

Children's EC becomes more diverse as their apprehension of natural situations becomes more apparent. Compared to children who fear becoming lost in the wilderness because of the possibility of encountering giant animals, those who are afraid of the wild have much lower exposure to the outdoors. Children afraid of predators are more likely to be missing than others. The other essential factors that shape this type of dread of natural settings include the children's social surroundings, particularly the environmental ethics of their family and parents.

It addresses the other research question mentioned at the beginning of the research. In the qualitative examination of data collected from youngsters, the majority of responses favored playing in the natural environment outside. Most parents responded that their children spent most of their time indoors because they do not consider the outdoors safe and do not tolerate their children getting even slightly injured while playing outside or getting their clothes dirty while playing in the mud! Therefore, they limit their children's experiences, and by doing so, they actively affect their future relationship with nature and environmental behavior.

The study's findings on Environmental Attitude show that the Biophilia theory fails to consider the nuances of a person's connection to nature and how that connection might change over time due to the person's own life experiences. It is the genetic fulcrum of our human connection to Nature in its manifestations: the evolutionary attitude toward the Biosphere, and the evolutionary ability to perceive the Biosphere via the senses, are both addressed by the idea of EC, which aims to capture both gaps. As opposed to the deterministic view of a positive or negative relationship with Nature, the complexity is first handled by EC's neutrality. EC's adaptability has been shown by the outcomes of all three components: Environmental Sensitivity, Awareness, and Attitude. Their daily exposure to natural settings has shaped EC's emotional characteristics. It is necessary, however, to evaluate the social context before summing these observations in an expanded definition of EC. This first section of the debate focuses on the EC's ability to adapt to various ecological conditions.

As we delved deeper into the results of interrelations 10&11, we found it intriguing that the vast majority of kids who spent a large proportion of their time indoors were high in environmental awareness and sensitivity and that their favored place to play was outdoors in natural environments and parks, while their daily school and the environment they are exposed to are low in EQ index, below average. This result implies that although they were knowledgeable and enjoyed being in natural settings, their access to these environments was restricted, just as it was for their parents and teachers. There is another side to this story; it

concerns all the negativity their parents and children face daily of the different environmental crises we face nowadays. As global environmental change processes increase, there is a gloomy side to feeling about extinct species, to adoring lost wilderness areas. To feel linked to a planet whose life-supporting systems are disintegrating. This challenging aspect arose in conversations with both children and parents. Most parents care about their children's repercussions rather than their own and are concerned about animal implications [71,155].

As a result, it is impossible to tell that children's fear of predators, which they have never experienced firsthand, is a product of their social environment. The study examines social perceptions of settings, not the whole social structure Even if the fear of wild animals under this study cannot be explained by genetic programming, and the data show that it does not come through sensory experiences in the wild, it is reasonable to assume that this fear stems from an indirect experience in the same habitat. Children's apprehension about the natural world stems less from their observations of the actual world than from the images they have been exposed to in their social circles. Biological cognition [134] suggests that sensory interaction with the physical environment is responsible for forming an emotional link with the Biosphere. Another critical factor is the connection between the physical environment's social representation and the senses. Individuals' views and emotions are influenced by their social setting, which is not a discovery. According to Bronfenbrenner (1986), it is also a significant element in creating general values and conduct. As a reminder, this study only deals with how social views are transmitted through physical surroundings [145].

Is there any evidence that the places and people with whom children have spent time affect their emotional ties to the Biosphere? Exposure to natural areas and pro-environmental social context seems to affect children's interaction with nature and also conversely is true. The scientific concept of "feeling linked to Nature" has been compared to this sector's present state of the art. Environmental Consciousness (EC) is a complex combination of mutually adaptable emotions to the socio-ecological Biosphere.

Several factors go towards developing an emotional connection to the Biosphere. With an approach based on complexity, EC must transcend the duality of positive and negative connections with the Biosphere [114]. Second, such an idea necessitates a degree of adjustment. Lifelong contact between an organism and its surroundings results from reciprocal adaptation to its socio-ecological context [134]. As a third consideration, it is essential to note that this definition includes sensory and social aspects. Human-Nature psychical link is described in

great detail in EC. Based on this information, several scientific fields can explore the reconnection between humans and nature.

Although this study mainly concerns primary school-aged children, even 5-year-olds are concerned about "the Earth growing too hot" [156]. In the adult study, such distressing emotions have been dubbed "ecological sadness" [157], and when they are caused by the deterioration of one's home landscape, "solastalgia" [158].

Figure 30 gives a summary of the topics covered thus far. It highlights events that improve or decrease nature connection, drawing on quantitative and qualitative studies and demonstrating that childhood experiences may impact adulthood. It elaborates on the Connection to nature has developmental advantages for children as well as conservation rewards because young people who have a better connection to nature show a greater understanding of environmental issues and a greater motivation to maintain the natural world.
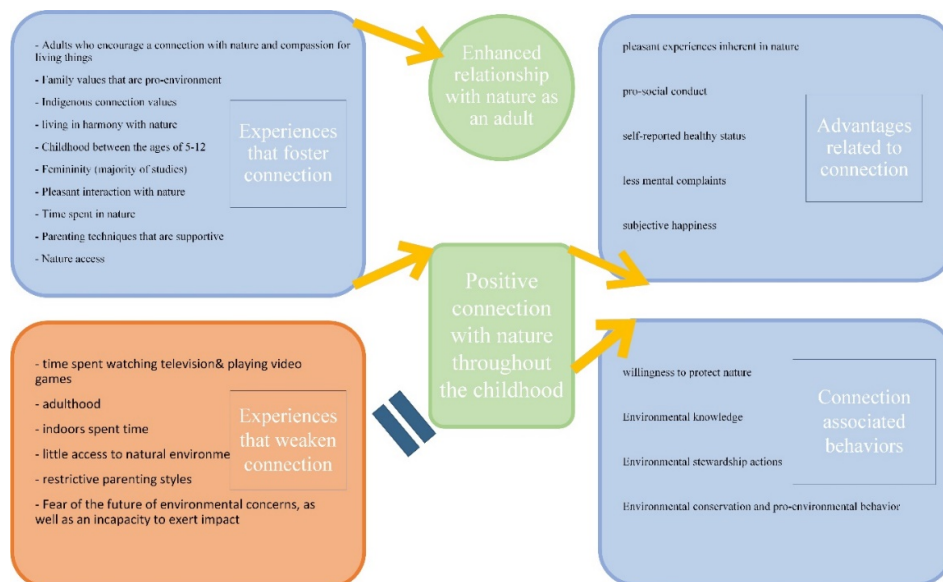
Figure 30: The benefits and behaviors that come from a child's connection to nature

Source: Author, derived from a review article of Chawla,2020 [159]

5.2. Managing environmental concerns, fears&hope-building

The study on environmental phobias has not been included in either adult or child studies on nature connections. However, fear and worry are undoubtedly manifestations of connection. Children that express these feelings comprehend their interconnection with the natural world, recognize their shared fragility with nature, and have compassion for other living things. This study contends that a complete perspective of nature's connection must embrace the whole range of human emotions. Establishing a love of nature and a sense of security, curiosity, and enjoyment while reserving unpleasant knowledge about environmental issues for older children also it is a top priority for environmental educators.

As a first step, young people should be able to express themselves without fear of being judged. change in weather optimism is strengthened by the expectation that instructors would recognise and support pupils' emotions as opposed to ignoring or ridiculing it [71]. The more supportive and solution-oriented parents and friends are, the more likely they are to demonstrate both problem-focused and meaning-focused coping [160]. In Labrador, too, Inuit youngsters cherished the support of family, friends, and neighbors who cared about their well-being and encouraged them to develop new ways to live off the land as the landscape changed around them [161]. Additionally, connecting students with scientists and activists who can share their work and experiences, motivating children to participate in environmental projects in their schools and communities, and engaging them through hands-on, inquiry-based, and arts-based techniques are essential (see review by Chawla, 2020[159]). Table 18 contains a list of the most effective techniques.

Table 18: Strategies for assisting children and youth in dealing with environmental change

Combine environmental science with knowledge about how to impact the world.	In order to find effective alternatives, youths must grasp the physical and social reasons for environmental change. It is also critical for students to understand what they can do to help solve issues, what others are doing, and how actions taken now can have a beneficial influence on tomorrow.
Make a safe area for children to express their feelings.	Teach the next generation that it is okay to voice their environmental concerns without fear of retribution. Listen to what the speaker has to say. Be helpful and problem-solving in your interactions with others.
Encourage an optimistic rethinking of challenges.	Assist youths in finding significance in environmental difficulties and seeing good possibilities in the reforms that civilization must make in order to protect nature.
Participate in visioning	Motivate and include young people in imagining and outlining possible paths in the direction of the desired future, with a focus on local locales.
Give young people a taste of self-determination.	Permit young people to explore significant environmental issues, select personally meaningful measures to solve them, and execute realistic ideas they can do alone or in collaboration.
Instill a sense of belonging and togetherness among	In order to show that they aren't alone in their efforts to protect and repair the natural world, it's important to bring young people together with other environmental activists.
Demonstrate that voluntary simplicity may be a rewarding lifestyle	Demonstrate youth how to find happiness in community, innovation, service, and the natural environment instead of collecting more and more material possessions.
Connect young people with nature	Give young people the time they need to become comfortable and confident in the natural world, as well as the opportunity to feel connection with other living species.

Source: Author, derived from a review article of Chawla,2020 [159]

Children looked such places where they could engage in physical recreation, risk, and discovery in nature. Friends and family gathered in parks and other green spaces to spend quality time together. Nature became a haven for them, allowing them to disengage from the stresses of the modern world, relax and reconnect with themselves or a small group of close friends. Indigenous children in Canadian cities who participated in photovoice, 'talking circles,' and interviews revealed that the metropolitan environment functioned as a source of calm, optimism, and resilience metaphors for them [162]. It is not uncommon for Taiwanese adolescents to describe their "most connected moments in nature" as "deep sensory immersion in wild environments far from urban centers, where they experienced the thrill of achievement during challenging activities such as hiking and stream-tracking," the awe of nature's beauty and the calm and relaxation of nature" [163].

5.3. Identity-Environment Compatibility and Environmental Prerequisites

Past research on how HNC is strengthened in communities has paid little consideration to individuals' preconceptions about nature (or worldview), such as previous values and environmental concerns. Of course, there are several preconceptions, such as positive, neutral, and negative. Recent psychological research indicates that beliefs often influence behavioral decisions concerning the environment. For example, Sörqvist et al. [108] discovered that environmental concerns influenced self-reported sensory impressions of items. Experiments revealed that such preconceptions shaped people's perception, performance, and sensations, such as tasting, comfortability, proofreading, and even participants' color vision [109,110], establishing that the effects of environmental labeling of products were more remarkable for people who scored high in environmental concern, compared to people who scored low in environmental concern. Environmental concern and values are also essential for how individuals construct expectations about future events, such as future experiences, decisions, and behavior. The interaction between environmental concern and values plays a role in such psychological dynamics [82,111]. Not unexpectedly, environmental concerns and values influence how we perceive natural environment aspects. According to Schultz and Zelezny [113], persons with self-transcendence values care more about environmental concerns than economic growth and are more active in pro-environmental practices.

In contrast, people prioritizing self-enhancing life objectives have a more egoistic concern for environmental issues. According to Halpenny and Caissie [114], people's concern and empathy for animals and natural ecosystems under threat of transformation appear to align with the same value orientation mentioned above. Schultz [115] discovered that people's concern for environmental issues was substantially connected to their perception of themselves as part of the natural environment. In addition to the above reasons, Rossi et al. [116] discovered that values, worldviews, and ethics impact people's capacity to build HCN. This has significant implications for urban planning. In some ways, cities provide a haven for those who have negative attitudes about nature. For example, many city inhabitants are afraid of nature for cultural reasons [117]. Lush green area habitats may be terrifying for people for safety concerns, so semi-natural environment designs in cities frequently need to care for safety through technological measures, such as sidewalk width, presence and brightness of street lights, and so on [118].

5.4. Increasing connectedness with nature

1. Evaluated <u>Environmental Education</u> intervention assessments

Data from quantitative and qualitative evaluations are summarized below (see Table 19). According to this body of research, we can create experiences that help people feel more connected to nature. Studies show the relevance of hands-on activities, natural history, and service-learning. A further social factor omitted from quantitative studies is the pride and unity people experience from working together to conserve natural ecosystems and species.

Table 19: Children & young people's increased connection to nature can be attributed to a variety of program approaches

• Ensure that there is sufficient time for direct interaction with nature and immersion in natural environments.

• Start concentrating on events defining natural connection

• A feeling of affiliation, a sense of closeness, a sense of oneness, pleasure, and comfort in nature, as well as a sense of self-assurance

• Curiosity, exploration

• Possibilities for growth and success Learning about our connection to the natural world as a species a concern for the well-being of all living things Taking care of nature and wildlife

• Allow youth to explore nature at speed and according to their interests. Inform children that there are several ways to be a "nature person," including play and enjoyment in nature, working the land sustainably, gardening, researching natural history, caring for animals, and creating art in nature.

• Include youth in collaborative efforts to understand and safeguard the natural world • Experiences with the local culture and nature on the ground.

• Share examples of people's excitement and concern for nature. Ensure that young people see others who resemble them engaging with nature. Permit young people to document their observations and experiences through writing, scientific record-keeping, and the arts.

All ages should be able to experience nature, but it's important to start early and have a long-term relationship with nature.

• Permit young people to overcome their anxieties about nature and specific creatures through progressive contacts at their comfort level.

Source: Based on Barthel et al. (2018), Barton et al. (2016), Braun and Dierkes (2017), Bruni et al. (2017, 2018), Cho and Lee (2018), Collado et al. (2013), Colvin Williams, and Chawla (2015), Dopko et al. (2019), Ernst and Theimer (2011), Kossack and Bogner (2012), Liefländer et al. (2013), Sheldrake et al. (2019), Stern et al. (2008), Theimer and Ernst (2012) and Yilmaz et al. (2020).

Where do successful practices overlap when *Table 18 on assisting young people to cope with environmental change and create hope is compared to Table 19 on improving young people's connection with nature? Are there techniques that are only included for one goal but may be good for both? This section compares these tables to indicate how programs for young people might foster connection with nature, action for nature, hope, and well-being all at the same time. During the process, it generates research questions.*

Several practices appear in both tables: giving young people time outside in natural areas, allowing them to feel comfortable and competent in nature, studying ecology and natural science, activities that show young people how they can make a positive difference for the environment, and examples of other people who are making a difference. Until now, these behaviors have been suggested for one of two reasons: increasing connection with nature or supporting healthy coping with environmental change and hope. The fact that they constitute a common core that is suggested for both objectives encourages investigation into whether these practices might help young people connect with nature while also developing constructive solutions to environmental problems. Are all of these program features required for success, in tandem or cumulatively over time? Or are some among the most formative? (See Figure 31 for an overview of experiences related to both connecting with nature and dealing with environmental change, as well as experiences that are predominantly connected with one or the other result.)
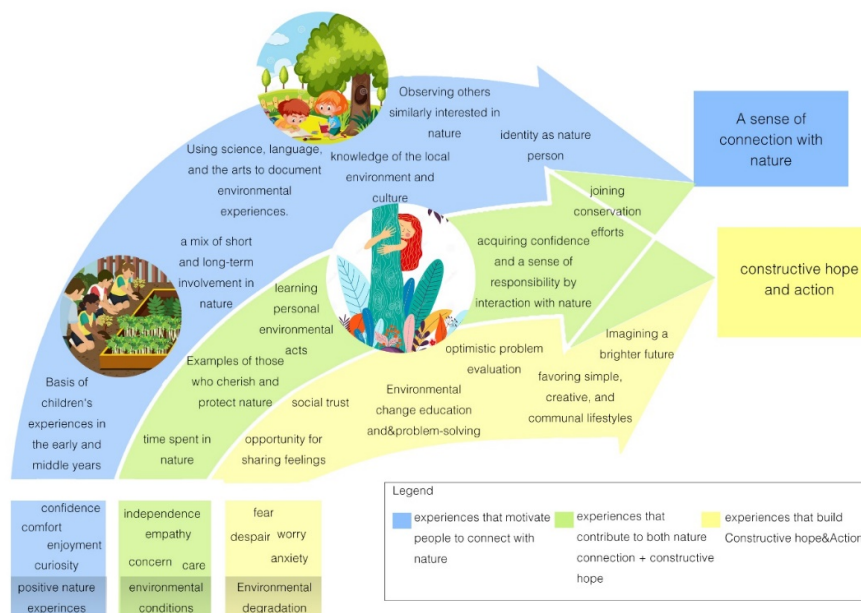

Figure 31:practices that help children to connect with nature and cope constructively with the environmental change

Source: Author, derived from review article of Chawla, 2020.

2. implication for practice: experiential learning in urban design

Experiential Learning& EC and the socio-ecological environment

Experiential learning is the goal of the EC. EC is, in fact, a collection of psychical characteristics that determine the human's relationship to the Biosphere. The road to EC is not easy to travel, and this research is not meant to give advice so much as inspiration. The motive for a learning transformation [116]. Aims to disrupt the present paradigmatic connection between humans and nature. Motivating events can help people transcend preconceived notions, emotions, and behavioral patterns. Inspiration to provide people a new psychological foundation so that they can do everyday acts that are not only nice to have but essential to the future of humankind if we are going to survive.

In addition, urban design is presented as the first step toward experiential learning in this area. This study found that EC and the socio-ecological environment are intertwined. Thus urban planning has a significant role in defining experiential learning by creating natural reconnection areas. *The social theory of space* [130] From a practical sense, Experiences and perceptions are not only stored in the morphology of a place but also constitute the basis for it. A surprising prospect is the creation of a new type of urban planning. The urban design attempts to bring people back together. Rather than just laying out green space, an urban design that creates emotional contact with nature is needed.

and this study have both stated and demonstrated that places are more than just a source of experiences and perceptions; they are also places where these experiences and perceptions are stored. This is a rare chance to gain experience in preparation for the EC. Inside a global system where urbanization consume the majority of natural resources, the definition of sites of reconnection would contribute to a sustainable urban mentality, the most crucial component in a global system where urbanization is rapidly expanding. Studies in other fields have previously pointed to this requirement [132,164].

"Our interaction with nature must be crucial in urban design and planning." [164]

The practical aspects of this urban architecture may be examined in further detail. During childhood, primary exposure to natural habitats has been found to significantly impact a person's development [45,146]. Urban planning must consider children's freedom to explore in a secure environment, which means adults must do it for future adults [66,111]. According to the results of the study, wild and rural areas play an important part in the formation of EC, and the

effect of such natural environments cannot be accounted for by the building of parks or recreational places. Such pragmatic issues are insufficient to define an urban design of reconnection, but they are able to motivate it.

Involvement Arenas for Collective Action and Environmental Learning

Planning and urban design are the professions of city managers and urban planners and must provide spaces where citizens may engage with nature more profoundly using their minds, hands, and hearts. Collective action occurs when a group of people collaborate to achieve a common objective. For instance, a collective-choice property right comprising management, exclusion, and alienation of natural resources and it can be designed at the operational level. Large-scale fieldwork has shown that people in many regions of the world self-organize to profit from enforcing norms for managing and protecting natural resources [165]. Collective action spaces in cities can facilitate a relationship with urban environment that has the ability to enhance the development of urban resilience. Building resilience further with natural environment has evolved as an analytical lens that facilitates discourse and collaboration across disciplines. It involves "cultivating the capacity to maintain growth in the face of anticipated and unexpected change, varied development routes, and possible thresholds between them" [166] says that the resilience method involves promoting transformational environmental learning at local sizes and the emergence and diffusion of initiatives across levels and scales. Deep leverage points for sustainability changes include extensive socio-cultural processes of self-concept development and societal norm construction [167], in which learning towards greater HNC in cities plays a significant role [52,74,168].

In cities, the need to overcome ecological illiteracy is much greater. Creating collective action for resilience building is particularly vital. HNC in cities can be promoted by "urban green commons" (UGC), when the rights to land are owned by an identified community or group of individuals who may construct their own institutions (i.e., regulations) for managing the resources [169,170]. Rural and traditional civilizations, where common-property systems abound, have urban parallels to the local commons found there [171–173]. Although urban green commons (UGCs) do not provide a daily source of income for the people who manage them, they do provide a variety of benefits for those who use them, including the opportunity to learn about gardening, the opportunity to socialize, and the opportunity to maintain intra-cultural identities [174–176]. A person who joins an urban common has the same rights as a property owner. However,

while entering a public green space like a park, the same individual only has the rights of an authorized entry; as a result, most public parks do not allow individuals to pluck flowers (withdrawal right) or grow vegetables and flowers (management right). When citizens in cities have a say in how they use land and grow food, they develop psychomotor and ecological literacy [177,178]. Public-access community gardens (PAC-gardens), and urban gardening initiatives on public property in Berlin, are an example of UGCs. These gardens provide stewardship organizations management powers over sections or entire parklands. As Bendt et al. discoveredAdditionally, PAC-gardens help students understand about urban ecology, self-organization and social integration, as well as political issues in urban area and social entrepreneurship. The majority of those who took part in the PAC gardening program said that they had gained a better understanding of micro-ecological factors such soil quality, shadow patterns, heat levels in various parts of the garden, and local wind patterns [179]. A fresh or renewed understanding of ecological challenges and processes is instilled in participants by participating in PAC gardening. Barthel et al. [180]. present examples of psychomotor learning skills applicable to allotment gardeners. Individuals test and error practices develop experiences in individuals and change environmental behaviors, which may or may not be conveyed to others by imitation or verbal ways. For instance, gardeners learn to monitor the response of their allotment's plants and animals to management inputs.

UGCs may incorporate private rooftop gardening or utility garden allotments. However, a frequently overlooked component of green roofs is that they are only available to a restricted number of urban people [181]. When it comes to PAC gardens, they are available to anybody who lives in the city, although members may be necessary to keep things running smoothly.

3. Urban planning&sustainability:

building resilience

As global urbanization continues, policymakers, planners, and urban designers must enhance city sustainability. Local factors, cultural contexts, socio-economic background, institutional pathway dependency, etc., dictate how to develop more environmentally suitable cities. This research presents Human–Nature Connection teachings (HNC). The worldwide COVID-19 epidemic shows how prone modern communities are to disturbances and stressors, frequently terrible issues and shocks. Wicked issues are intractable because solving one element reveals

or creates other, more complicated difficulties [182]. When pandemic, climate-related, or socioeconomic catastrophes occur, they serve as a reminder that we need to focus more on creating resilience, or a "carrying capacity," to deal with foreseeable and unforeseeable shocks [183,184]. The municipal government must prepare for shocks to the global food system, the consequences of climate change, and socioeconomic upheavals that may impact the city's quality of life [185,186]. Ecosystems are essential to the emotional, physical, and spiritual wellbeing of humans [8,187] and the development of urban resilience.

Property-Rights, and Human–Nature Relationships

In this research on schoolchildren's nature routines at Tabriz, Iran, it was shown that pupils in schools closer to nature were more empathetic and concerned for non-human life forms, as well as more cognitively aware of human-nature connection [108]. Property rights must also be addressed while approving HNC, notwithstanding the importance of the spatial distribution of natural places. Institutional scholars have long recognized that property rights play a role in linking humans to nature [68]. and in establishing the incentives underpinning political, social, and economic human interactions. However, the dynamics of property rights regimes and accompanying rights bundles have been largely ignored in urban sustainability research [170,188]. Nonetheless, in many regions of the world, the decentralization of management powers from local governments to local-level organizations and individuals, such as neighborhood groups, local communities, NGOs, and others, is growing because it has implications for eradicating ecological illiteracy [179].

While urban planning influences proximity to urban nature (both metric and cognitive distance), property rights arrangements influence HNC by limiting exclusion from or entry into urban nature. This is typically determined by whether land (and water) is owned by the government and administered by the government, privately, or jointly. In addition, a set of rights and responsibilities control entrance rights to land, the right to take resources from land, the right to manage resources, the right to prevent non-owners from enjoying the benefits of land, and the right to alienate (e.g. sell) or lease the property.

It is important to note that few city property rights regimes provide a larger variety of urban residents to actively manage land. Numerous natural and semi-natural habitats, such as public parks, street alleys, bioswales, pocket parks, etc., just allow access to land and do not grant management rights to regular residents, but rather to public and private land stewards and park managers. If land is privately held, only the owner (and his or her friends) have

management rights. In contrast, normal property-rights regimes permit a far larger proportion of the urban population to manage land in cities, especially areas preserved as urban green commons (UGCs), which represent urban ecosystems of mixed ownership that depend on communal organization and administration [170].

Sensorimotor Urban Environment Learning

It has been suggested for a long time that healthy urban settings should enable and promote stewardship of natural resources by providing opportunities to recycle, reduce, and reuse [189]. As previously mentioned, such stewardship requirements also affect children. In the same way that property-rights regimes, in general, have been overlooked in the development of urban environmental policy, environmental education, including land stewardship by a broader number of urban people, has also been disregarded. Different types of environmental stewardship need psychomotor learning, which includes learning by doing and via experience [190] and ranges from tacit and unconscious learning to explicit and codified learning [191]. Consequently, most psychomotor learning is never defined; it is just what we do or "what affects our capacity to participate in practice, our knowledge of why we engage in it, and the resources we have to do so" [192] (p. 97). Enhancing resilience-building on a more significant, more transformative scale involves the

Existence of ecosystems that allow people to interact with nature physically (Figure 1), i.e., by manual or physical abilities coordinated by the arms, hands, fingers, and feet, without verbal procedures. Planners and urban planners must give these land-management systems more significant consideration. Psychomotor learning has been alluded to by ecologists in cruder utilizing such terms as 'ecosystem management or 'ecosystem stewardship' [193].

Psychomotor learning comprises sustainable agricultural education [194] and gardening [195,196] and includes, but is not limited to, the creation and retention of memories and skills in the motor cortices [197] Barthel et al. [180] provide several examples of ecosystem management practices in Tabriz, Iran, that involve psychomotor learning, referring to these practices as "social-ecological memory." These practices involve practical skills for gardening and wildlife support, such as creating habitats for the diversity and abundance of wild bees and other pollinators and habitats for supporting insectivorous birds. Similarly, Giusti [52] demonstrates the ecological and social benefits of youngsters leading environmental restoration projects.

Children's Habitats and Human–Nature Relationships

It is crucial to create sustainable relationships with environment by preventing the development of phobias and disaffection with nature by organizing the everyday habitat [52,74,198]. This is the objective of biophilic design [108] and the study of places that interact with nature [51,52,74]. The HNC of youngsters as early as five years old has been shaped by natural environments [74]. Unfortunately, children's connections with urban environments demotivate them to preserve nature [52].

Creating nature-reconnecting environments for children is a spatial design approach that facilitates increased HNC, as well as a better sense of place in children [51,199]. The cognitive and affective learning environments at HNC might benefit from a feeling of place [200,201]. Active green-area management provides a feeling of place [202–204], and such an HNC can inspire a sense of moral obligation and behavior toward the environment [54,74,205]. Several research have also proven the relationship between HNC and more traditional value-based or cognitive hierarchy models of environmentally appropriate behavior [54,206], despite the fact that the value-action gap remains a challenge in sustainability science [168,207,208].

References

1. Rockström J, Steffen W, Noone K, et al. A safe operating space for humanity. *Nature*. 2009;461(7263):472-475. doi:10.1038/461472a

2. Vitousek P, Mooney H, Lubchenco J, Melillo J. Human Domination of Earth's Ecosystems. *Science (1979)*. 1997;277. doi:10.1007/978-0-387-73412-5_1

3. Folke C, Jansson Å, Rockström J, et al. Reconnecting to the biosphere. In: *Ambio*. Vol 40. ; 2011. doi:10.1007/s13280-011-0184-y

4. Gershuny J. United Kingdom Time Use Survey, 2014-2015. Published online 2017.

5. Generation M2: Media in the Lives of 8- to 18-year-olds - Henry J. Kaiser Family Foundation, Victoria J. Rideout, Ulla G. Foehr, Donald F. Roberts - Google Books. Accessed February 2, 2022. https://books.google.fr/books/about/Generation_M2.html?id=ciZNnQEACAAJ&redir_esc=y

6. What Studying Nature Has Taught Us - The Solutions Journal. Accessed February 2, 2022. https://thesolutionsjournal.com/2016/02/22/what-studying-nature-has-taught-us/

7. Keniger LE, Gaston KJ, Irvine KN, Fuller RA. What are the Benefits of Interacting with Nature? *International Journal of Environmental Research and Public Health 2013, Vol 10, Pages 913-935*. 2013;10(3):913-935. doi:10.3390/IJERPH10030913

8. Hartig T, Mitchell R, de Vries S, Frumkin H. Nature and Health. *https://doi.org/101146/annurev-publhealth-032013-182443*. 2014;35:207-228. doi:10.1146/ANNUREV-PUBLHEALTH-032013-182443

9. Ginsburg KR, Shifrin DL, Broughton DD, et al. The Importance of Play in Promoting Healthy Child Development and Maintaining Strong Parent-Child Bonds. *Pediatrics*. 2007;119(1):182-191. doi:10.1542/PEDS.2006-2697

10. Burdette HL, Whitaker RC. Resurrecting Free Play in Young Children: Looking Beyond Fitness and Fatness to Attention, Affiliation, and Affect. *Archives of Pediatrics & Adolescent Medicine*. 2005;159(1):46-50. doi:10.1001/ARCHPEDI.159.1.46

11. Rickinson M, Dillon J, Teamey K, et al. *A REVIEW OF RESEARCH ON OUTDOOR LEARNING EXECUTIVE SUMMARY*.; 2004. http://www.teachernet.gov.uk/teachingandlearning/resourcematerials/growingschools/

12. Chawla L. Research methods to investigate significant life experiences: Review and recommendations. *Environmental Education Research*. 1998;4(4). doi:10.1080/1350462980040403

13. Chawla L. Life paths into effective environmental action. *Journal of Environmental Education*. 1999;31(1). doi:10.1080/00958969909598628

14.   Hsu SJ. Significant life experiences affect environmental action: a confirmation study in eastern Taiwan. *http://dx.doi.org/101080/13504620903076973*. 2009;15(4):497-517. doi:10.1080/13504620903076973

15.   Evans GW, Brauchle G, Haq A, Stecker R, Wong K, Shapiro E. Young Children's Environmental Attitudes and Behaviors: *http://dx.doi.org/101177/0013916506294252*. 2007;39(5):635-658. doi:10.1177/0013916506294252

16.   Experiencing nature: Affective, cognitive, and evaluative development in children. - PsycNET. Accessed February 2, 2022. https://psycnet.apa.org/record/2002-01686-005

17.   (PDF) Videophilia: Implications for Childhood Development and Conservation. Accessed February 2, 2022. https://www.researchgate.net/publication/237557695_Videophilia_Implications_for_Childhood_Development_and_Conservation

18.   Miller JR. Biodiversity conservation and the extinction of experience. *Trends in Ecology & Evolution*. 2005;20(8):430-434. doi:10.1016/j.tree.2005.05.013

19.   Soga M, Gaston KJ. The ecology of human–nature interactions. *Proceedings of the Royal Society B*. 2020;287(1918). doi:10.1098/RSPB.2019.1882

20.   Oxford Learner's Dictionaries | Find definitions, translations, and grammar explanations at Oxford Learner's Dictionaries. Accessed December 12, 2021. https://www.oxfordlearnersdictionaries.com/

21.   Nisbet EK, Zelenski JM, Murphy SA. The Nature Relatedness Scale: Linking Individuals' Connection With Nature to Environmental Concern and Behavior. *http://dx.doi.org/101177/0013916508318748*. 2008;41(5):715-740. doi:10.1177/0013916508318748

22.   Martin C, Psychology SCJ of E, 2016 undefined. The extended inclusion of nature in self scale. *Elsevier*. Accessed March 31, 2022. https://www.sciencedirect.com/science/article/pii/S0272494416300512

23.   Martin L, White MP, Hunt A, Richardson M, Pahl S, Burt J. Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*. 2020;68:101389. doi:10.1016/J.JENVP.2020.101389

24.   geography TCI encyclopedia of human, 2009 undefined. Place. *academia.edu*. Accessed February 5, 2022. https://www.academia.edu/download/54395926/Place.pdf

25.   Conservation GBE, 1987 undefined. Our common future—Call for action. *cambridge.org*. Accessed February 5, 2022. https://www.cambridge.org/core/journals/environmental-conservation/article/our-common-futurecall-for-action/65808D6676E07552EF891DF31C3DF7A1

26.   Strommen E. Lions and tigers and bears, oh my! children's conceptions of forests and their inhabitants. *Journal of Research in Science Teaching*. 1995;32(7):683-698. doi:10.1002/TEA.3660320704

27. Keliher V. Children's perceptions of nature. *International Research in Geographical and Environmental Education*. 1997;6(3):240-243. doi:10.1080/10382046.1997.9965051

28. Ernst J, Research STEE, 2011 undefined. Evaluating the effects of environmental education programming on connectedness to nature. *Taylor & Francis*. 2017;17(5):577-598. doi:10.1080/13504622.2011.565119

29. Bonnett M, Williams J. Environmental education and primary children's attitudes towards nature and the environment. *Cambridge Journal of Education*. 1998;28(2):159-174. doi:10.1080/0305764980280202

30. Bailey S, Watson R. Establishing basic ecological understanding in younger pupils: A pilot evaluation of a strategy based on drama/role play. *International Journal of Science Education*. 1998;20(2):139-152. doi:10.1080/0950069980200202

31. Aaron R, Environments PWCY and, 2011 undefined. Urban students' definitions and perceptions of nature. *JSTOR*. Published online 2011. doi:10.7721/chilyoutenvi.21.2.0145

32. October RWR, 2004 undefined. Interaction with nature during the middle years: Its importance in children's development and nature's future. *Citeseer*. Published online 2004. Accessed February 9, 2022. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.205.9447&rep=rep1&type=pdf

33. Soga M, Gaston KJ. Extinction of experience: The loss of human-nature interactions. *Frontiers in Ecology and the Environment*. 2016;14(2):94-101. doi:10.1002/FEE.1225

34. evolution JMT in ecology &, 2005 undefined. Biodiversity conservation and the extinction of experience. *Elsevier*. Accessed February 9, 2022. https://www.sciencedirect.com/science/article/pii/S0169534705001643

35. Clayton S, Colí eony A, Conversy P, et al. Transformation of experience: Toward a new relationship with nature. *Wiley Online Library*. 2017;10(5):645-651. doi:10.1111/conl.12337

36. Kellert S, Case D, Escher D, Witter D, Mikels-Carrasco J, & SP. *The Nature of Americans: Disconnection and Recommendations for Reconnection*.; 2017. Accessed February 9, 2022. NatureofAmericans.org

37. Carver A, Timperio A, place DCH&, 2008 undefined. Playing it safe: The influence of neighbourhood safety on children's physical activity—A review. *Elsevier*. Accessed February 9, 2022. https://www.sciencedirect.com/science/article/pii/S1353829207000536

38. Oryx RP, 2003 undefined. Nature matrix: reconnecting people and nature. *cambridge.org*. 2022;37(2). doi:10.1017/S0030605303000383

39. Leadership RLE, 2009 undefined. Do our kids have nature-deficit disorder. *forestschoolportfolio.com*. Accessed February 9, 2022.

http://www.forestschoolportfolio.com/wp-content/uploads/2015/08/DoOurKidsHaveNature-DeficitDisorderLouv.pdf

40. Cobern WW. College students' conceptualizations of nature: An interpretive world view analysis. *Journal of Research in Science Teaching*. 1993;30(8):935-951. doi:10.1002/TEA.3660300810

41. hypothesis RUT biophilia, 1993 undefined. Biophilia, biophobia, and natural landscapes. *books.google.com*. Accessed February 9, 2022. https://books.google.nl/books?hl=en&lr=&id=GAO8BwAAQBAJ&oi=fnd&pg=PA73&dq=Ulrich,+R.+S.+(1993).+Biophilia,+biophobia,+and+natural+landscapes.+The+Biophilia+Hypothesis&ots=pmrcKHAYw_&sig=X_ssckfThZ6yiAIWdFjq74egDmo

42. Clearing DS, 1995 undefined. Beyond Ecophobia: Reclaiming the Heart in Nature Education. *ERIC*. Accessed February 9, 2022. https://eric.ed.gov/?id=EJ540105

43. Dowdell K, Gray T, Malone K. Nature and its Influence on Children's Outdoor Play. *Journal of Outdoor and Environmental Education*. 2011;15(2):24-35. doi:10.1007/BF03400925

44. Jr TK. Children's attitudes toward learning science. Published online 1995. Accessed February 13, 2022. https://psycnet.apa.org/record/1995-98680-003

45. Louv, R. (2005). Last child in the woods Saving our children from nature-deficit disorder. London Atlantic Books. - References - Scientific Research Publishing. Accessed February 9, 2022. https://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=625949

46. Ives CD, Giusti M, Fischer J, et al. Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*. 2017;26-27:106-113. doi:10.1016/J.COSUST.2017.05.005

47. Bosch M van den, Bird W. *Oxford Textbook of Nature and Public Health: The Role of Nature in Improving the Health of a Population*.; 2018. Accessed April 25, 2022. https://books.google.com/books?hl=en&lr=&id=vr9EDwAAQBAJ&oi=fnd&pg=PP1&dq=van+den+Bosch,+M.,+%26+Bird,+W.+(Eds.)+(2018).+Oxford+textbook+of+nature+and+public+health.+Oxford,+UK:+Oxford+University+Press.&ots=wXLGymhtlH&sig=sMaO44V0y1x_9Z-CN4rpSQBrKW4

48. Restall B, Conrad E. A literature review of connectedness to nature and its potential for environmental management. *Journal of Environmental Management*. 2015;159:264-278. doi:10.1016/J.JENVMAN.2015.05.022

49. Tam KP. Dispositional empathy with nature. *Journal of Environmental Psychology*. 2013;35:92-104. doi:10.1016/J.JENVP.2013.05.004

50. Zylstra MJ, Knight AT, Esler KJ, le Grange LLL. Connectedness as a Core Conservation Concern: An Interdisciplinary Review of Theory and a Call for Practice. *Springer Science Reviews*. 2014;2(1-2):119-143. doi:10.1007/S40362-014-0021-3

51. Giusti M, Svane U, Raymond CM, Beery TH. A framework to assess where and how children connect to nature. *Frontiers in Psychology*. 2018;8(JAN):2283. doi:10.3389/FPSYG.2017.02283/BIBTEX

52. Giusti M. Human-nature relationships in context. Experiential, psychological, and contextual dimensions that shape children's desire to protect nature. *PLOS ONE*. 2019;14(12):e0225951. doi:10.1371/JOURNAL.PONE.0225951

53. Raymond CM, Giusti M, Barthel S. An embodied perspective on the co-production of cultural ecosystem services: toward embodied ecosystems. *https://doi.org/101080/0964056820171312300*. 2017;61(5-6):778-799. doi:10.1080/09640568.2017.1312300

54. Gosling E, Williams KJH. Connectedness to nature, place attachment and conservation behaviour: Testing connectedness theory among farmers. *Journal of Environmental Psychology*. 2010;30(3). doi:10.1016/j.jenvp.2010.01.005

55. Mayer FS, Frantz CMP. The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*. 2004;24(4). doi:10.1016/j.jenvp.2004.10.001

56. Rossi L. Yksilöllä on väliä: Miten voisi tutkia yksilön elinikäistä ympäristösuhdetta. *Elore*. 2010;17(2). doi:10.30666/elore.78877

57. Feygina I. Social Justice and the Human-Environment Relationship: Common Systemic, Ideological, and Psychological Roots and Processes. *Social Justice Research*. 2013;26(3):363-381. doi:10.1007/S11211-013-0189-8

58. Musser LM, Malkus AJ. The Children's Attitudes toward the Environment Scale. *http://dx.doi.org/101080/0095896419949941954*. 2010;25(3):22-26. doi:10.1080/00958964.1994.9941954

59. Cheng JCH, Monroe MC. Connection to nature: Children's affective attitude toward nature. *Environment and Behavior*. 2012;44(1). doi:10.1177/0013916510385082

60. Cheng JCH. CHILDREN, TEACHERS AND NATURE: AN ANALYSIS OF AN ENVIRONMENTAL EDUCATION PROGRAM. Published online 2009.

61. Cheng JCH, Monroe MC. Connection to Nature: Children's Affective Attitude Toward Nature. *http://dx.doi.org/101177/0013916510385082*. 2010;44(1):31-49. doi:10.1177/0013916510385082

62. Whitburn J, Linklater W, Abrahamse W. Meta-analysis of human connection to nature and proenvironmental behavior. *Conservation Biology*. 2020;34(1):180-193. doi:10.1111/COBI.13381

63. Schultz PW. Inclusion with Nature: The Psychology Of Human-Nature Relations. *Psychology of Sustainable Development*. Published online 2002:61-78. doi:10.1007/978-1-4615-0995-0_4

64. Home to us all: how connecting with nature helps us care for ourselves and the Earth. Accessed March 31, 2022. https://derby.openrepository.com/handle/10545/623158

65. Daedalus EC, 1959 undefined. The ecology of imagination in childhood. *JSTOR*. Accessed February 9, 2022. https://www.jstor.org/stable/20026521

66. Jr PK, Kellert S. *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*.; 2002. Accessed February 9, 2022. https://books.google.nl/books?hl=en&lr=&id=RCjdKjI_qIcC&oi=fnd&pg=PR7&dq=Kahn,+P.+H.,+%26+Kellert,+S.+R.+(Eds.).+(2002).+Children+and+nature:+Psychological,+sociocultural,+and+evolutionary+investigations.&ots=SbVyjbV90q&sig=eKaqX2z10xICqidW2BpaHEqkfrI

67. Kellert S, Wilson E. *The Biophilia Hypothesis*.; 1993. Accessed February 5, 2022. https://books.google.com/books?hl=en&lr=&id=GAO8BwAAQBAJ&oi=fnd&pg=PP6&dq=Kellert,+S.+R.+%26+Wilson,+E.+O.+1993.+The+Biophilia+hypothesis&ots=pmrcHCFWy3&sig=5H_OAv8Nehn26g5TqhZUcPaa7_g

68. Chan KMA, Balvanera P, Benessaiah K, et al. Why protect nature? Rethinking values and the environment. doi:10.13140/RG.2.1.5146.0560

69. Taylor A. Reconfiguring the natures of childhood. *Reconfiguring the Natures of Childhood*. Published online January 1, 2013:1-148. doi:10.4324/9780203582046/RECONFIGURING-NATURES-CHILDHOOD-AFFRICA-TAYLOR

70. Taylor A, Childhood MGCI in E, 2012 undefined. Common worlds: Reconceptualising inclusion in early childhood communities. *journals.sagepub.com*. 2012;13(2):2012. doi:10.2304/ciec.2012.13.2.108

71. Ojala M. Hope in the Face of Climate Change: Associations with Environmental Engagement and Student Perceptions of Teachers Emotion Communication Style and Future Orientation. *Journal of Environmental Education*. 2015;46(3). doi:10.1080/00958964.2015.1021662

72. Enid Elliot, Kayla Ten Eycke, Sharon Chan, Ulrich Müller. Taking Kindergartners Outdoors: Documenting Their Explorations and Assessing the Impact on Their Ecological Awareness. *Children, Youth and Environments*. 2014;24(2). doi:10.7721/chilyoutenvi.24.2.0102

73. Giusti M, Barthel S, Marcus L. Nature Routines and Affinity with the Biosphere : A Case Study of Preschool Children in Stockholm. *Children, Youth and Environments*. 2014;24(3).

74. Matteo Giusti, Stephan Barthel, Lars Marcus. Nature Routines and Affinity with the Biosphere: A Case Study of Preschool Children in Stockholm. *Children, Youth and Environments*. 2014;24(3). doi:10.7721/chilyoutenvi.24.3.0016

75. Müller MM, Kals E, Pansa R. Adolescents' Emotional Affinity toward Nature: A Cross-Societal Study.

76. Camilla S. Rice, Julia C. Torquati. Assessing Connections between Young Children's Affinity for Nature and Their Experiences in Natural Outdoor Settings in Preschools. *Children, Youth and Environments*. 2013;23(2). doi:10.7721/chilyoutenvi.23.2.0078

77. Richardson M, Hunt A, Hinds J, et al. A measure of nature connectedness for children and adults: Validation, performance, and insights. *Sustainability (Switzerland)*. 2019;11(12). doi:10.3390/SU11123250

78. Larson LR, Whiting JW, Green GT. Exploring the influence of outdoor recreation participation on pro-environmental behaviour in a demographically diverse population. *http://dx.doi.org/101080/135498392010548373*. 2011;16(1):67-86. doi:10.1080/13549839.2010.548373

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

80. Barrable A, Booth D. Nature connection in early childhood: A quantitative cross-sectional study. *Sustainability (Switzerland)*. 2020;12(1). doi:10.3390/su12010375

81. Kollmuss A, Agyeman J. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*. 2002;8(3):239-260. doi:10.1080/13504620220145401

82. Review MMHE, 2003 undefined. Two avenues for encouraging conservation behaviors. *JSTOR*. Accessed February 5, 2022. https://www.jstor.org/stable/24706961

83. Schultz P, Kaiser F. Promoting pro-environmental behavior. Published online 2012. Accessed February 5, 2022. https://psycnet.apa.org/record/2012-25531-029

84. Lavelle MJ, Rau H, Fahy F. Different shades of green? Unpacking habitual and occasional pro-environmental behavior. *Global Environmental Change*. 2015;35:368-378. doi:10.1016/J.GLOENVCHA.2015.09.021

85. Jensen BB. Knowledge, Action and Pro-environmental Behaviour. *https://doi.org/101080/13504620220145474*. 2010;8(3):325-334. doi:10.1080/13504620220145474

86. Stern PC. New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*. 2000;56(3):407-424. doi:10.1111/0022-4537.00175

87. Bauer A, Menrad K. Beyond risk and return: What motivates environmentally friendly or harmful student fund investments in Germany? *undefined*. 2020;67. doi:10.1016/J.ERSS.2020.101509

88. Evans GW, Otto S, Kaiser FG. Childhood Origins of Young Adult Environmental Behavior. *Psychological Science*. 2018;29(5):679-687. doi:10.1177/0956797617741894

89. Otto S, Pensini P. Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change*. 2017;47:88-94. doi:10.1016/J.GLOENVCHA.2017.09.009

90. Chawla L, Derr V. The Development of Conservation Behaviors in Childhood and Youth. Published online September 28, 2012. doi:10.1093/OXFORDHB/9780199733026.013.0028

91. Pamela Pensini, Eva Horn, Nerina J. Caltabiano. An Exploration of the Relationships between Adults' Childhood and Current Nature Exposure and Their Mental Well-Being. *Children, Youth and Environments*. 2016;26(1):125. doi:10.7721/CHILYOUTENVI.26.1.0125

92. Thompson CW, Aspinall P, Montarzino A. The Childhood Factor: Adult Visits to Green Places and the Significance of Childhood Experience. *http://dx.doi.org/101177/0013916507300119*. 2007;40(1):111-143. doi:10.1177/0013916507300119

93. Wells N, Lekies K. Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism1. *Children, Youth and Environments*. 2006;16.

94. Rosa CD, Profice CC, Collado S. Nature experiences and adults' self-reported pro-environmental behaviors: The role of connectedness to nature and childhood nature experiences. *Frontiers in Psychology*. 2018;9(JUN):1055. doi:10.3389/FPSYG.2018.01055/BIBTEX

95. Asah ST, Guerry AD, Blahna DJ, Lawler JJ. Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications. *Ecosystem Services*. 2014;10:180-186. doi:10.1016/J.ECOSER.2014.08.003

96. Seymour V, Haklay M (Muki). Exploring Engagement Characteristics and Behaviours of Environmental Volunteers. *Citizen Science: Theory and Practice*. 2017;2(1):5. doi:10.5334/CSTP.66

97. Programme authorCorporate:United NE. Intergovernmental Conference on Environmental Education, Tbilisi, USSR, 14-26 October 1977: final report. Published online 1978.

98. Driscoll EA, Lownds NK. The Garden Wonder Wall: Fostering Wonder and Curiosity on Multi-Day Garden Field Trips. *http://dx.doi.org/101080/15330150701319412*. 2007;6(1):105-112. doi:10.1080/15330150701319412

99. Adcock L, Ballantyne R. Drama as a Tool in Interpretation: Practitioner Perceptions of its Strengths & Limitations. *Australian Journal of Environmental Education*. 2007;23(2-3):31-44. doi:10.1017/S0814062600000690

100. Rickinson M. Learners and Learning in Environmental Education: A critical review of the evidence. *https://doi.org/101080/13504620120065230*. 2010;7(3):207-320. doi:10.1080/13504620120065230

101. Nabors ML, Edwards LC, Murray RK. Making the Case for Field Trips: What Research Tells Us and What Site Coordinators Have to Say. *Education (Chula Vista)*. 2009;129(4):661-667.

102. Millan DA. Field Trips: Maximizing the Experience. Published online 1995.

103. Vygotskiĭ LS, Cole M. Mind in society : the development of higher psychological processes. *undefined*. Published online June 25, 1978. doi:10.2307/J.CTVJF9VZ4

104. Solomon, Joan. Social Influences on the Construction of Pupils' Understanding of Science. *SScEd*. 1987;14(1):63-82. doi:10.1080/03057268708559939

105. Green Infrastructure: Smart Conservation for the 21st Century. Accessed July 6, 2022. https://www.researchgate.net/publication/273127683_Green_Infrastructure_Smart_Conservation_for_the_21st_Century

106. Mell I. Green infrastructure planning: Policy and objectives. In: *Handbook on Green Infrastructure: Planning, Design and Implementation*. ; 2015. doi:10.4337/9781783474004.00013

107. The evidence base for linkages between green infrastructure, public health and economic benefit. *vu.edu.au*. Accessed July 6, 2022. https://www.vu.edu.au/sites/default/files/cses/pdfs/gi-econ-health-paper.pdf

108. Biophilic Cities: Integrating Nature Into Urban Design and Planning - Timothy Beatley - Google Books. Accessed July 6, 2022. https://books.google.nl/books?hl=en&lr=&id=H9Y4z68WSgUC&oi=fnd&pg=PR5&dq=Beatley,+T.+Biophilic+Cities%3B+Island+Press:+Washington,+DC,+USA,+2010&ots=ZmEk1IMQv9&sig=JnHNjg1z8SfBPlC3d9El0OVTZQY#v=onepage&q=Beatley%2C%20T.%20Biophilic%20Cities%3B%20Island%20Press%3A%20Washington%2C%20DC%2C%20USA%2C%202010&f=false

109. Chawla L. Learning to Love the Natural World Enough to Protect It. *Barn*. 2006;2(2).

110. NA AS, 2013 undefined. Sociotope mapping-exploring public open space and its multiple use values in urban and landscape planning practice. *arkitekturforskning.net*. Accessed February 9, 2022. http://arkitekturforskning.net/na/article/viewFile/134/105

111. Spencer C, Woolley H. Children and the city: A summary of recent environmental psychology research. *Child: Care, Health and Development*. 2000;26(3):181-198. doi:10.1046/J.1365-2214.2000.00125.X

112. Chawla L. Learning to love the natural world enough to protect it. 2006;(2):57-78. Accessed February 9, 2022. https://pdfs.semanticscholar.org/498c/d253984ca7f8d25c4ce45f8b493a9af8331a.pdf

113. Wilson E. *Biophilia*.; 1984. Accessed February 5, 2022. https://www.degruyter.com/document/doi/10.4159/9780674045231/html

114. review PKJD, 1997 undefined. Developmental psychology and the biophilia hypothesis: Children's affiliation with nature. *Elsevier*. 1997;17:1-61. Accessed February 5, 2022. https://www.sciencedirect.com/science/article/pii/S027322979690430X

115. Kahn P, environment HPI and the natural, 2003 undefined. The development of environmental moral identity. *books.google.com*. Accessed February 5, 2022.

https://books.google.com/books?hl=en&lr=&id=Wwf0oVe2rHIC&oi=fnd&pg=PA113&dq=Kahn+Jr,+2003.+The+development+of+environmental+moral+identity.&ots=J2TU_kv_bM&sig=sJAW5OPYz-Hc_SCkmEL8MSYDMZQ

116. Learning Toward an Ecological Consciousness: Selected Transformative Practices. *Learning Toward an Ecological Consciousness: Selected Transformative Practices*. Published online 2004. doi:10.1007/978-1-349-73178-7

117. Davis J. The transpersonal dimensions of ecopsychology: Nature, nonduality, and spiritual practice. *The Humanistic Psychologist*. 1998;26(1-3):69-100. doi:10.1080/08873267.1998.9976967

118. Bamberg S, Möser G. Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*. 2007;27(1):14-25. doi:10.1016/J.JENVP.2006.12.002

119. Peterson, J N. Developmental variables affecting environmental sensitivity in professional environmental educators /. Published online January 1, 1982.

120. Sia AP, Hungerford HR, Tomera AN. Selected Predictors of Responsible Environmental Behavior: An Analysis. *undefined*. 1986;17(2):31-40. doi:10.1080/00958964.1986.9941408

121. Marcinkowski T. Predictors of responsible environmental behavior: A review of three dissertation studies. *Essential readings in environmental education*. 2001;(1973).

122. Ehrlich PR, Kennedy D. Millennium assessment of human behavior. *Science (1979)*. 2005;309(5734). doi:10.1126/science.1113028

123. Dunlap RE, van Liere KD, Mertig AG, Jones RE. Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*. 2000;56(3):425-442. doi:10.1111/0022-4537.00176

124. Beck M. Increased time spent in a natural setting related to an increase in pro-environmental behaviors and pro-environmental attitudes in adolescents. *School of Education and Leadership Student Capstone Theses and Dissertations*. Published online January 1, 2010. Accessed December 12, 2021. https://digitalcommons.hamline.edu/hse_all/1037

125. Roth C. Environmental Literacy: Its Roots, Evolution and Directions in the 1990s. Published online January 9, 1992.

126. Karp DG. Values and their Effect on Pro-Environmental Behavior: *http://dx.doi.org/101177/0013916596281006*. 2016;28(1):111-133. doi:10.1177/0013916596281006

127. de Young R. Expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues*. 2000;56:509-526.

128. Stebbins R. *Exploratory Research in the Social Sciences*.; 2001. Accessed February 5, 2022. https://books.google.com/books?hl=en&lr=&id=hDE13_a_oEsC&oi=fnd&pg=PA7&d

q=Stebbins,+Robert+A.+2001.+Exploratory+research+in+the+social+sciences&ots=N mTIW0CJqG&sig=KH4BCFrDpZtriEajmkvDwNTNc5Q

129. Maturana H, Varela F. *The Tree of Knowledge: The Biological Roots of Human Understanding.*; 1987. Accessed February 5, 2022. https://psycnet.apa.org/record/1987-98044-000

130. Hillier B, Hanson J. *The Social Logic of Space*. Cambridge University Press; 1984. doi:10.1017/CBO9780511597237

131. Pereira M, of PFRA international journal, 2015 undefined. The relationship between connectedness to nature, environmental values, and pro-environmental behaviours. *eprints.worc.ac.uk*. Accessed February 5, 2022. https://eprints.worc.ac.uk/4081

132. Kahn Jr. PH. Children's affiliations with nature: Structure, development, and the problem of environmental generational amnesia. In: *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*. MIT Press; 2002:93-116.

133. Adevi AA, Grahn P. Preferences for Landscapes: A Matter of Cultural Determinants or Innate Reflexes that Point to Our Evolutionary Background? *Landscape Research*. 2012;37(1):27-49. doi:10.1080/01426397.2011.576884

134. Maturana H, Varela F. *The Tree of Knowledge: The Biological Roots of Human Understanding*.; 1987.

135. Löw M. The Constitution of Space. *European Journal of Social Theory*. 2008;11(1):25-49. doi:10.1177/1368431007085286

136. Ståhle A. Sociotope mapping - exploring public open space and its multiple use values in urban and landscape planning practice. *Nordic Journal of Architectural Research*. 2006;19:59-71.

137. Kaiser FG. A General Measure of Ecological Behavior1. *Journal of Applied Social Psychology*. 1998;28(5):395-422. doi:10.1111/J.1559-1816.1998.TB01712.X

138. Tabriz, Iran Metro Area Population 1950-2022 | MacroTrends. Accessed June 26, 2022. https://www.macrotrends.net/cities/21522/tabriz/population

139. 12 Cities Piloted for Child Friendly Cities Initiative in Iran. Accessed June 27, 2022. https://www.unicef.org/iran/en/press-releases/12-cities-piloted-child-friendly-cities-initiative-iran

140. رحیمی ا. با استفاده از تصاویر ماهواره 1395تا 1355ارزیابی تغییرات فضاهای سبزشهری تبریز از سال و پیش بینی تغییرات با شبکه های عصبی مصنوعی. ای. *نشریه علمی جغرافیا و برنامه ریزی*. 2020;24(71):67-82. doi:10.22034/GP.2020.10531

141. Rahimi A, Moharrami M, Faraji S. Evaluating the structure of urban parks in Tabriz using network analysis and their optimal location by FAHP. *Physical Sacial Planning*. 2018;5(1):107-122. doi:10.30473/PSP.2018.4834

142. *Analayzing the Effective Factors on Tourism Demand in Elgoli Jungle Park of Tabriz City*.

143. McNally SA, Slutsky R. Key elements of the Reggio Emilia approach and how they are interconnected to create the highly regarded system of early childhood education. *Early Child Development and Care*. 2017;187(12). doi:10.1080/03004430.2016.1197920

144. van Herzele A, Wiedemann T. A monitoring tool for the provision of accessible and attractive urban green spaces. *Landscape and Urban Planning*. 2003;63(2). doi:10.1016/S0169-2046(02)00192-5

145. Bronfenbrenner U, Kessel F, Kessen W, White S. Toward a Critical Social History of Developmental Psychology. A Propaedeutic Discussion. *American Psychologist*. 1986;41(11). doi:10.1037/0003-066X.41.11.1218

146. Kahn PH, Severson RL, Ruckert JH. The Human Relation With Nature and Technological Nature. *Current Directions in Psychological Science*. 2009;18(1):37-42. doi:10.1111/j.1467-8721.2009.01602.x

147. Chawla L. Benefits of Nature Contact for Children. *Journal of Planning Literature*. 2015;30(4). doi:10.1177/0885412215595441

148. McCormick R. Does Access to Green Space Impact the Mental Well-being of Children: A Systematic Review. *Journal of Pediatric Nursing: Nursing Care of Children and Families*. 2017;37:3-7. doi:10.1016/J.PEDN.2017.08.027

149. Norwood MF, Lakhani A, Fullagar S, et al. A narrative and systematic review of the behavioural, cognitive and emotional effects of passive nature exposure on young people: Evidence for prescribing change. *Landscape and Urban Planning*. 2019;189:71-79. doi:10.1016/J.LANDURBPLAN.2019.04.007

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

151. Vanaken GJ, Danckaerts M. Impact of Green Space Exposure on Children's and Adolescents' Mental Health: A Systematic Review. *International Journal of Environmental Research and Public Health 2018, Vol 15, Page 2668*. 2018;15(12):2668. doi:10.3390/IJERPH15122668

152. Kuo M, Barnes M, Jordan C. Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*. 2019;10(FEB). doi:10.3389/fpsyg.2019.00305

153. Nussbaum M, Cambridge CCC capabilities., 2011 undefined. The human development approach. *academia.edu*. Accessed July 6, 2022. https://www.academia.edu/download/32232075/CreatingCapabilities.pdf

154. Visser BA, Ashton MC, Vernon PA. Beyond g: Putting multiple intelligences theory to the test. *Intelligence*. 2006;34(5). doi:10.1016/j.intell.2006.02.004

155. Wilson SJ, Snell C. 'Bad for the penguins … because they need ice and that to live on': an exploratory study into the environmental views, concerns and knowledge of

socially disadvantaged young people. *http://dx.doi.org/101080/13676260903233704*. 2010;13(2):151-168. doi:10.1080/13676260903233704

156. (PDF) Davis, Julie M. (2010) Early childhood education for sustainability : why it matters, what it is, and how whole centre action research and systems thinking can help. Journal of Action Research Today in Early Childhood, pp. 35-44. | Julie Davis - Academia.edu. Accessed July 6, 2022. https://www.academia.edu/16107225/Davis_Julie_M_2010_Early_childhood_educatio n_for_sustainability_why_it_matters_what_it_is_and_how_whole_centre_action_rese arch_and_systems_thinking_can_help_Journal_of_Action_Research_Today_in_Early _Childhood_pp_35_44

157. Cunsolo A, Ellis NR. Ecological grief as a mental health response to climate change-related loss. *Nature Climate Change 2018 8:4*. 2018;8(4):275-281. doi:10.1038/s41558-018-0092-2

158. Galway LP, Beery T, Jones-Casey K, Tasala K. Mapping the Solastalgia Literature: A Scoping Review Study. *International Journal of Environmental Research and Public Health 2019, Vol 16, Page 2662*. 2019;16(15):2662. doi:10.3390/IJERPH16152662

159. Chawla L. Childhood nature connection and constructive hope: A review of research on connecting with nature and coping with environmental loss. *People and Nature*. 2020;2(3). doi:10.1002/pan3.10128

160. Ojala M, Bengtsson H. Young People's Coping Strategies Concerning Climate Change: Relations to Perceived Communication With Parents and Friends and Proenvironmental Behavior. *Environment and Behavior*. 2019;51(8):907-935. doi:10.1177/0013916518763894

161. Petrasek MacDonald J, Cunsolo Willox A, Ford JD, et al. Protective factors for mental health and well-being in a changing climate: Perspectives from Inuit youth in Nunatsiavut, Labrador. *Social Science & Medicine*. 2015;141:133-141. doi:10.1016/J.SOCSCIMED.2015.07.017

162. Hatala AR, Njeze C, Morton D, Pearl T, Bird-Naytowhow K. Land and nature as sources of health and resilience among Indigenous youth in an urban Canadian context: A photovoice exploration. *BMC Public Health*. 2020;20(1):1-14. doi:10.1186/S12889-020-08647-Z/FIGURES/8

163. Tseng YC, Wang SM. Understanding Taiwanese adolescents' connections with nature: rethinking conventional definitions and scales for environmental education. *https://doi.org/101080/1350462220191668354*. 2019;26(1):115-129. doi:10.1080/13504622.2019.1668354

164. Pickett STA, Cadenasso ML, Grove JM, et al. Urban Ecological Systems: Linking Terrestrial Ecological, Physical, and Socioeconomic Components of Metropolitan Areas1. *http://dx.doi.org/101146/annurev.ecolsys32081501114012*. 2003;32:127-157. doi:10.1146/ANNUREV.ECOLSYS.32.081501.114012

165. Ostrom E. Collective Action and the Evolution of Social Norms. *Journal of Economic Perspectives*. 2000;14(3):137-158. doi:10.1257/JEP.14.3.137

166. Folke C, Biggs R, Norström A v., Reyers B, Rockström J. Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society, Published online: Sep 29, 2016 | doi:105751/ES-08748-210341*. 2016;21(3). doi:10.5751/ES-08748-210341

167. Abson DJ, Fischer J, Leventon J, et al. Leverage points for sustainability transformation. *Ambio*. 2017;46(1). doi:10.1007/s13280-016-0800-y

168. Barthel S, Belton S, Raymond CM, Giusti M. Fostering children's connection to nature through authentic situations: The case of saving salamanders at school. *Frontiers in Psychology*. 2018;9(JUN):928. doi:10.3389/FPSYG.2018.00928/BIBTEX

169. McPhearson T, Andersson E, Elmqvist T, Frantzeskaki N. Resilience of and through urban ecosystem services. *Ecosystem Services*. 2015;12:152-156. doi:10.1016/J.ECOSER.2014.07.012

170. Colding J, Barthel S. The potential of 'Urban Green Commons' in the resilience building of cities. *Ecological Economics*. 2013;86:156-166. doi:10.1016/J.ECOLECON.2012.10.016

171. Colding J, Folke C, Elmqvist T. Social institutions in ecosystem management and biodiversity conservation. *Tropical Ecology*. 2003;44(1).

172. Berkes F, Folke C. Linking social and ecological systems for resilience and sustainability. In: *Linking Social and Ecological Systems*. Vol 1. ; 1998.

173. Ostrom E. COPING WITH TRAGEDIES OF THE COMMONS. *http://dx.doi.org/101146/annurev.polisci21493*. 2003;2:493-535. doi:10.1146/ANNUREV.POLISCI.2.1.493

174. Sanecka J, Barthel S, Colding J. Countryside within the City: A Motivating Vision behind Civic Green Area Stewardship in Warsaw, Poland. *Sustainability 2020, Vol 12, Page 2313*. 2020;12(6):2313. doi:10.3390/SU12062313

175. Pearsall H, Gachuz S, Rodriguez Sosa M, Schmook B, van der Wal H, Gracia MA. Urban Community Garden Agrodiversity and Cultural Identity in Philadelphia, Pennsylvania, U.S. *https://doi.org/101111/j1931-0846201612202.x*. 2019;107(3):476-495. doi:10.1111/J.1931-0846.2016.12202.X

176. Saldivar-Tanaka L, Krasny ME. Culturing community development, neighborhood open space, and civic agriculture: The case of Latino community gardens in New York City. *Agriculture and Human Values 2004 21:4*. 2004;21(4):399-412. doi:10.1023/B:AHUM.0000047207.57128.A5

177. Theodori GL, Luloff AE, Willits FK. The Association of Outdoor Recreation and Environmental Concern: Reexamining the Dunlap-Heffernan Thesis1. *Rural Sociology*. 1998;63(1):94-108. doi:10.1111/J.1549-0831.1998.TB00666.X

178. McDaniel J, Alley KD. Connecting local environmental knowledge and land use practices: A human ecosystem approach to urbanization in West Georgia. *Urban Ecosystems 2005 8:1*. 2005;8(1):23-38. doi:10.1007/S11252-005-1417-2

179. Bendt P, Barthel S, Colding J. Civic greening and environmental learning in public-access community gardens in Berlin. *Landscape and Urban Planning*. 2013;109(1):18-30. doi:10.1016/J.LANDURBPLAN.2012.10.003

180. Barthel S, Folke C, Colding J. Social–ecological memory in urban gardens—Retaining the capacity for management of ecosystem services. *Global Environmental Change*. 2010;20(2):255-265. doi:10.1016/J.GLOENVCHA.2010.01.001

181. Lindholm G. Land and Landscape; Linking Use, Experience and Property Development in Urban Areas. *Land 2019, Vol 8, Page 137*. 2019;8(9):137. doi:10.3390/LAND8090137

182. Hulme M. One Earth, Many Futures, No Destination. *One Earth*. 2020;2(4). doi:10.1016/j.oneear.2020.03.005

183. Holling CS. Resilience and Stability of Ecological Systems. *http://dx.doi.org/101146/annurev.es04110173000245*. 2003;4(1):1-23. doi:10.1146/ANNUREV.ES.04.110173.000245

184. Navigating Social-Ecological Systems: Building Resilience for Complexity and Change. *Navigating Social-Ecological Systems*. Published online January 1, 2002. doi:10.1017/CBO9780511541957

185. Barthel S, Isendahl C. Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities. *Ecological Economics*. 2013;86:224-234. doi:10.1016/J.ECOLECON.2012.06.018

186. Barthel S, Isendahl C, Vis BN, Drescher A, Evans DL, van Timmeren A. Global urbanization and food production in direct competition for land: Leverage places to mitigate impacts on SDG2 and on the Earth System: *https://doi.org/101177/2053019619856672*. 2019;6(1-2):71-97. doi:10.1177/2053019619856672

187. Hartig T, Kahn PH. Living in cities, naturally. *Science (1979)*. 2016;352(6288):938-940. doi:10.1126/SCIENCE.AAF3759

188. Colding J, Barthel S, Bendt P, Snep R, van der Knaap W, Ernstson H. Urban green commons: Insights on urban common property systems. *Global Environmental Change*. 2013;23(5):1039-1051. doi:10.1016/J.GLOENVCHA.2013.05.006

189. Largo-Wight E. Cultivating healthy places and communities: evidenced-based nature contact recommendations. *http://dx.doi.org/101080/096031232010499452*. 2011;21(1):41-61. doi:10.1080/09603123.2010.499452

190. Lave J. Situating learning in communities of practice. In: *Perspectives on Socially Shared Cognition.* ; 2004. doi:10.1037/10096-003

191. Leonard D, Sensiper S. The role of tacit knowledge in group innovation. *California Management Review*. 1998;(3). doi:10.2307/41165946

192. Wenger E. Communities of Practice: Learning, Meaning, and Identity. *Systems thinker*. 1998;9. doi:10.2277/0521663636

193. Chapin FS, Kofinas GP, Folke C. *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World*.; 2009. doi:10.1007/978-0-387-73033-2

194. Action Learning for Sustainable Agriculture: Transformation through Guided Reflection on JSTOR. Accessed July 6, 2022. https://www.jstor.org/stable/43766961

195. Sipos Y, Battisti B, Grimm K. Achieving transformative sustainability learning: Engaging head, hands and heart. *International Journal of Sustainability in Higher Education*. 2008;9(1):68-86. doi:10.1108/14676370810842193/FULL/XML

196. Inwood H, Sharpe J. Growing a Garden-Based Approach to Art Education. *https://doi.org/101080/0004312520181465318*. 2018;71(4):43-49. doi:10.1080/00043125.2018.1465318

197. Shmuelof L, Krakauer JW. Recent insights into perceptual and motor skill learning. *Frontiers in Human Neuroscience*. 2014;8(SEP):683. doi:10.3389/FNHUM.2014.00683/BIBTEX

198. Soga M, Evans MJ, Yamanoi T, et al. How can we mitigate against increasing biophobia among children during the extinction of experience? *Biological Conservation*. 2020;242:108420. doi:10.1016/J.BIOCON.2020.108420

199. Lewicka M. What makes neighborhood different from home and city? Effects of place scale on place attachment. *Journal of Environmental Psychology*. 2010;30(1):35-51. doi:10.1016/J.JENVP.2009.05.004

200. Millar MG, Millar KU. The Effects of Direct and Indirect Experience on Affective and Cognitive Responses and the Attitude–Behavior Relation. *Journal of Experimental Social Psychology*. 1996;32(6):561-579. doi:10.1006/JESP.1996.0025

201. Duerden MD, Witt PA. The impact of direct and indirect experiences on the development of environmental knowledge, attitudes, and behavior. *Journal of Environmental Psychology*. 2010;30(4):379-392. doi:10.1016/J.JENVP.2010.03.007

202. Stedman RC. Toward a Social Psychology of Place: Predicting Behavior from Place-Based Cognitions, Attitude, and Identity. *http://dx.doi.org/101177/0013916502034005001*. 2016;34(5):561-581. doi:10.1177/0013916502034005001

203. Kiesling FM, Manning CM. How green is your thumb? Environmental gardening identity and ecological gardening practices. *Journal of Environmental Psychology*. 2010;30(3):315-327. doi:10.1016/J.JENVP.2010.02.004

204. (PDF) Community Gardens: An Exploration of Urban Agriculture in the Bronx, New York City. Accessed July 6, 2022. https://www.researchgate.net/publication/51602170_Community_Gardens_An_Exploration_of_Urban_Agriculture_in_the_Bronx_New_York_City

205. Schroeder HW. Place experience, gestalt, and the human–nature relationship. *Journal of Environmental Psychology*. 2007;27(4):293-309. doi:10.1016/J.JENVP.2007.07.001

206. Stern PC, Dietz T. The Value Basis of Environmental Concern. *Journal of Social Issues*. 1994;50(3):65-84. doi:10.1111/J.1540-4560.1994.TB02420.X

207. Kaaronen RO. Affording sustainability: Adopting a theory of affordances as a guiding heuristic for environmental policy. *Frontiers in Psychology*. 2017;8(NOV):1974. doi:10.3389/FPSYG.2017.01974/BIBTEX

208. Linder N, Lindahl T, Borgström S. Using behavioural insights to promote food waste recycling in urban households-evidence from a longitudinal field experiment. *Frontiers in Psychology*. 2018;9(MAR):352. doi:10.3389/FPSYG.2018.00352/BIBTEX