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Articles

Reconnecting to Nature Through Civic Education: The Role of Schools in Fostering Environmental Identity

Riconnettersi con la natura nell'ambito dell'educazione civica: il ruolo delle scuole per potenziare l'identità ambientale

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Abstract

In the context of civic education, an experimental study conducted in Italy in 2022 invited teachers and their pupils to participate in an experiment that encompassed teacher training and workshops specifically designed to re-establish a connection with nature. The objective of this research was to assess the influence of these workshops on teachers' subsequent communication about environmental issues with their pupils. In most cases, there has been a noticeable shift in pedagogical discourse. Overall, there is a more mindful approach to the importance of sensory engagement. Given the prevailing wave of eco-anxiety affecting younger generations, the strategy of reconnecting with nature through the senses could prove effective for both teachers and students in improving well-being, attentiveness, and study motivation.

Keywords: civic education; sustainable development; in-service teacher training; environmental identity; reconnection to nature.

Sintesi

Nel contesto dell'educazione civica, uno studio sperimentale condotto in Italia nel 2022 ha invitato gli insegnanti e i loro alunni a partecipare a un esperimento che comprendeva la formazione degli insegnanti e laboratori specificamente progettati per ristabilire un legame con la natura. L'obiettivo di questa ricerca era quello di valutare l'influenza di questi laboratori sulla successiva comunicazione degli insegnanti sulle questioni ambientali con i loro alunni. Nella maggior parte dei casi, si è notato un cambiamento discernibile nel discorso pedagogico e un approccio complessivamente più consapevole dell'importanza dell'uso dei sensi. Data l'ondata prevalente di ansia ecologica che colpisce le giovani generazioni, la strategia di riconnettersi con la natura attraverso i sensi potrebbe rivelarsi efficace tra il personale docente e tra gli studenti per migliorare benessere, attenzione e motivazione allo studio.

Parole chiave: educazione civica; sviluppo sostenibile; formazione degli insegnanti; giustizia sociale; riconnessione con la natura.

[1] The article is conceived and designed by all authors jointly: in particular, paragraphs 2, 3, 3.1, 3.2, 3.5 and Conclusions are to be attributed to Isabel de Maurissens; Introduction to Hubert Mansion; paragraphs 3.3, 3.4 to Jessica Niewint-Gori.

1. Introduction

Scientific research demonstrates that nature is a valuable ally in educational processes (Zylstra, Knight, Esler, & Le Grange, 2014). Nature enhances the motivation, attention, and well-being of students and the entire school community (Claesen et al., 2021; Dadvand et al., 2015; Hodson & Sander, 2017; Wu, Yao, Song, He, & Wang, 2021). However, for many students, contact with nature has become primarily virtual. For many students, however, contact with nature has become primarily virtual, and this is especially true for disadvantaged children. These children, whose parents lack both the time to immerse them in nature and the ability to own a garden, miss out on the direct experience of nature, depriving them of essential resources for their development. Pollution, the need for recycling, carbon footprint reduction, and global warming are at the core of this approach. Nature itself, its elements, and the positive relationship we can maintain with it are often overlooked, as if they were inconsequential. The environment, presented as a global problem, is viewed cognitively, through the lens of numbers, graphs, and tables (Unesco, 2019). This lens develops negative feeling like ecoanxiety. In addition, teaching children abstract concepts like rainforest destruction, acid rain, ozone layer depletion, and whaling can lead to dissociation. Children may become anxious, disconnected, and develop a phobia about these issues (Cohen & Wingerd, White, White Hutchinson Leisure & Learning Group, 2004). In fact, when a problem is more significant than what a young person can solve alone, individual strategies can lead to a sense of futility and reduce well-being (Clarke, 2006). Thus, more and more eco-emotions, including eco-anxiety, weigh on the shoulders of younger generations. Many studies therefore recommend that activities with young children should focus on learning love for nature and the comfort, interest, and pleasure they find in it, leaving disruptive information about environmental problems for later (Sobel, 1996; Wilson, 1984). For teenagers, it has been demonstrated that they are more likely to express constructive hope when their teachers respect their emotions and offer them support (Ojala, 2015).

This is why cognitive education alone cannot meet the current needs of students or the goals of sustainable development. It is essential, first and foremost, to restore the experience of nature (Pyle, 1993), increasingly rare, and allow students to benefit from its contact before engaging in problem-solving (Soga & Gaston, 2016). Students are encouraged to change their behavior based on the *heuristic of fear* (Jonas, 2013), claiming that Earth is at serious risk if profound changes are not made. Alongside the positive aspects of environmental education, we cannot overlook the impact of such information on the mental health of students. Regarding the cognitive aspect, research has shown that most environmental education programs are based on a curriculum that is too abstract for children. The connection with nature should be encouraged, and the school is the most suitable setting for this, as it was with the introduction of physical education in the late 19th century (L. n. 3725/1859; L. n. 4442/1878). During this time period, it was observed that young people were moving less, and the *teaching* of physical fitness could no longer be entrusted to increasingly busy families.

2. Reconnection with nature within other frameworks

This triad of interconnectivity between the economy, society, and the environment was adopted by the United Nations in 2012 and subsequently integrated into the 2030 Agenda. The role of political choices and decisions, in the context of nature-based solutions along with the relevant laws, is indeed of fundamental importance to restore the connection with

nature. Within the field of education, it is equally crucial to avoid programs that, in the long term, result in abstract contact with nature. Among the Nature-Based Solutions that can contribute to reconnecting people with nature, one practice is de-paving roads, particularly around schools. Some Italian cities, like Lucca, have decided to reduce asphalt in the outdoor spaces of 15 schools, bringing back grass and planting trees. This approach gives citizens, especially children, the opportunity to breathe certain soil-contained bacteria, such as Mycobacterium vaccae, which is recognized for its mood-stabilizing effects. Another significant measure is the regreening of cities. Planting trees in urban areas, reintroducing natural environments into urban settings, can have the effect of enriching the aerobiome, thus helping to improve public health. In this sense, the recent EU law (European Parliament, 2024) is welcome.

The law sets an ambitious target for the EU to restore at least 20% of its land and sea areas by 2030 and all ecosystems in need of restoration by 2050. Although the law does not explicitly mention the relationship between individuals and the urban environment, it is a significant step forward in restoring nature in urban areas, especially in the suburbs, which are often degraded. This opposes the extinction of the experience of nature. According to Pyle (2016) "As cities and sprawling suburbs abandon their natural diversity and citizens are further removed from personal contact with nature, awareness and appreciation diminish. This generates apathy towards environmental concerns and, inevitably, further degradation of the common habitat. Thus, goes on indefinitely, the extinction of experience that sucks the life from the earth, the intimacy of our connections" (p. 185). Therefore, indirectly, the law on nature restoration is of fundamental importance for the discourse on social justice. Social justice regarding green spaces is reflected in fair access and equitable distribution of these resources within a community.

Before the law on nature restoration, the GreenComp (Bianchi et al., 2022), the European Competence Framework for Sustainability adopted by the Commission in 2022 has contributed to providing another perspective on sustainability. It defines the skills that students should develop in four interconnected competency areas: *embodying the values of sustainability*, *embracing complexity in sustainability*, *imagining sustainable futures*, and *acting for sustainability***.** One of the values to be integrated is the "promotion of nature" as a part of embodying the values of sustainability. As the framework states, "Meta Competence, as its primary purpose is not to teach specific values but to help students understand that values are constructed, and individuals can choose which values to prioritize in their lives" (Bianchi et al., 2022, p. 17). This value acknowledges humans as an integral part of nature, underscoring the importance of respecting the needs and rights of other species and nature itself for the restoration and regeneration of healthy and resilient ecosystems. This appears to be a virtuous example where, through guiding frameworks and appropriate laws, a shift towards sustainability is being envisioned.

Another key framework introduced in 2019 is the Italian law on civic education (L. n. 92/2019) and the following guidelines (MIUR, 2020). The law established the transversal teaching of civic at all levels. In particular, the workshops (see below) have also been calibrated in view of the development of these skills, including "the concepts of self-care, community, and the environment. The individual is aware that the principles of solidarity, equality, and respect for diversity are the pillars supporting civil coexistence and fostering the construction of a fair and sustainable future" (MIUR-Annex B, 2020, p. 6). Certainly, the perspective always revolves around humans and consistently reflects a dualistic conception with the environment. This dualistic view between humans and nature has historical, religious, and cultural origins.

3. Pilot experimentation

The pilot includes teacher training and lesson plans, student questionnaires, and a Visual Nature Footprint (VINA) Test, which implies a comprehensive approach involving both educator preparation and direct student assessment tools.

3.1. Key objectives

The general aim of the experiment was to re-establish a connection with nature through the development of environmental identity. Specifically, the aim of the experimentation was:

- strengthening environmental identity and developing one of the competencies outlined in the GreenComp, i.e. "promotion of nature" within the civic education curriculum. This involves proposing it as a viable option within the monitoring framework outlined by L. n. 92/2009 and involves teacher training and workshops specifically designed to re-establish a connection with nature;
- perception analysis: examining how current environmental and sustainable development education lessons are perceived by teachers within the civic education curriculum;
- measuring their comprehension, engagement, and overall reception of the content and measuring the connection of teachers and their students through an experimental test.

However, there is a missing link in the chain, which is the reconnection of young people with nature. Not only in terms of knowledge (cognitive aspect) but also ensuring that students can re-establish an emotionally strong connection (empathetic and emotional aspect). This is crucial for them to subsequently act (behavioral aspect), constituting environmental identity. Environmental identity, as described by American researcher Susan Clayton (2003), is "a felt connection with the non-human natural environment […] that affects our perception and actions towards the world; an intimate conviction that the environment is an important part of oneself" (p. 12). Considering the unstoppable global trend of urbanization, with a projected 80% of the population living in urban areas by 2050 (World Data), the European Union has taken a significant step to address this phenomenon. The recently adopted law in November 2023 aims to restore urban environments, reflecting a commitment to balancing urban development with ecological considerations (European Parliament, 2024).

3.2. The school: the environmental and socio-economic context

The choice of a primary and middle school of I.C. Amerigo Vespucci in Florence to conduct the experimentation was dictated by the context as the lack of green spaces in that part of the city and by the socio-economic context of the area as well. The school is located on the northern outskirts of Florence, in a densely populated and intensely busy area within the triangle between the A11 motorway exit, the junction for the main highway to the seaside, and the Amerigo Vespucci International Airport.

The institute hosts about 1250 students, distributed over seven delivery points in five complexes with three kindergartens, three primary schools and one lower secondary school. In general, the socio-economic background of the students is medium-low. About 45% of students have non-Italian citizenship, and there are more than 25 nationalities represented. This diversity provides an opportunity, not only for Italian students to gain exposure to

other cultures, but also for non-Italian students to be included into the social fabric of the city.

Like other schools within disadvantaged contexts, I.C. Amerigo Vespucci is called upon to play a facilitating role in reconnecting students with nature. In most cases, the only education students receive is about sustainable development and its practices. This education, however, does not address the affection for nature, which is the primary driver of behaviors that sustainable development aims to change.

3.3. Teachers' training and lesson plans

The experimentation commenced with remote learning, considering the prevailing pandemic situation. The main goal of the training was to present a new viewpoint on environmental identity, a concept elucidated by the American writer Susan Clayton (2003) as sense of connection with the non-human natural environment that shapes the understanding of the world and actions toward it; a deep-seated belief that the environment is an essential part of oneself. This concept served as the cornerstone of the training, which aimed to transcend the dichotomy between humans and nature. The six lesson plans progressively developed this fundamental concept.

Participating teachers & students

The research took place from March to June 2022, embedded into the curriculum activities of civic education involving a total of 18 teachers and 356 students, with the following breakdown:

- Secondary low school level: One teacher and 64 students;
- Kindergarten: 4 teachers and 79 students;
- Primary school: 13 teachers and 213 students.

Teachers' training

The professional development for in-service teachers was delivered through a digital platform, encompassing eight webinars, each ranging from 90 to 120 minutes in duration. These online sessions were facilitated by the researchers themselves. The initial and final webinars served to introduce and conclude the training series, respectively. Additionally, one session was allocated to elucidate the research methodologies, specifically focusing on the student questionnaire and the VINA test. The core of the training was structured around five separate webinars, with each one devoted to discussing a distinct lesson plan.

Lesson plans

The experimentation involved five lesson plans offered through a previous teacher training course. For the pilot implementation, the teachers could choose between two of the following activities to propose in class.

Every lesson plan (Figure 1) provides:

- a description of the overall goal of the activity;
- a suggestion of the technologies that could be used;
- a list of the skills students' may gain through the activities;
- a description of the activity itself;
- a suggestion for possible products created by students.

The first lesson plan, "The Nature Around Us" essentially deals with what nature consists of. What do we have around us in the classroom and school? Is the desk a part of nature, yes or no? Is the interactive whiteboard (LIM) a part of nature, yes, or no? (Berto, 2005; Stevenson et al., 2018; Johnson et al., 2019).

The second one, *Us and Nature* focuses on the relationship with nature, the historical reasons that led us to perceive nature in a perpetual dualism, and how to view our relationship with nature differently. Also, the profound cultural influence on the very concept of nature, as theorized by Descola (2014), is explored. For example, some cultures don't even have a word to define *Nature*, because culturally, there has never been such a strong detachment as experienced by some Western countries (Vining, 2003; Zylstra et al., 2014).

The third activity, *Connect to Nature* was dedicated to reconnecting with nature through the senses, focusing on perceiving nature solely through that sense. The students worked in groups, thus, there was a group for smell, touch, sight, hearing, and an optional one for taste (Richardson et al., 2019).

The fourth, *Take Action for Nature* was dedicated to action for nature but contextualized around their school. Students were asked: How can we protect nature in the city? In what ways can we improve our relationship with the nature around us? How can we nurture nature? (Salazar, 2020).

The fifth workshop, *The Ideal Classroom* was dedicated to observing the space around us, starting from our own desks. Students were asked: "How can we improve the relationship between us and nature in the confined space of a classroom or a school?" (Arnocky et al., 2007; Lumber et al., 2017; Mackay & Schmitt, 2019).

The overall objective of the activities was to generate a new awareness of nature and the relationship with nature. This reinforces the environmental identity as defined above, which consists not only of a cognitive dimension, but also an emotional and behavioral one.

The ministerial order n. 35 from June 22nd 2020[2] outlines competencies related to understanding and promoting equitable and sustainable development, environmental respect, and ecosystem awareness. These competencies include recognizing the impact of environmental degradation, understanding the need for equitable and sustainable development, and being conscious of using environmental resources wisely. It also emphasizes the importance of self-care, community welfare, and environmental stewardship, fostering respect for others, nature, and the environment among students.

Attachment B of the document focuses on integrating the teaching of civic education into the educational curriculum. It emphasizes developing competencies in students, including understanding self-care, community, and environmental concepts. It also stresses the importance of recognizing the principles of solidarity, equality, and respect for diversity as pillars of civil coexistence, and building a fair and sustainable future. The attachment outlines specific competencies and knowledge areas related to civic education, sustainable development, and digital citizenship.

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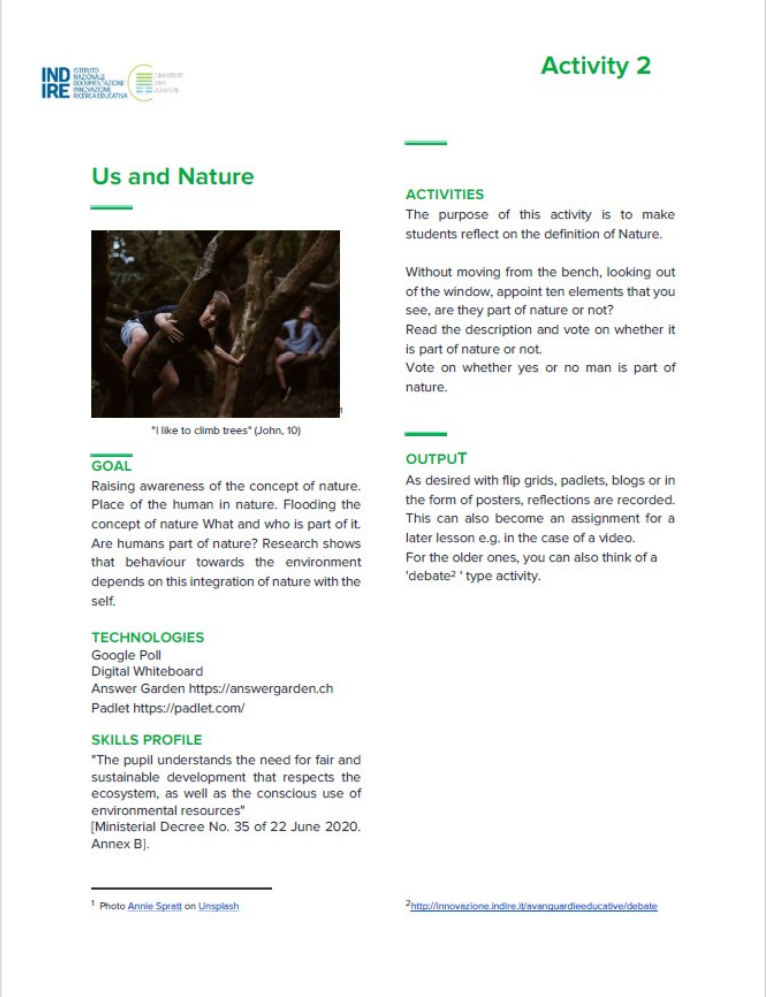
2 https://www.miur.gov.it/documents/20182/2432359/All.+A+Linee+guida_insegnamento_educazione+civica.pdf/d525412a-4461-3dba-a8a6-c455984c728d?version=1.0&t=1593499140853



Activity 2

Us and Nature

*"I like to climb trees" (John, 10)

GOAL

Raising awareness of the concept of nature. Place of the human in nature. Flooding the concept of nature What and who is part of it. Are humans part of nature? Research shows that behaviour towards the environment depends on this integration of nature with the self.

TECHNOLOGIES

Google Poll
Digital Whiteboard
Answer Garden https://answergarden.ch
Padlet https://padlet.com/

SKILLS PROFILE

"The pupil understands the need for fair and sustainable development that respects the ecosystem, as well as the conscious use of environmental resources"
[Ministerial Decree No. 35 of 22 June 2020. Annex B].

ACTIVITIES

The purpose of this activity is to make students reflect on the definition of Nature.

Without moving from the bench, looking out of the window, appoint ten elements that you see, are they part of nature or not?
Read the description and vote on whether it is part of nature or not.
Vote on whether yes or no man is part of nature.

OUTPUT

As desired with flip grids, padlets, blogs or in the form of posters, reflections are recorded. This can also become an assignment for a later lesson e.g. in the case of a video.
For the older ones, you can also think of a 'debate[2] ' type activity.

[1] Photo Annie Spratt on Unsplash

[2] http://innovazione.indire.it/avanguardieeducative/debate

Figure 1. Example of a Lesson Plan.

3.4. The students' questionnaire

This pilot study introduces three different scales as tools to explore the attitudes and connections of students aged 6-14 towards nature and the environment. The study aims to test the feasibility of these instruments in capturing young students' affinity to the natural world and their perception of environmental issues. This approach is rooted in the understanding that experiences with nature have been shown to promote learning in children in various ways. Research suggests that nature can improve learners' attention, levels of stress, self-discipline, interest, and enjoyment in learning. It also provides a calmer, quieter, safer, and more cooperative context for learning, as well as opportunities for developmentally beneficial forms of play. Children who spend more time in nature have been found to have lower rates of asthma, depression, and other illnesses, and green space around a school has been linked to improved student performance, including grades and graduation rates (Kuo et al., 2019). The impact of various educational interventions on students' connection to nature has been the subject of several studies. These interventions have shown positive results in increasing nature connection in children. For example, a mini review of interventions published in Frontiers in Psychology highlighted the success of different programs, such as forest schools and environmental education, in promoting connectedness to nature in children (Barrable & Booth, 2020). Similarly, a study on the

practice of mindful engagement in natural environments with children found that short-term interventions, such as field trips and mindful engagement activities, led to an increase in nature connection and positive affect in children (Barrabel et al., 2021).

The questionnaire scales

The Connectedness to Nature Scale (CNS) measures an individual's emotional and experiential response to nature (Mayer & Frantz, 2004) and reflects the psychological and emotional aspects of an individual's relationship with nature, emphasizing a sense of unity and closeness with the natural environment. Specifically, the tool measures the extent to which an individual feels a sense of community, equality, kinship, embeddedness, and belongingness to nature. Following the indications of the "Practitioner Guide to Assessing Connection to Nature" (Salazar, 2020, p. 23) the tool can be used to collect baseline data or a snapshot of a person's connection to nature at a certain point in time. For the pilot experimentation, an adapted, shorter version of the scale was used.

Connectedness to Nature Scale (adapted from Connectedness to Nature Scale-children; Mayer & Frantz, 2004):

- I perceive nature as if it were a big family;
- I feel connected to the animals around me;
- I feel connected to the plants around me;
- I feel part of the world around me, like a tree is part of the forest;
- I often do outdoor activities when I'm at school;
- I often do outdoor activities when I'm at home.

The Environmental Perceptions Scale (EPS) is designed to investigate children's attitudes towards learning about and protecting the environment (Larson et al., 2010). The items cover a range of topics, including a passion for learning about flora and fauna, recognizing the importance of plants and animals to people, a desire to learn about environmental protection, and a preference for spending time in nature. Additionally, it includes items that reflect a willingness to engage in practical environmental conservation activities, such as cleaning up green areas. This scale captures both cognitive and behavioural dimensions of environmental attitudes, focusing on educational interests, the perceived value of nature, and proactive environmental stewardship. For the pilot experimentation, an adapted, shorter version of the scale was used.

Environmental Perceptions Scale (adapted from Children's Environmental Perceptions Scale; Larson, et al., 2011):

- I love learning about plants;
- I love learning about animals;
- plants are important to people;
- animals are important to people;
- I am interested in learning new ways to help protect plants;
- I am interested in learning new ways to help protect animals;
- I like to spend time in places where I am in contact with nature;
- I would like to help clean up green areas in my neighborhood.

To answer the questions about the connectedness and perception, a five-point Likert Scale with the values "Strongly Disagree, Disagree, Not Sure, Agree, Strongly Agree" was used, where 1=Strongly Disagree and 5=Strongly Agree. Following the example shown in the

publication (Salazar, 2020, p. 21), instead of numbers, each response option was also marked by one or two "thumbs up" or "thumbs down" symbols. This facilitates interpretation for younger children. The intermediate option of "Not sure" is shown as a question mark (Figure 2).

strongly disagree	disagree	not sure	agree	strongly agree
👎👎	👎	?	👍	👍👍

Figure 2. Illustrated Likert scale use for the questionnaire.

The Inclusion of Nature in Self (INS) (Schultz, 2002) scale is a tool for measuring the extent to which individuals perceive themselves as part of the natural world. This scale typically involves a series of diagrams that visually represent the relationship between the self and nature. The closer the self is to nature in these diagrams, the higher the individual's sense of connectedness to nature. It provides insights into how deeply children feel integrated with the natural environment, which is key for understanding and fostering environmental attitudes and behaviors at a young age. For this pilot study, as shown in Figure 3, an adaptation of a more inclusive version was used, the Illustrated Inclusion of Nature in Self Scale (IINS) (Kleespies, 2021).

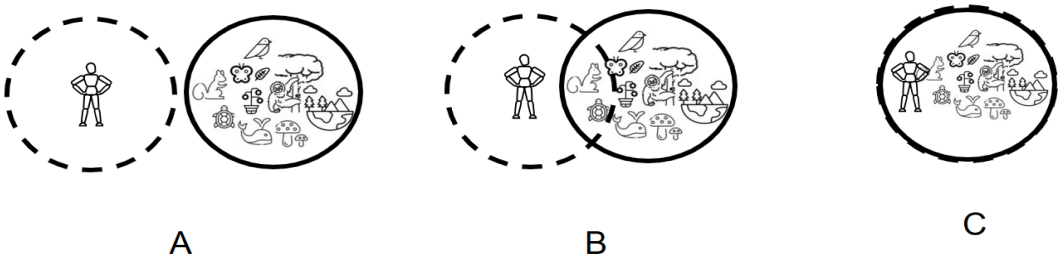


Figure 3. Simplified adaptation of Illustrated Inclusion of Nature in Self Scale (IINS, Kleespies, 2021).

The questionnaire administration

The questionnaire was administered by the teachers themselves in class. Depending on the age of their pupils, the questionnaire was provided in a pen and paper version or as an online survey.

Since the goal of the questionnaire itself was to test the tool's feasibility, participation was optional. The administration was anonymous, and the questionnaire was provided with the start of the classroom activities. At the end of the pilot, students of 4 primary school classes (from 2nd to 5th grade) and 2 secondary low classes (8th grade) had filled out a total of 120 surveys in total.

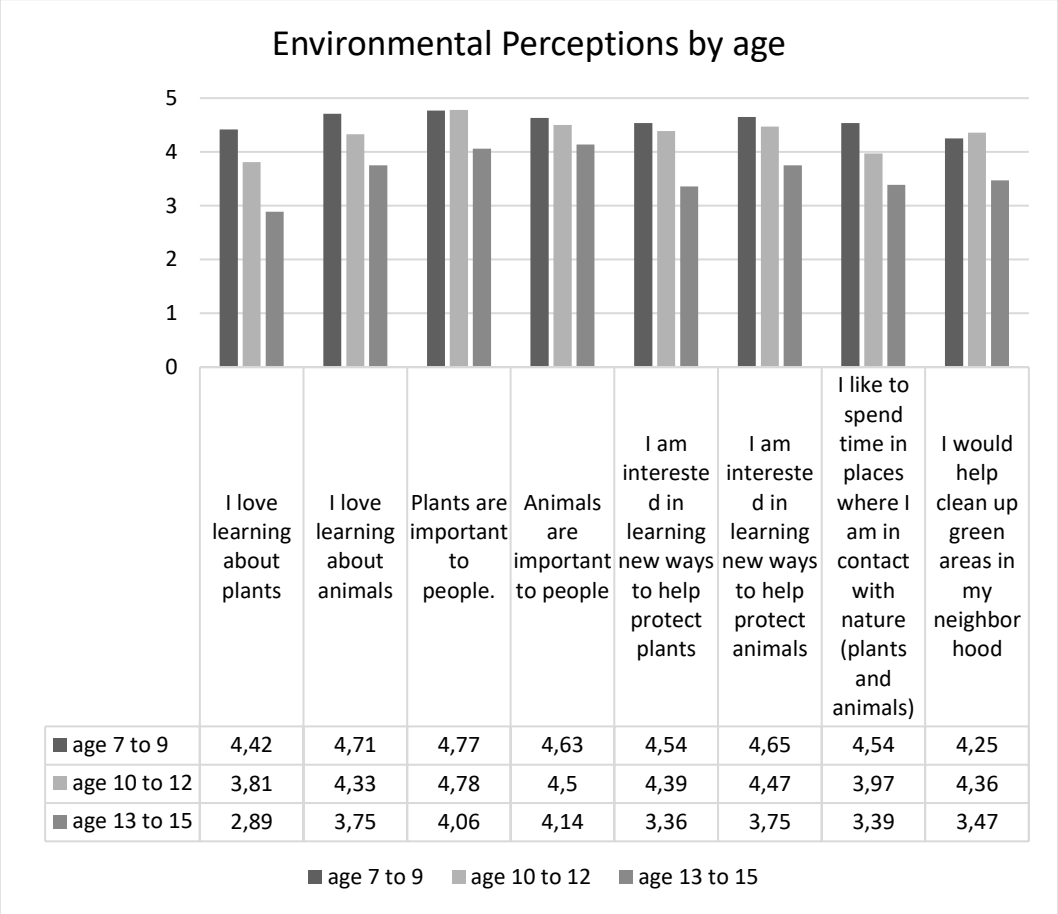
The participant group

The gender and age composition of the questionnaire participant group is composed as follows: male participants are predominant, comprising 61.70% with 74 individuals, while females account for 38.30% with 46 individuals. Age-wise, the group is segmented into three categories: the 7 to 9 age group includes 48 participants (40.00% of the total), the 10 to 12 age group consists of 36 participants (30.00%), and the 13 to 15 age group also has 36 participants, representing another 30.00% of the total. This distribution shows a majority of male participants and a relatively balanced representation across the older age groups.

Findings

Since this was a pilot study, which aimed to test the feasibility of the questionnaire, only a descriptive analysis of the data was carried out.

The data on the "Environmental Perception by Age" groups (Figure 4) shows that younger children (ages 7 to 9) express a stronger enthusiasm for nature. They score highest in loving to learn about plants (4.42) and animals (4.71), and strongly believe in the importance of both to people (4.77 for plants, 4.63 for animals). Their interest in protecting plants (4.54) and animals (4.65), and their enjoyment of spending time in nature (4.54), is also notable. In contrast, these perceptions and interests tend to decrease with age, as seen in the lower scores of the 13 to 15 age group.



	I love learning about plants	I love learning about animals	Plants are important to people.	Animals are important to people	I am interested in learning new ways to help protect plants	I am interested in learning new ways to help protect animals	I like to spend time in places where I am in contact with nature (plants and animals)	I would help clean up green areas in my neighborhood
age 7 to 9	4,42	4,71	4,77	4,63	4,54	4,65	4,54	4,25
age 10 to 12	3,81	4,33	4,78	4,5	4,39	4,47	3,97	4,36
age 13 to 15	2,89	3,75	4,06	4,14	3,36	3,75	3,39	3,47

Figure 4. Results Environmental Perception Scale by Age (mean).

The results for the "Environmental Perception by Gender" data (Figure 5) shows that for both learning about plants and animals, females scored higher (4.15 and 4.41) than males (3.54 and 4.24). Regarding the importance of plants and animals to people, females again had higher scores (4.72 for plants, 4.54 for animals) compared to males (4.46 for plants, 4.38 for animals). Females expressed more interest in learning new ways to help protect plants (4.41) and animals (4.48), while males scored 3.97 and 4.23 in these areas respectively. Females also showed a higher preference for spending time in nature (4.11) and willingness to clean up green areas (4.13), compared to males (3.97 for spending time in nature, 4 for cleaning up).

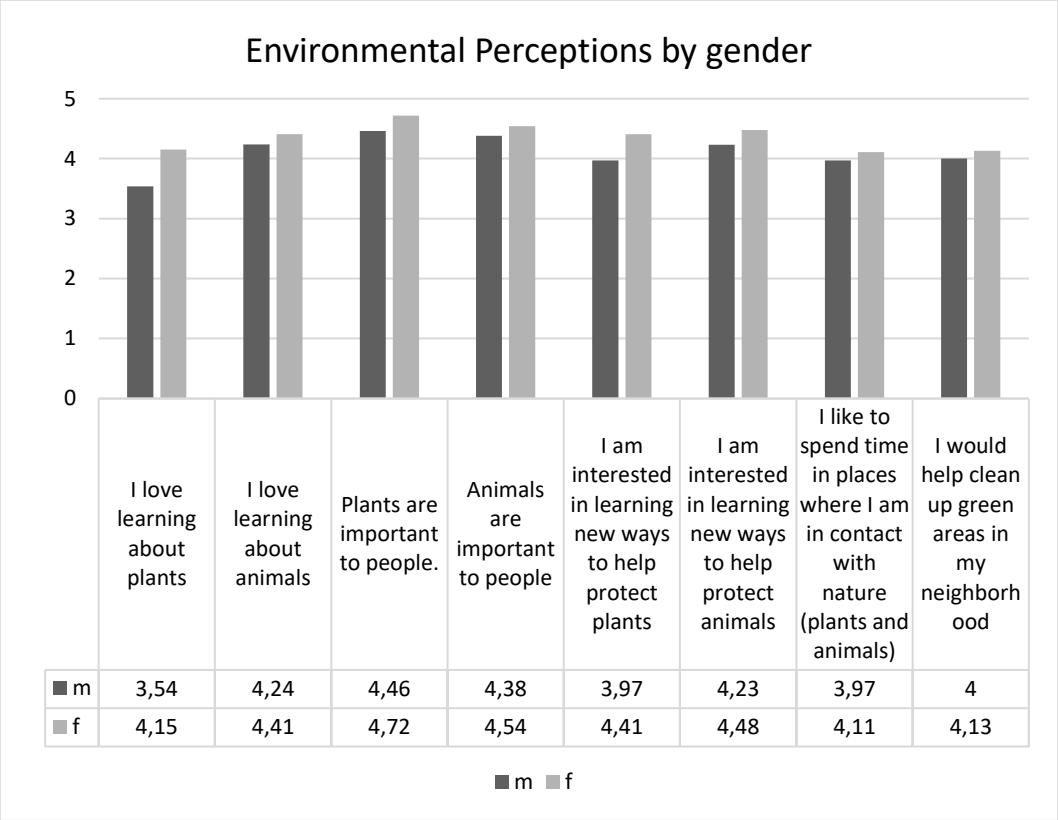


Figure 5. Results Environmental Perception Scale by Gender (mean).

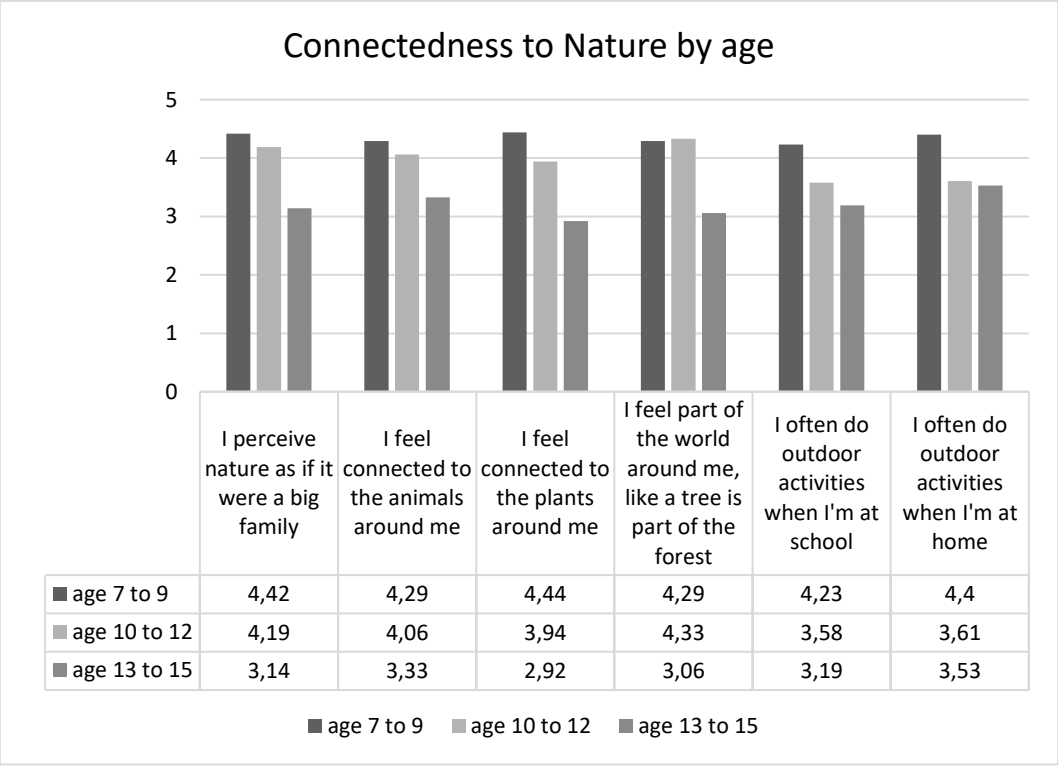


Figure 6. Results Connectedness to Nature Scale by age (mean).

The data for the scale "Connectedness to Nature by Age" shows varying levels of nature connectedness across three age groups: 7 to 9, 10 to 12, and 13 to 15 (Figure 6). In general, younger children (ages 7 to 9) report higher connectedness to nature across all aspects. For example, they score higher in perceiving nature as a big family (4.42), feeling connected to animals (4.29), and plants (4.44), and in feeling part of the world (4.29). They also engage more in outdoor activities at school (4.23) and at home (4.4). Conversely, the oldest group (ages 13 to 15) consistently shows lower scores in these areas, indicating a decrease in nature connectedness as age increases.

The data of the responses for the "Connectedness to Nature Scale by Gender" (Figure 7) reflects gender differences in perceptions of nature. Males consistently score lower than females across all aspects. Females feel a stronger connection to nature, as indicated by higher scores in perceiving nature as a family (4.24 vs. 3.8 for males), feeling connected to animals (4.09 vs. 3.84) and plants (4.02 vs. 3.72), and feeling like a part of the world (4.09 vs. 3.84). For outdoor activities, both genders show similar tendencies, but females slightly outscore males in both school (3.78 vs. 3.69) and home settings (3.98 vs. 3.85).

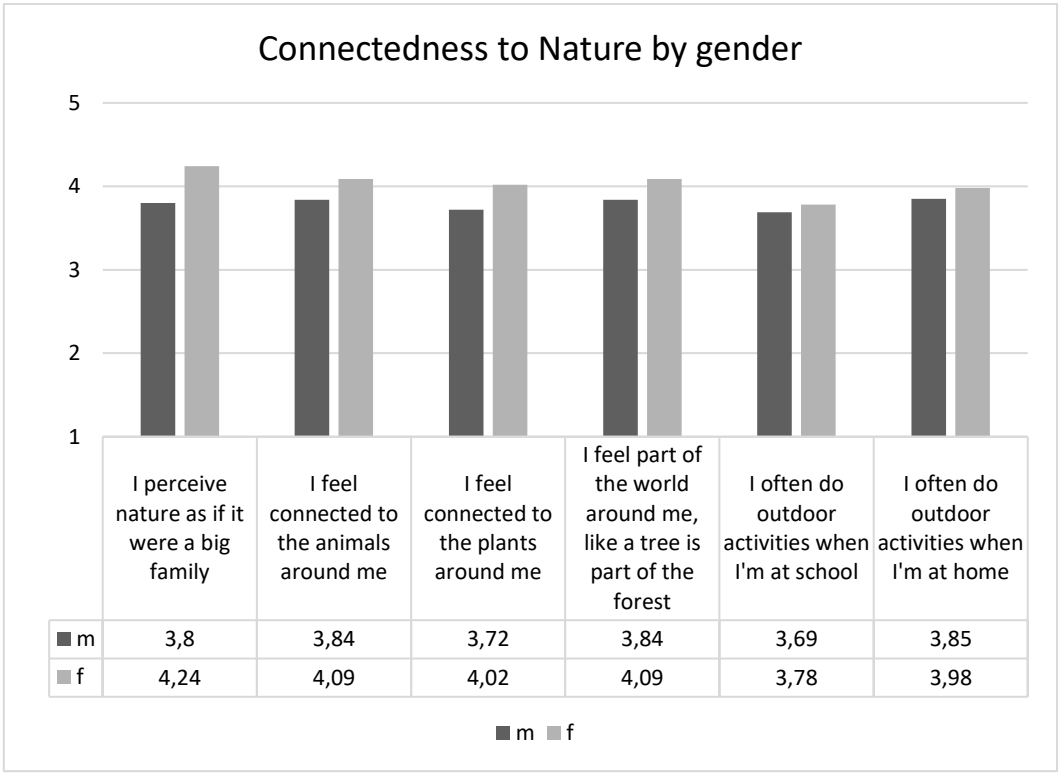


Figure 7. Results Connectedness to Nature Scale by gender (mean).

The "Inclusion of Nature in Self Scale by Age" results (Figure 8), categorized by age groups for options A, B, C (see Figure 3 above), show that prevailing option B and C, younger children (ages 7 to 9) have a higher sense of inclusion with nature (Option A: 4.17%, B: 58.33%, C: 37.5%). For ages 10 to 12, no participants chose Option A, with a split between Options B (41.67%) and C (33.33%). The oldest group (ages 13 to 15) instead shows a shift for options A (36.11%) and B (50%), and less frequencies for option C (13.89%). The overall average scores for the options are A: 2.36, B: 2.39, and C: 1.75, indicating a moderate level of nature inclusion across all age groups, with a lower value for the 13-15 age group.

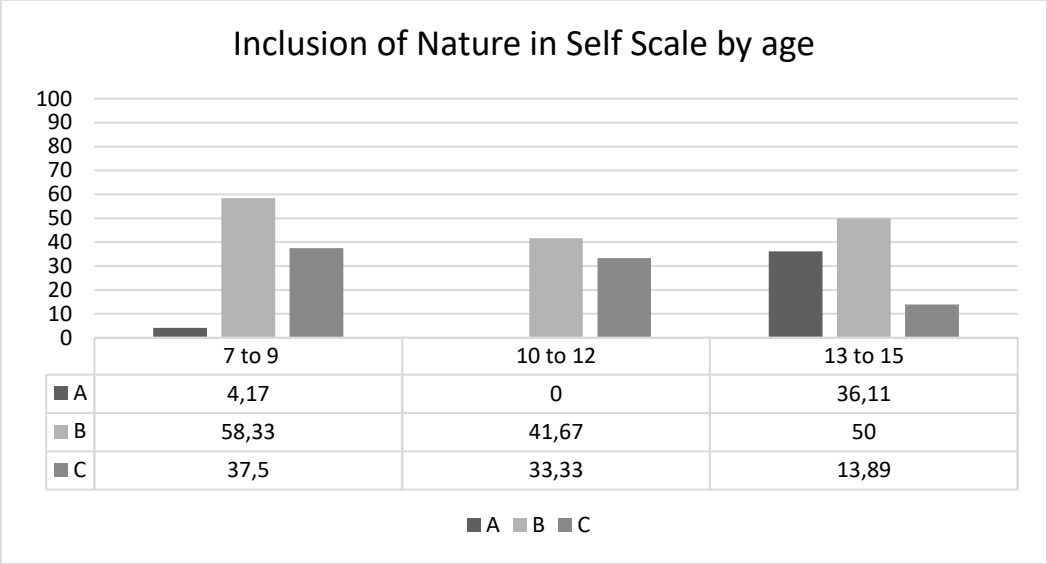


Figure 8. Results Inclusion of Nature in Self Scale by age (%).

The results for the "Inclusion of Nature in Self by Gender" scale, categorized by gender (Figure 9), show for category A, no males (0%) reported a sense of inclusion with nature, while a substantial portion of females (36.1%) did. In category B, a majority of both genders reported inclusion, with males at 55.6% and females at 50%. Category C had a lower percentage of females (13.9%) feeling included in nature compared to males (44.4%).

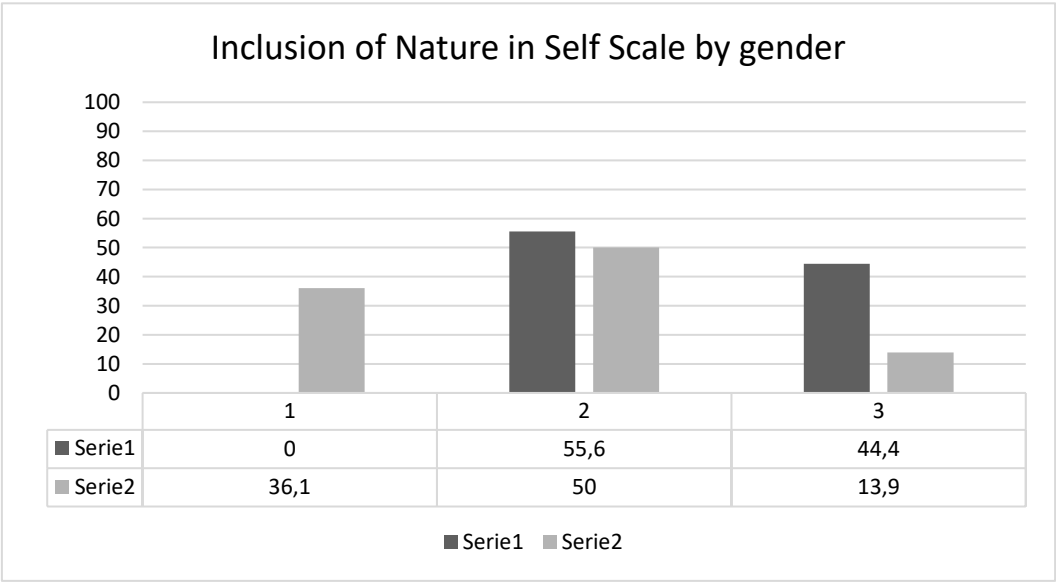


Figure 9. Results Inclusion of Nature in Self Scale by gender (%).

Interpretation

The data from the pilot study offers a nuanced view of nature connectedness among children, demonstrating clear age and gender patterns that follow the findings of previously

conducted research. Within the data of the pilot study data, it becomes evident that nature connectedness among children is influenced by both age and gender, a conclusion supported by various researchers including Price et al. (2022), Hughes et al. (2019), and Cleary et al. (2020). The Connectedness to Nature Scale and the Environmental Perceptions Scale revealed that the youngest age group, 7 to 9 years old, reported the highest levels of connectedness to nature. This group's sense of unity with nature is stronger when compared to the older age groups of 10 to 12 and 13 to 15 years old, where a noticeable decrease in connectedness scores is observed. This decline is in line with developmental theories that suggest a shift in interests and cognitive focus as children grow older (Barrable & Booth, 2020; Richardson et al., 2019).

The gender differences found are also striking, with girls across all age groups consistently showing higher levels of connectedness to nature than boys. This is evident in their responses to statements about perceiving nature as a family, feeling connected to animals and plants, and seeing themselves as part of the world. The trend continues in perceptions of the environment, with girls showing a greater interest in learning about plants and animals, recognizing the importance of plants and animals to humans, and showing a willingness to get involved in conservation efforts. This finding of the pilot study is supported by scientific evidence, as several studies have consistently found that nature connectedness is higher in girls than in boys (Rosa et al., 2023). The research by Price et al. (2022) supports these findings, suggesting that girls have higher Nature Connectedness Index (NCI) scores than boys, a gender difference that is maintained across age groups. However, this difference becomes less pronounced in older children, where boys reach similar levels to girls by the age of 17-18. This pattern mirrors the results reported by other studies (RSPB-Royal Society for the Protection of Birds, 2013; Chawla, 2020; Keith et al., 2021), which have consistently highlighted the importance of gender in nature connectedness.

The Inclusion of Nature in Self Scale further illustrates these gender differences. No boys reported the highest level of nature inclusion (Option A), while a significant proportion of girls (36.1%) did. The majority of both genders identified with the moderate level of nature inclusion (Option B), and fewer girls felt the lowest level of inclusion (Option C) compared to boys. Age-wise, the youngest children also exhibited the highest levels of self-identification with nature, with the oldest group showing a resurgence in nature inclusion at the highest level (Option A). This could suggest a developmental arc where nature connectedness peaks in early childhood, dips during the middle years, and potentially increases again in adolescence.

The implications for environmental education are significant. These findings suggest that young children, particularly girls, are more open to environmental engagement, and this propensity should be nurtured. As children grow older, and their connectedness to nature declines, educational interventions may need to be adapted to rekindle their interest and engagement with the natural world. This might involve more targeted, gender-sensitive approaches that consider the different ways boys and girls relate to nature (Kleespies & Dierkes, 2020).

3.5. Visual Nature Footprint Test (VINA): measuring the connection between student and nature.

With the same sample, we administered an additional experimental test to understand the starting point and their connection with nature.

The aim of the VINA test (de Maurissens & Mansion, 2023), conducted through images, was to understand how and if teachers and students were linked with nature.

For example, if they were connected, were they connected cognitively or through the senses? The entirely experimental test produced somewhat surprising results, and these were communicated to the teachers in an additional meeting, showing the percentages of connection with nature for both themselves and their students. The VINA test involved asking them to take three photos along their daily route from home to school and comment on them. The test results are as follows: 42% of the teacher's images and 59% of student's images on the home-to-school route do not contain or portray any shape or form of nature. The area where the school is located lacks nature. This is why the school was chosen, to address a social justice issue. Even though nature is limited, you can still connect with it. It is important to specify that, while adults require a real immersion in nature to feel included, for adolescents and children, very little is needed. A flower or an aromatic plant on a balcony can be enough to feel connected to nature for non-adults, as confirmed by the test itself. The test aimed to measure how both teachers and students related to nature. Only 15% of both groups do so through the senses and non-intellectual modes.

In that 15% of teachers/students, the sense of sight was by far the most favored (92% for teachers, 88% for students). It should be noted that the experimentation was carried out during the COVID period, and while the senses, in general, are already limited in urban areas, during the COVID period, the sense of smell and touch were significantly affected. Additionally, according to Soga et al (2021), the pandemic had the potential to alter the dynamics of direct interactions between humans and nature, leading to further changes in these interactions, with the potential to prolong the pandemic's impacts to persist long after its conclusion.

Finding in a diachronic perspective

In a diachronic perspective, after two years, teachers, responding to a questionnaire, claimed to have changed their relationship with nature (yes, very much 33.3%, yes, a lot 33.3%, quite a bit 33.3%). We cite these two comments from teachers:

- "I see the positive aspects, rather than the damages - I enjoy it more - I feel more a part of it - I exhibit more responsible behaviors (e.g., using less detergent, thinking about clean seas) - I teach differently, with a very different perspective";
- "The change has been mainly in relating to nature, making contact more consciously".

When asked if they have changed their approach to sustainability issues in the classroom, they responded (yes, very much 33.3%, yes, a lot 33.3%, quite a bit 33.3%). For example, two comments were:

- "I present the beauty of nature, the wonders of our world, using all the senses";
- "In every lesson of mine, I always try to convey to the children the beauty of nature in its entirety".

Regarding environmental identity, it is worth noting that the course, two years later, has made a difference in the way of teaching, moving from an almost exclusively cognitive approach to a more affective and behavioral mode.

Some comments indicate how this experimentation, even two years later, has allowed teachers to change their approach to sustainability:

- "For me, it was very powerful, a change as a person and as a teacher. An emotional

> approach is also necessary for children, who are increasingly distant from nature and less and less in contact, generally, with themselves, with others, with the world. I liked bringing the children back a bit to their natural dimension, that of wonder. And bringing their gaze back to the created, the real one, not the digital one".

This result aligns with the intended direction in proposing this experimentation and is in line with the recommendations of the research "Country progress on climate change education, training, and public awareness: an analysis of country submissions under the United Nations Framework Convention on Climate Change" (2019) (https://unesdoc.unesco.org/ark:/48223/pf0000372164). Although it specifically addresses climate, it notes the significant progress made by the teachers involved in the experiment compared to teachers from the sample of teachers in the report's typical approach to sustainability issues. Particularly for primary schools, the approach is predominantly cognitive (67%) compared to 7% for socio-emotional and 27% for behavioral approaches (Figure 10).

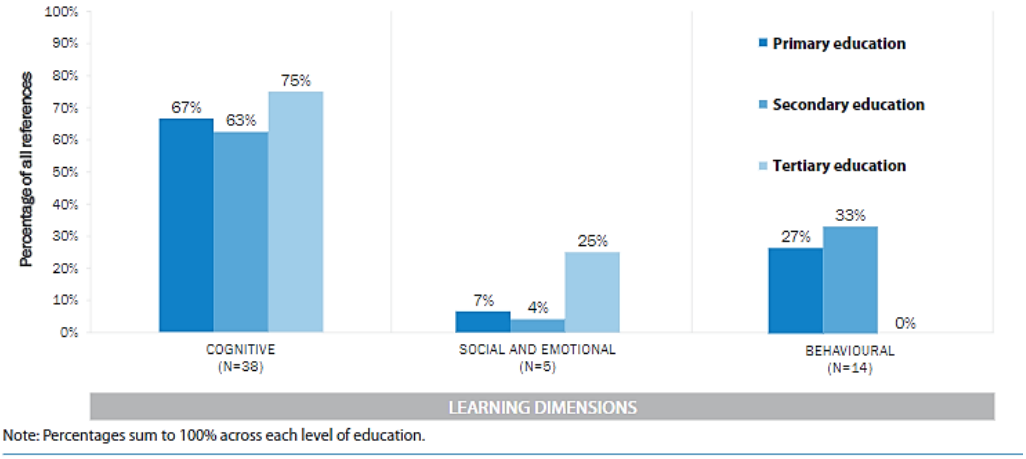


Figure 10. Learning dimensions. Resource: UN (2019).

In remote interviews, it emerged that the experience has changed the way sustainability issues are addressed and has strengthened their environmental identity. They have significantly shifted from a cognitive approach to favor a socio-emotional and behavioral approach.

4. Conclusion

In conclusion, the findings from the experimentation underscore a significant gap in the inclusion of nature-reconnecting workshops and labs within current sustainability programs. There are relatively few studies on the long-term impact of teacher training. This research shows, firstly, how profoundly their pedagogical approach can be transformed, which can have a positive impact on the hundreds of children in their care. These results are undoubtedly helped by the long-suppressed emotional bond between humans and nature. The cognitive understanding of environmental identity, coupled with limited direct contact and sensory experiences with nature, poses a challenge, especially for children in suburban areas with minimal green spaces. Recognizing the importance of direct nature experiences for healthy human development, there is a pressing need for schools to

integrate nature connection into their curriculum. This integration, supported by coaching and training for educators, could be aligned with Italian civic education guidelines and the Green Comp (Bianchi et al., 2022), but also has the potential to foster essential skills such as environmental awareness and empathy for ecosystems.

Further research is crucial to refine and implement this nature-centric approach in schools. For example, the new pedagogical proposal of reconcilism (Mansion, 2022) could help to overcome the dualism between nature and humans, as evidenced by the valuable resources and tools provided by the pilot study. The tools for measuring nature connectedness and perception show promise for effective use in educational settings.

Considering the limited opportunities for students to engage with nature, schools must take on the responsibility of reconnecting students to counteract the loss of the experience of nature (Pyle, 2003) for new generations. This involves not only allowing students to climb trees, but also ensuring that these natural elements exist within school premises. Reconnecting students and teachers to nature is not only essential for health and well-being, but also aligns with the broader goal of making cities more biophilic, starting with schools. By incorporating nature into the curriculum and fostering a sense of responsibility towards the environment, schools can effectively contribute to students' holistic development and a more sustainable future. In addition, it would help reduce environmental anxiety in children by giving them the opportunity to get closer to nature through their senses and better understand their relationship with it.

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