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Nature, Reimagined: Fostering Adults' Nature Perceptions and Experiences Through Online Nature Workshops

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ABSTRACT

Adults influence younger generations and play an important role in responding to climate change. This qualitative case study explored the impact of a 12-week Online Nature Workshop (ONW) program on adults' perceptions and experiences of nature. Ten adults engaged in interactive, experiential activities delivered online. Data were collected with open-ended pre-post questionnaires and nature diaries. Before the ONWs, participants described nature only in terms of human benefit, but afterward, they began to see it as an interconnected system where humans coexist with other living beings. Nature diaries supported this shift, showing an increased frequency and diversity of nature-related activities. The results suggest that ONWs can bring adults closer to nature and encourage them to rethink their everyday choices.

Keywords: adult education, anthropocentric view, ecocentric view, nature perceptions, nature experiences, online nature workshops

INTRODUCTION

In today's fast-paced world, individuals spend less time in nature, leading to a growing disconnect (DeVille et al., 2021; Louv, 2005). In fact, a recent study estimates that human-nature connectedness has declined by 60% since 1800 (Richardson, 2025). This decline has been linked to negative effects on physical health (Fang et al., 2019; Lanca & Saw, 2020) and mental well-being (Wang et al., 2019) and to lower environmental awareness and fewer pro-environmental behaviors (Kortenkamp & Moore, 2001). Addressing this issue is crucial, especially among adults, who both influence younger generations and play an active role in climate action (UNESCO, 2002). This study examines whether online nature workshops (ONWs) can foster adults' nature perceptions and experiences and, in doing so, help reduce their disconnection from the natural world.

One factor contributing to this disconnection is how individuals perceive their relationship with nature. Perceptions of the natural environment are shaped by values, emotions, and lived experiences, which influence both well-being and responses to ecological challenges (Gunko et al., 2025). Environmental crises are perceived differently depending on whether nature is viewed as an interconnected system or as a resource for humans (Kortenkamp & Moore, 2001). An anthropocentric perspective views humans as the owners of nature, valuing it only for personal benefit (Thompson & Barton, 1994). In contrast, an ecocentric perspective emphasizes nature's intrinsic value, independent of human use (Kortenkamp & Moore, 2001). Nature metaphors also shape perceptions, influencing emotional connections and ethical reasoning (Bulut et al., 2021; Sabeen et al., 2023; Stålhammar et al., 2017).

Research suggests a reciprocal relationship between nature perceptions and experiences. The more time individuals spend in nature, the more positive their perceptions, which in turn encourages deeper and more frequent engagement (DeVille et al., 2021; Kokkonen et al., 2023; Otto & Pensini, 2017).

While childhood experiences play a role in shaping environmental attitudes and perceptions, adults hold greater responsibility for addressing environmental issues since waiting for the next generation to grow up and become fully equipped with knowledge, skills, and pro-environmental behaviors would take time (UNESCO, 2002). Recent research suggests that childhood experiences can influence adult nature connectedness (Barrable et al., 2024) and that adults are more likely than children to take environmental action and influence others (Slattery, 2000). This makes adult-focused interventions especially important when early experiences with nature are limited.

Previous studies show that nature-based interventions and structured educational programs can enhance individuals' nature perceptions and experiences (Aaron & Witt, 2011; Otto & Pensini, 2017). In adult education, these perceptions

affect behaviors toward nature (Köşker, 2019). Given that ONWs emphasize engagement, reflection, and direct experiences with nature, they are expected to foster adults' nature perceptions and experiences.

Despite growing research on nature education, most studies focus on children and adolescents, with limited or no emphasis on adults' nature perceptions and experiences (e.g., Aaron & Witt, 2011; Bonnell et al., 2018). Adults, however, play a critical role in shaping intergenerational perceptions and pro-environmental behaviors, yet structured interventions for them remain limited. To fill this gap, this study explores the effects of ONWs, which integrate nature-related topics and hands-on activities, on adults' nature perceptions and experiences. Grounded in the Humanist Adult Education framework, the workshops aim to reconnect adults with nature in today's digital era.

LITERATURE REVIEW

This study is grounded in the Humanist Adult Education framework (Elias & Merriam, 1995), which emphasizes learners' interests, self-actualization, and personal growth. Instructors act as facilitators rather than information providers, encouraging autonomy and connection with nature (Giuseffi, 2021; Walter, 2009). Learners of humanist adult education are self-conscious, have an intrinsic urge to learn, and take responsibility for their own learning experiences (Elias & Merriam, 1995). This humanist approach echoes naturalist views that emphasize the importance of self-realization within nature by connecting it to a sense of spiritual connection and healing (Walter, 2009). Thus, involving adults in environments that foster a sense of belonging to nature, rather than ownership of it, is essential.

Modern environmental education emphasizes informal and nonformal practices to motivate action (Boger, 2002). Recent studies highlight the value of creating opportunities to 'bring nature indoors' using representations, metaphors, or digital tools (Troy & Skurka, 2023), given that perceptions of nature shape both attitudes and behaviors (Köşker, 2019). For example, digital storytelling has been shown to enhance global citizenship skills and cross-cultural understanding, pointing to the potential of digital tools to strengthen ecological awareness (Modi, 2024). Simulations with VR tools have also been shown to contribute to pro-environmental intentions (Xuan et al., 2025). Similarly, recent research has shown that activities demanding physical presence can be adapted to online settings, highlighting the value of flexibility and accessibility (Mata & Marasigan, 2024).

Nature Perceptions: Anthropocentrism and Ecocentrism

Perceptions, defined as cognitive connections with the world (Efron, 1969), influence orientations toward nature. One of the earliest categorizations of nature perceptions was made by Thompson and Barton (1994) as environmental attitudes

and by Kortenkamp and Moore (2001) as moral reasoning patterns (or environmental ethics), namely, ecocentrism and anthropocentrism, which are used in this study to interpret participants' views (Lopez-Bonilla & Lopez-Bonilla, 2016; Ntanos et al., 2019; Xu & Fox, 2014).

Individuals with poor natural perception will most likely have an anthropocentric view, believing that all elements in nature exist solely to meet human needs and feeling the urge to protect nature only for the sake of their own well-being (Peters, 2022). Ecocentric thinkers, on the other hand, understand themselves as a part of nature, recognizing that all elements and species in nature are interconnected. They seek the well-being of nature not only for their own sake but also for other species because they have natural connectedness (Peters, 2022). Because those perceptions influence individuals' attitudes and behaviors toward nature (Köşker, 2019), encouraging individuals to have a more ecocentric view is crucial.

Research on nature perceptions has used tools such as drawings, interviews, questionnaires, diaries, and observations (Aaron & Witt, 2011; Birinci, 2013; Liu & Lin, 2014). Findings often indicate that participants picture nature as a green space filled with plants and animals, excluding humans, and focus only on its benefits to humankind (Bonnell et al., 2018; Köşker, 2019; Shepardson et al., 2007). Such anthropocentric views limit deeper connectedness with nature.

Direct experiences with nature are often emphasized as essential. Exposure to natural elements increases the likelihood of developing ecocentric views and forming a deeper connection (Aaron & Witt, 2011; Keliher, 1997; Nisbet et al., 2016). Brody (2005), for instance, argued that individuals must have direct physical contact with nature for meaningful learning. While this idea has been highly influential, more recent studies have explored whether nature-related experiences can also be facilitated through digital and online environments (Avcu & Yaman, 2025; Hannouch & Milstein, 2025; Lau & Jong, 2023; Makransky & Mayer, 2022). The present study builds on this debate by integrating ONWs that integrate online accessibility with hands-on nature activities, broadening the concept of "direct" experience. Research highlights methods to foster connectedness, such as media campaigns, family nature visits, parental experiences, and well-planned instructional design (Karatekin & Elvan, 2021; Kokkonen et al., 2023; Shin et al., 2022).

In accordance with the present literature, learning environments should provide direct experiences and interactive activities. The present study designed six biweekly ONWs to provide adults with an opportunity to explore nature independently and to positively influence their perceptions and experiences, filling the gap created by limited outdoor contact. This study aimed to evaluate the impact of ONWs on adults' nature perceptions and experiences. The research questions are provided below.

1. How do ONWs affect adults' perceptions of nature?

2. How do ONWs affect adults' time spent in nature and their nature experiences?
3. How do nature perceptions relate to time spent in nature and experiences?

Rationality

In the face of the growing climate crisis, it is essential to address adults' nature perceptions, which shape attitudes and behaviors (Köşker, 2019), and to enrich nature experiences, which are linked to the value attributed to nature (Kokkonen et al., 2023). Offering simple online workshops with hands-on activities, this study aims to address these variables and shift adults' anthropocentric mindsets toward ecocentric mindsets.

Online environmental education programs have increasingly been used to enhance nature connectedness, fostering interactivity, motivation, and adaptation (Li et al., 2016). Research indicates that structured online workshops can foster pro-environmental attitudes, particularly when they include interactive and experiential components (Aaron & Witt, 2011; Avcu & Yaman, 2025). Virtual environments have been shown to trigger positive emotions toward nature (Lau et al., 2023), improve retention and engagement (Makransky & Mayer, 2022), and broaden access to learning (Assaf & Gan, 2021). Moreover, they can also serve as platforms where ecocentric identities are expressed and shared, connecting digital experiences with environmental meaning-making (Hannouch & Milstein, 2025). Building on this evidence, the ONWs in this study were designed to combine digital accessibility with hands-on nature activities, aiming to bridge the gap between online learning and direct engagement with nature.

While previous studies have explored adults' environmental learning in various contexts, systematic research on their nature perceptions and experiences in online settings remains limited. McClain et al. (2025) studied adult participation in community nature journaling, with a focus on shared reflection and outdoor engagement. In contrast, this study places adults in structured online workshops that include interactive, hands-on activities, aiming to connect digital accessibility with lived experience. This distinction highlights the novelty of the ONWs, as they extend adult-focused environmental education to contexts where direct outdoor participation may not always be possible. Moreover, most prior research has centered on school-aged children and adolescents (Aaron & Witt, 2011; Bonnell et al., 2018). To date, no study has qualitatively examined how online workshops enriched with real-life activities can support adults in shifting from anthropocentric to ecocentric mindsets and in deepening their natural experiences. By exploring this connection, this study addresses an area that has received little attention in the literature.

Another distinctive feature of this study is its heterogeneous group of participants. Unlike most studies examining homogeneous groups of students, this research involved adults with diverse ages, interests, and lifestyles. Such diversity

fosters collaborative learning and richer reflection, as prior studies suggest (Dijk et al., 2020; Donnovan et al., 2018; Han et al., 2020).

Finally, some studies have found that online workshops have a limited impact on fostering a sense of belonging with nature (Arbuthnott et al., 2022). This suggests that more research is needed since workshop design and content may lead to different outcomes. By combining online accessibility, experiential activities, and diverse adult participation, this study contributes to advancing adult environmental education in a digital era.

RESEARCH METHOD

This study used a qualitative case study design to examine adults' experiences during a 12-week ONW program (Creswell & Poth, 2018). Since the study focused on a single group experiencing the same intervention, a single-case design was adopted.

Participants

Participants were ten volunteer adults aged 18-31 (4 males, 6 females) from Western Anatolia recruited through convenience sampling (Patton, 2015). They applied via Google Forms and were informed about the voluntary nature of participation. Participants were informed about the study's purpose, process, and their rights through consent forms prepared in accordance with BERA's (2024) ethical guidelines. The demographic characteristics of the participants are presented in Table 1.

Table 1: Demographics of the Participants

Participant ID	Age	Gender	Field of Study	Educational Level
1	24	Male	Language and literature	Master's
2	27	Male	Fine arts/Ceramics	Undergraduate
3	22	Female	Energy systems engineering	PhD
4	31	Male	International relations and trading	B.A.
5	29	Female	Sociology	Undergraduate
6	18	Female	Chemistry	Undergraduate
7	25	Female	Science education	Undergraduate
8	21	Male	Preschool education	Undergraduate
9	21	Female	Nursery	Undergraduate
10	23	Female	Science education	Undergraduate

Context of the ONWs

The ONWs were organized into six sessions, held every two weeks over 12 weeks. Topics included human-nature relationships, climate change, ecological footprints, organic composting, local seeds, biodiversity, and slow-living. In the Nature Workshop Application Form, volunteering participants answered the question "Which subjects/concepts do you expect the ONWs to cover?" and their expectations and interests were considered when shaping the workshop content. Activities were designed to be practical and doable at home, such as seed-ball making, composting in jars, and creating bird feeders from recycled materials.) Each session began with a nature sound to stimulate sensory engagement (see Appendix F for the sound references), followed by discussions, interactive activities, and reflective sharing.

Each week, the instructor sent an explanatory e-mail (see Appendix E for an example) to participants, outlining the topic and needed materials. The weekly plan of the ONWs, including themes and covered content, is provided in Appendix A (Table A1).

Sessions held every two weeks encouraged participants to reflect on and discuss ecological themes in interactive ways. The content was designed to promote nature perceptions not only cognitively but also in affective and experiential dimensions. Books, additional scientific resources, mobile applications, and interactive website recommendations were offered to deepen the experience. To this end, these topics were specifically addressed in each interactive activity held in ONWs to contribute to adults' nature perceptions and experiences.

An overview of the interactive activities integrated into the ONWs is provided in Appendix A (Table A2). Some activities were adapted from or inspired by practices documented in the literature, which are cited in the table where relevant. The table also outlines the expected contributions of each activity to adults' nature perceptions and experiences.

For instance, in the "Finding the Hidden Water" workshop, participants experimented with comparing land ice and sea ice melting using household materials (containers, rocks, ice cubes). They observed that land ice contributes more to sea-level rise, reinforcing the concepts of climate change and ecological footprints. The activity was supported by exploration of the Water Footprint Network's product gallery, which helped participants reflect on hidden water consumption in everyday products. Some visuals of participants engaging in interactive activities in workshops are provided in Appendix D (Figure D1). The details regarding the implementation of each week's workshops are presented in Appendix A.

Instrumentation

Data were gathered through:
1. Open-ended questionnaires (pre- and post) with five questions on nature metaphors, lifestyle choices, ecological footprints, and life habits.
2. Nature diaries, in which participants recorded time spent in nature, activities, and emotional and physical experiences.

Both instruments were validated through a comprehensive literature review, expert opinions, and pilot testing. Minor revisions were made for clarity, and interrater reliability was high (84% for questionnaires, 91% for diaries).

The questionnaire with open-ended questions

The aim of using a questionnaire with open-ended questions was to determine adults' nature perceptions. The finalized version of the questionnaire with five open-ended questions, after the necessary revisions, is presented in Appendix B (Table B1).

The first and second questions were designed to reveal adults' nature metaphors and images, which are indicated to be determinants of perceptions because metaphors trigger brain regions that are linked to emotions and impressions (Ifantidou, 2021) and how ideas are communicated (Lawler et al., 1981). The third question was designed to elicit their justifications for adopting a nature-friendly lifestyle, the fourth question to explore their reflections on the impact of their personal shopping choices on their ecological footprint, and last, the fifth question to identify the changes that occur in adults' daily life habits, which are also linked to nature perceptions, including ecocentrism and anthropocentrism (Ntanos, 2019; Peters, 2022).

Nature Diaries

The purpose of using nature diaries was to document and track adults' time spent in nature and their nature experiences/activities. Some guidelines were provided to help adults record their natural experiences effectively. Those directions were:

1- Date and time: For each nature experience, please record the date and approximate time. (RQ 2a)

2- Nature activities: Please note down the activities you engage in (e.g., playing, meditating, walking, sitting, observing). (RQ 2b)

3- Experiences (if any): Please include any physical experiences (see, hear, smell, feel, etc.) or emotional experiences (happiness, wonder, anxiety, calm, etc.) during your time in nature. (RQ 2b)

The directions for the nature diaries, provided to adults without sacrificing flexibility, were designed to guide them in recording the nature activities they engaged in comfortably and to encourage them to track their activities. Nature diaries were expected to be carried by participants anywhere to facilitate the recording of feelings and emotions in real time.

Data Analysis

Thematic analysis (Braun & Clarke, 2012) was conducted using MAXQDA. Two researchers independently coded the data, compared themes, and resolved discrepancies. Interrater reliability was calculated using Miles and Huberman's (1994) formula, showing a high level of agreement (84%). Codes were grouped under anthropocentric/ecocentric categories for questionnaires and under time, activity, and experience themes for nature diaries. An example of the coding process is presented in Appendix C (Table C1).

Anthropocentric codes captured utilitarian justifications (e.g., valuing nature only for human benefit) and a sense of vulnerability/protection; ecocentric codes captured interdependence, intrinsic value, balance, and belonging. Imageries/metaphors (e.g., baby, ocean, mother, home, place) were coded according to this orientation based on the justifications provided.

The coding process of nature diaries was inherently more structured because adults were given directions regarding what they needed to note down in their diaries. The emerging themes were time spent, activity type (e.g., walking, observing species, gardening, sitting still), and experience (e.g., calm, noticing colors/patterns), as presented in Table 2.

Table 2: Themes and Codes Emerged from the Coding of Nature Diaries

Themes	Subthemes	Codes	Sample Statement
Amount of time spent	Duration	None, less than 30 minutes, 30 minutes, 1 hour, more than 1 hour	"This week I could not find spare time to spend in nature..."
	Frequency	Once a week, more than once a week/every day	"I spent lots of time in nature today, walking. I plan to repeat this activity for 3 more days this week because it felt nice. Breathing in the fresh air with nice scents made me feel happy."

Nature activity	Physical activity	Cycling, walking, gardening	"Today, I'm in the woods, near our village. I'm watching birds chirping and flying from one tree to another. I leaned my back against a tree; it felt so calm."
	Observation	Birdwatching, observing different species, and counting species	
	Interaction	Touching plants, petting animals, picking fruits/harvesting vegetables	"Today, I walked 2 km around my neighborhood with my dog; he chased pigeons."
	Resting	Sitting, napping, meditating	
Nature experiences	Physical	Realizing colors/patterns, listening to birds singing, feeling the wind, smelling scents, and feeling/touching plants	"This day I decided to count the species in my garden, it was surprising there were so many kinds of species living together, I also realized the smells of beautiful flowers in my hometown."
	Emotional	Calm, happy, freedom, boredom, wonder, connectedness	"Today, I'm sitting on the grass silently. It feels soft and nice. I feel like I'm connected to the Earth."

RESULTS

Results on Adults' Nature Perceptions

Change in nature metaphors and images: "Nature is like…"

Before the ONWs, most adults described nature through anthropocentric and fragile images, such as "baby" (40%) or "life-giver" (see Figure 1). These metaphors reflected both dependency and weakness and utility: "Nature is like a baby that needs protection, we need to look after its needs" (A2). Others positioned nature as distant: "…but now it seems distant from us, because the system's thought supports moving away from nature rather than telling us that we are a part of it." (A7). In diaries, this same adult reported spending only once a week outdoors, reinforcing their sense of alienation.

Figure 1
Answers given for questionnaire item: “Nature is like….”

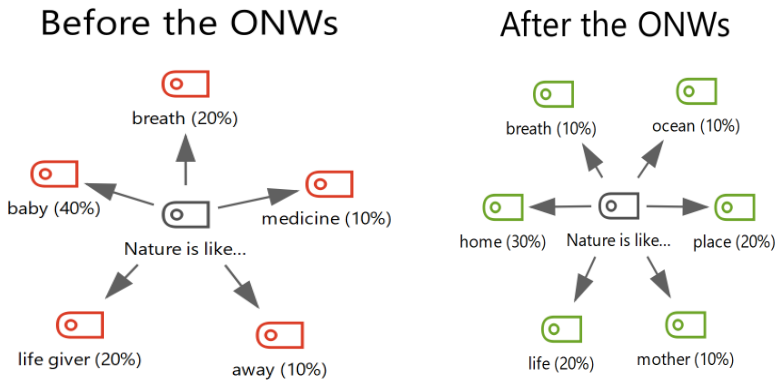


Figure 1 shows that after the ONWs, metaphors shifted to ecocentric and inclusive terms such as “home,” “ocean,” or “mother,” highlighting strength, coexistence, and balance. For instance, the same adult (7) who once felt disconnected later indicated, “Nature is like a home which we all return it at the end of the long, tiring day to find hospitality and generosity,” after the ONWs. Before the ONWs, the justifications for their metaphors reflected views of nature as weak, unfamiliar, in need of human help, or valuable mainly for human survival.

After the ONWs, these justifications shifted to seeing nature as powerful, hospitable, and generous (see Figure D2 in Appendix D). Adults’ reasoning on their metaphors mostly gathered around its utility for humans (60%) and less frequently its weakness (10%) and unfamiliarity (10%). For instance, (A1) stated, “Nature is like medicine because it has the power to heal. We could not be healthy and durable without its offerings.” This reflects an anthropocentric and utilitarian mindset, valuing nature mainly for its services to humans. After the ONWs, justifications shifted. The most common themes were nature’s power (40%), generosity, and hospitality. For instance, the same adult (A1) who had previously compared nature to medicine later said: “Nature is like an ocean because it hosts many other species living together, like a small fish feeding from the remains of bigger fish’s food...” This reflects a shift to ecocentric thinking by recognizing interdependence and removing the human-centered perspective.

Comparing nature with the “breath” metaphor appeared both before and after the ONWs. However, the way it was justified changed. Before the ONWs, one adult (A4) said, “Nature is like a breath because we could not live without it.” Indicated an anthropocentric and utilitarian view, however, after the ONWs, another adult stated that

> "Nature is like breath because it contains all the materials necessary for life and is indispensable for all living beings; it has vital importance. With deep love and attention, it gives life, and it becomes life." (A3)

This statement reflected a more ecocentric perspective, acknowledging nature's role in all life forms, not just humans.

The adults' descriptions of the imagined picture also became richer. Before ONWs, adults mainly referred to green/blue colors (80%), plants, and skies, with no humans (see Figure D3 in Appendix D). "Shades of green and blue, and flowers..." (A1). After the ONWs, they included humans, animals, and varied ecosystem elements, with emphasis on coexistence. One stated, "…There would be birds chirping in the trees and wandering around in the sky. There would be rivers, people walking their dogs, and benches" (A9). This shows a shift from cliché, human-absent imagery to ecocentric, interconnected descriptions.

Changes in adults' reasoning for adopting nature-friendly lifestyles: "Do you think that adopting a nature-friendly lifestyle is essential? Why?"

Every adult agreed that living in a nature-friendly way was essential, but their explanations shifted after the workshops (see Figure D4 in Appendix D). Before ONWs, justifications reflected an anthropocentric and utilitarian mindset. Adults mostly emphasized survival and human benefit (70%):

"I think it is absolutely important because I see nature as life itself. It is where we are and where we will be. There's no reason not to be a friend of nature, not to work to protect it. Nature holds so many benefits for us." (A3)

After the ONWs, adults began to stress responsibility and a sense of belonging to nature. One adult, for example, stated,

"… Of course, it is important because nature is a part of our essence. For us, it is breath, it is water. Sometimes above ground, it is our best friend, and sometimes beneath, it is the home of our lost ones. We must respect it, and with this understanding, we must leave behind beautiful things to be passed on to future generations." (A1)

Others stressed indebtedness and guilt for harm caused: "…We cannot survive by mistreating and destroying nature. Furthermore, it is our responsibility to our grandchildren to protect nature." (A4)

These statements showed that adults started to reconsider their place in nature. After the ONWs, adults more frequently described themselves as being part of nature rather than being separate from it.

The change in adults' reflection of possible impacts of their shopping choices on their ecological footprints: "… from the purchase of this product to the expiration period, what kind of effects can it have on nature?"

When asked about the impact of their favorite products on nature, adults' reflections changed after the ONWs. Before the ONWs, responses were superficial and disconnected from ecological impacts. The most frequently mentioned product was plastic bags (80%), along with pencils and leather goods (see Figure D5 in Appendix D). Explanations generally focused only on visible materials: "My favorite product to use is probably pencils. I do not know if pencils are environmentally friendly since trees are usually cut down while producing them." (A5). Most adults did not mention indirect effects such as fossil fuel, electricity, or water use. Energy use was slightly recognized, but few adults linked it to pollution or carbon release.

After the ONWs, adults provided more detailed and critical reflections (see Figure D6 in Appendix D). They frequently mentioned deforestation (80%), pollution (80%), carbon emissions, and energy waste as possible damage from their choices. For instance, (A4) said,

"Due to the location of my dormitory, I can only reach school by bus/taxi, but fuel consumption increases carbon emissions, and packaged products such as food and accessories threaten ecosystems, especially forests. After these workshops, I became especially sensitive about plastic packaging, and now I carry a metal water bottle and have started using cloth bags."

Others mentioned cosmetics, packaged food, and clothing, emphasizing hidden costs in production and disposal. Some adults even shifted their wording from saying "energy use" to "energy waste," reflecting a deeper understanding of efficiency and sustainability. These shifts indicate that ONWs encouraged adults to connect their personal choices with larger ecological footprints and rethink their product choices.

Changes occurred in adults' life habits through the ONWs

When adults described everyday habits, they considered nature-friendly (see Figure D7 in Appendix D), and their answers changed. Before the ONWs, examples were mostly limited to collecting garbage (90%), with a few mentioning not picking flowers or being vegan. One adult said,

"I never throw away trash. If there's no trash can near me, I put it in my bag or pocket. I pick up any trash I see on the ground. When I go to picnic areas, I try to clean up my immediate surroundings." (A7).

Such responses reflect a limited understanding of environmental responsibility, with a focus only on visible actions.

After the ONWs, habits became more diverse, intentional, and informed. Adults mentioned recycling and waste management (80%), water and energy saving, protecting and interacting with nature, making sustainable consumption choices, and spreading awareness. For instance, one adult shared:

"There are actually several habits I'm trying to develop. Such as recycling, a waste-free lifestyle, trying to use chemical-free (min-containing) products, paying attention to water use, and examining the production conditions of purchased products." (A10).

Overall, adults described how their habits expanded from small steps, such as picking up trash, to more thoughtful practices, such as recycling, reducing consumption, and protecting other species.

Results on Adults' Nature Experiences

When the adults' first and last week's recordings were compared, a positive shift was detected in terms of time spent in nature, type of activities, and nature experiences, and this shift gave clues on their nature perception change as well.

Change in Time Spent in Nature

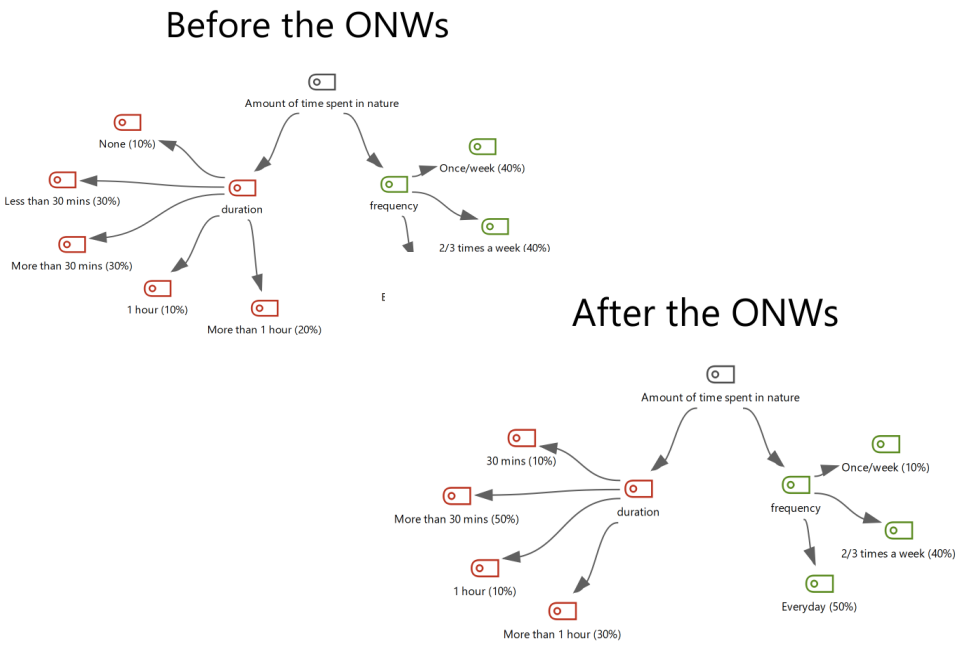
At the beginning of the ONWs, almost half of the adults (40%) reported no contact or spent less than 30 minutes with nature. "This week I could not find spare time to spend in nature, I have been with my laptop all the time." (A1). By the end, all adults recorded higher engagement, with the majority spending over 30 minutes outdoors. "Today, I'm sitting on the grass silently. It feels soft and nice. I feel like I'm connected to the Earth." (A7). (Figure 2).

Change in Nature Activities and Experiences

Before ONWs, adults' activities were limited, most frequently nature walks (70%) and farming activities (10%) (see Figure D8 in Appendix D). After the ONWs, adults described a wider range of activities, such as observing species (40%), gardening, and sitting quietly, as well as less common practices, such as meditating, petting animals, or cycling. One stated: "…it was surprising there were so many kinds of species living together, I also realized the smells of beautiful flowers in my hometown." (A2).

Many adults initially mentioned happiness (60%), and by the end, most described calmness (90%), a stronger sense of connection, and greater awareness of sensory details (see Figure D9 in Appendix D). "Today, I'm in the woods, near our village. I'm watching birds chirping and flying from one tree to another. I leaned my back against a tree; it felt so calm" (A8). Before the ONWs, boredom and disconnection were frequently noted; after, adults emphasized noticing other species, colors, scents, and a sense of wonder.

Figure 2: Time Records of Adults



The relation between adults' nature perceptions and nature experiences

The comparison of questionnaires and diaries revealed a reciprocal relationship. Adults who initially saw nature as weak or distant rarely engaged with it. After the ONWs, as perceptions shifted toward ecocentric minds, time spent outdoors and the diversity of activities increased, reinforcing their sense of connectedness. One of the adults summarized,

"Before this (ONW sessions), I felt like I did not have any extra time for being in nature or feeling bored when I did; however, now, I love being in nature every day. I find real peace there. I believe that nature understands me without telling the problems inside me that I cannot explain to others" (A1).

Both their questionnaires and diary entries increasingly highlighted direct engagement with nature and noticing and valuing more of its details.

DISCUSSION AND CONCLUSIONS

The present study demonstrated that online nature workshops (ONWs) fostered adults' nature perceptions and experiences. Before the workshops, some

adults described nature as “a helpless baby” or valued it mainly for human survival. Later, they began to use metaphors such as “home”, “ocean”, or “mother”, emphasizing interdependence and responsibility. This perceptual change was mirrored in experiences and behaviors; adults who at first reported little or no time in nature later described higher engagement, and their activities broadened from basic exercises to noticing species, gardening, or meditating. Their life habits also broadened, from collecting garbage to recycling, reducing consumption, protecting other species, and spreading awareness. These findings point to a reciprocal relationship, as adults developed more ecocentric views, they engaged more with nature, and those experiences in turn reinforced their perceptions. This relationship is also reported by prior research, indicating that time spent in nature is both shaped by and shapes environmental attitudes (DeVille et al., 2021; Otto & Pensini, 2017).

One of the factors explaining these changes is the integration of actual nature experiences into online settings. Arbuthnott et al. (2022) reported that online workshops have limited effects on nature connectedness, suggesting that the absence of actual outdoor contact limits their impact. However, our findings revealed noticeable shifts in both nature perceptions and experiences. This variance may be attributed to three distinctive elements of the ONWs: (a) integration of concrete, hands-on nature activities such as composting and seed-ball making, (b) the heterogeneity of adult participants, which encouraged peer learning and diverse perspectives to be revealed, and (c) the use of nature diaries that extended interactions with nature beyond the workshop hours. Together, these allowed adults to examine their everyday habits and to experience nature within their own homes and neighborhoods, offering a broader form of connection than earlier online implementations.

The findings are consistent with earlier research showing that both direct experience with nature and interaction among learners can contribute to nature perceptions (Burgess et al., 2011; Li et al., 2016). In our case, the combination of hands-on interactive nature activities and shared ideas seemed to play an important role. Planting seeds, preparing organic compost, or making bird feeders were not only simple tasks but also moments when participants began to rethink their everyday choices and their possible influence on nature. Such nature-related activities, also emphasized in previous studies (Birinci, 2013; Bogner & Wiseman, 2004), may explain why the ONWs fostered perceptual and behavioral change.

These results also connect to the Humanist Adult Education framework. Positioning the instructor as a facilitator enabled adults to take ownership of their learning. Participants demonstrated self-direction in carrying out nature activity tasks. Additionally, their nature diary entries revealed not only what they did in nature but also how they felt, suggesting self-reliance in noticing and recording everyday experiences with nature. Reflection played a central role; adults moved beyond simply reporting sensory experiences to questioning their consumption habits and lifestyle choices through both reflection and action. Consistent with

Modi et al. (2024), who showed that digital storytelling can foster reflective engagement with sustainability issues, our study suggests that the reflective design of the ONWs likewise encouraged adults to engage more deeply with nature-related discussions. This "learning and experiencing together" atmosphere appeared to be advantageous in fostering adults' natural experiences, as also reported by previous studies (Aaron & Witt, 2011; Burgess et al., 2011; Li et al., 2016). Taken together, these findings indicate that adults demonstrated humanist principles of autonomy, reflection, and intrinsic motivation, highlighting the value of the framework.

Another contribution of the ONWs was the diversity of participants. Because the workshops included adults with varied backgrounds and life experiences, participants learned from one another and broadened their perspectives. Prior studies have similarly reported that learning in heterogeneous groups can foster richer discussions, deeper reflections, and stronger engagement in environmental topics (Dijk et al., 2020; Donovan et al., 2018; Han et al., 2020). Beyond group diversity, recent research shows that collective action and community-based learning help sustain motivation toward sustainable life habits (Hannouch & Milstein, 2025). Together, these findings align with this research, showing that adult learning in nature-related contexts is enriched by diverse groups and further strengthened through collective, community-based learning.

This study contributes to research on nature perceptions by highlighting how adults from diverse academic and personal backgrounds experienced changes in their views and practices. Importantly, many participants extended their learning to their family members, encouraging children to engage with nature. As younger individuals have the tendency to mimic the views and behaviors of their elders (Otto & Pensini, 2017), this intergenerational transfer illustrates how adult education can cultivate environmental responsibility and climate action. Thus, studying adults and their nature perceptions needs to be further considered, investigated, and improved.

LIMITATIONS AND IMPLICATIONS

Although the study provides useful insights, several limitations should be noted. First, the sample size was small (N = 10), which limits the generalizability of the findings. Future studies should include larger participant groups to strengthen the results. Second, the study findings are limited to the period of 12 weeks, which involves relatively short-term changes in nature perceptions and experiences. Future studies could track participants over a longer period to see if these changes in perception and experience last. It would also be useful to compare online and face-to-face nature workshops across different groups to have a clearer understanding of each format's effect. Moreover, the participants in this study were between 18 and 31 years old, representing a relatively young part of the adult

population. As a result, the findings cannot be generalized to older adults. Future studies could involve middle-aged and older adults to explore their experiences.

It is also important to recognize possible biases in this study. Participants who volunteered for ONWs may already have higher environmental awareness than the general adult population. In addition, although reflective online diaries were valuable, they may have caused social desirability bias, encouraging participants to present themselves more positively and emphasize 'green' behaviors more than they practiced. Future studies could address these issues by reaching participants with different levels of environmental interest, a wider age range, and by using multiple forms of data collection beyond self-reports.

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