

Exploring Early Nature Connectedness: A Descriptive Study with Icelandic Preschool Children

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ABSTRACT

Nature connectedness - a person's psychological relationship with the natural world - has been associated with well-being, environmental attitudes, and pro-environmental behavior. Although interest in nature connectedness has grown in recent years, relatively little research has examined how young children themselves describe and experience relationships with nature. This qualitative study explores early nature connectedness among Icelandic preschool children using draw-and-tell interviews. Guided by a tripartite conceptualization of nature connectedness encompassing emotional, cognitive, and behavioral domains, we analyze children's drawings and narratives to examine how they conceptualize nature, express feelings toward it, and describe their interactions with natural environments. Findings suggest that young children describe nature connectedness through relational, sensory, and imaginative experiences that are often grounded in familiar places and everyday activities. The study highlights the role of sociocultural and ecological context in shaping children's understandings of nature and demonstrates the value of child-centered qualitative approaches for advancing research on early nature connectedness.

Keywords: early nature connectedness; preschool children; environmental education; child-nature relationships; draw-and-tell interviews; Iceland

Across the globe, researchers and educators are increasingly concerned with how children develop meaningful relationships with the natural world (Arola et al., 2023; Beery et al., 2020; Choe & Sheffield, 2024; Mohamed et al., 2022). As environmental challenges intensify, fostering care for nature and sustainable ways of living has become an urgent educational and societal priority (Barragan-Jason et al., 2023; Whitburn et al., 2020). Many scholars argue that experiences in early childhood play an important role in shaping how individuals understand, value, and interact with the natural environment across the lifespan (Barrable, 2019b; Chawla, 2020; Wells & Lekies, 2006).

One concept that has gained growing attention in this work is nature connectedness (NC), or the psychological relationship individuals feel with the natural world (Richardson et al., 2020). In adults, NC has been positively associated with both environmental stewardship and pro-environmental behavior (Guazzini et al., 2025; Mackay &

Schmitt, 2019) and with individual health and well-being (Barragan-Jason et al., 2023; Martin et al., 2020). Conversely, lower levels of NC has been associated with feelings of fear, aversion, discomfort, or indifference toward nature (Beery et al., 2023; Olivos-Jara et al., 2020), which may contribute to disengagement from environmental issues or harmful environmental behaviors (Green et al., 2016). However, most research on NC has focused on adults or older children, leaving open important questions about how these relationships begin to form in early childhood.

Understanding early nature connectedness (ENC) - which we conceptualize as nature connectedness in children less than 6 years - is challenging because young children experience and express their relationships with nature in ways that may differ substantially from adults (Arola et al., 2023; Barrable, 2019b; Beery et al., 2020). For example, young children often convey their experiences through play, imagination, and sensory engagement rather than abstract reasoning (Beery & Jørgensen, 2018; Berger, 2021). Yet relatively little research has explored how young children themselves describe their experiences with nature. The present study addresses this gap by examining how Icelandic preschool children articulate their relationships with nature through draw-and-tell interviews. By centering children's own perspectives, this study contributes to a growing body of research seeking to better understand how ENC develops in young children (e.g., Barrable, 2019a; Beery et al., 2020; Giusti et al., 2018).

Conceptual Foundations of Early Nature Connectedness

In the present study, we use nature connectedness as an umbrella term to refer to a person's psychological relationship with the natural world, including a person's thoughts about, and feelings toward, nature (Richardson et al., 2020). A number of related constructs have been used to describe people's relationships with nature including emotional affinity toward nature (Kals et al., 1999), inclusion of nature in the self (Schultz, 2001), environmental identity (Clayton, 2003), and nature relatedness (Nisbet et al., 2009). Empirical work by Tam (2013), however, found that these constructs converge onto a common latent factor. Following Barrable and Booth (2020a), we use the term nature connectedness as an umbrella construct to capture this broader psychological relationship with the natural world, and we use early nature connectedness (ENC) to describe this psychological experience for children under 6 years. Empirical research also suggests that environmental knowledge and nature connectedness show only modest overlap (Otto & Pensini, 2017; Roczen et al., 2014), reinforcing the importance of distinguishing children's developing interpretations of nature from broader forms of environmental knowledge or competence.

A Tripartite Framework of Early Nature Connectedness

While nature connectedness in adults has been conceptualized through multiple related constructs and measurement scales, the conceptual boundaries of ENC are still being defined. Studies involving older children often measure nature connectedness using adapted versions of adult instruments, such as the Connection to Nature Index (Cheng & Monroe, 2012). Other research with young children has relied on parent reports (e.g., Sobko et al., 2018) or operationalized children's relationships with nature in specific ways, such as biophilia (Rice & Torquati, 2013) or affinity with the biosphere (Giusti et al., 2014).

In the present study, we conceptualize ENC as an emerging psychological relationship with the natural world that is expressed through how children feel, think, and act in relation to nature. We utilize a tripartite framework of ENC encompassing three interrelated domains: emotional, cognitive, and behavioral. In previous quantitative work (Orman et al., 2025), this tripartite framework was operationalized using measures of enjoyment of nature, empathy for nature, and pro-environmental behavior. In the present study, we instead examine how these dimensions are expressed descriptively through children's narratives and drawings. Emotionally, children may express feelings such as joy, calm, curiosity, or fear in relation to natural elements and environments (e.g., Beery et al., 2020; Soga et al., 2020). Cognitively, children begin forming working theories about nature, developing ideas about its components, affordances, meanings, and relational processes (e.g., Giusti et al., 2014; Zhai & Gao, 2024). Behaviorally, children may engage in caregiving activities or pro-environmental behaviors with nature (e.g., Barrable & Booth, 2020a; Kos et al., 2016).

Importantly, we do not consider these domains to be discrete stages or static traits. Rather, they represent overlapping and co-occurring expressions of a child's developing ENC. For example, a child who names a tree, hugs

it, and later tells a story about it may be engaging emotionally, cognitively, and behaviorally in relation to the same experience. Further, we distinguish ENC - a psychological experience - from physical contact with nature (i.e., time spent in natural environments). Although direct experiences in nature can create opportunities for ENC to develop, physical exposure alone does not necessarily lead to a sense of connectedness (Barragan-Jason et al., 2023; Richardson et al., 2019). In early childhood, interactive experiences with nature may therefore serve as contexts through which children's emerging ENC becomes visible (Chawla, 2015).

Our previous work (Orman et al., 2025) operationalized this tripartite framework of ENC through structured measures of enjoyment of nature (EON), empathy for nature (EFN), and pro-environmental behavior (PEB). The present study builds on that foundation but shifts toward a descriptive, child-centered approach using draw-and-tell interviews to capture how young children themselves articulate their experiences with nature.

Sociocultural and Biosystem Influences on Early Nature Connectedness

Culture shapes the neurological processes by which humans take in and interpret sensory data from their environment (Miyamoto et al., 2006), making "nature" itself a social construction (Greider & Garkovich, 2010). Culture also interacts with ecological contexts to shape how humans perceive and interpret the natural environment (Kaplan & Herbert, 1987; Milfont & Schultz, 2016; Wang et al., 2021). Thus, sociocultural and ecological influences are not simply external moderators or confounders of nature connectedness; rather, they are constitutive of how individuals experience and interpret nature (Giusti et al., 2018; Milfont & Schultz, 2016).

Relatedly, culture is not layered onto development but rather embedded within children's cognitive and emotional processes (Heft, 2013; Immordino-Yang & Damasio, 2007). Children's relationships with nature are shaped not only by individual preferences or developmental stage, but also by the cultural, relational, and ecological contexts in which they live (Chawla, 2021; Orman et al., 2025; Passmore et al., 2020). This aligns with ecological systems theory (Bronfenbrenner & Morris, 2005), which emphasizes that children's developing relationships with nature are embedded within their everyday environments, including homes, schools, neighborhoods, and broader cultural narratives about nature (Beery et al., 2020; Chawla, 2020; Elliott & Davis, 2020). For example, a child's sense of wonder at a thunderstorm, fear of an insect, or affection for a tree is shaped by meanings conveyed through family interactions, media, schooling, and cultural practices.

The ecological characteristics of a child's local environment also shape how nature is defined and experienced (Fraijo-Sing et al., 2020; Profice, 2018). In this study, we use the term "local biosystem" to refer to the sensory and ecological features of a child's surroundings that shape their experiences with nature (Elliott & Davis, 2020). These may include specific organisms, landscapes, weather patterns, or environmental textures. For example, in Iceland, children may encounter coastal environments, volcanic landscapes, wind, and moss-covered terrain as everyday elements of "nature." These local ecological conditions become embedded in children's emotional and cognitive maps of nature, shaping how they experience and describe the natural world (Kellert, 2002; Procter, 2015). In the present study, these local biosystem influences are examined through children's expressions of *ecological situatedness*, reflected in references to nearby organisms, environmental features, and familiar outdoor settings embedded within their everyday routines.

Developmental Expression of Nature Connectedness in Early Childhood

In addition to these domains and contextual influences, young children may express their relationships with nature through developmentally characteristic modes of thinking and communication. Early childhood is marked by imaginative engagement with the world, including the attribution of human-like qualities to animals, plants, and other natural elements (Herrmann et al., 2010; Severson & Woodard, 2018). Such anthropomorphic or imaginative representations can reflect children's emerging relational thinking, empathy, and meaning-making about the natural world (Beery et al., 2020; Geerds, 2016). In this study, we attended to imaginative and anthropomorphic expressions as one way that children's emotional, cognitive, and behavioral connectedness to nature may become visible.

Why Studying Early Nature Connectedness Matters

A growing body of research suggests that NC in childhood is associated with a range of positive outcomes, including psychological well-being, environmental attitudes, and pro-environmental behaviors (Arola et al., 2023; Cheng & Monroe, 2012; Harris et al., 2025; Tillmann et al., 2018). In early childhood, these relationships may be particularly significant, as this developmental period is foundational for self-understanding, emotional regulation, and social learning (Annu & Singh, 2021; Barrable, 2019b; Berger, 2021). That is, the relationships young children form with the natural world may develop alongside an understanding of who they are in the world, as they are increasingly able to regulate emotions towards specific aims, and as they develop social skills like empathy and theory of mind (Annu & Singh, 2021; Barrable, 2019b).

In older children and adults, NC has been associated with positive affect, reduced stress, and greater life satisfaction (Arola et al., 2023; Capaldi et al., 2014; Chawla, 2020). These benefits are related not only to time spent outdoors but also to the quality of the individual's psychological relationships with nature. This is important: time in nature is not the same as, nor does it produce the same benefits as, the quality of an individual's psychological relationship with nature (Barragan-Jason et al., 2023; Martin et al., 2020). Thus, it is important to understand and examine ENC in young children, not just how much time they spend in nature.

Further, research suggests that nurturing ENC in childhood may influence environmental concern and/or behaviors later in life (Barrable et al., 2024; Chawla, 2020; Wells & Lekies, 2006). In older children and adults, NC has been associated with pro-environmental behaviors both concurrently and over time (Cheng & Monroe, 2012; Uram et al., 2025). For example, recent work by Yan and colleagues (2025) found that early experiences in nature were not directly associated with pro-environmental behavior in adulthood, but were indirectly related through feelings for nature, a core feature of NC. Similarly, Shakari et al. (2024) found that associations between early nature experiences and adult pro-environmental behavior were mediated by NC. Longitudinal research in this area remains limited, however, and further work is needed. Clarifying the conceptual boundaries of ENC may help support more rigorous longitudinal studies examining whether and how early ENC contributes to later pro-environmental behavior, an important question in the context of climate change.

Why Iceland

Iceland provides a compelling context in which to explore ENC. In Iceland, over 96% of children aged three to five attend publicly funded preschools (OECD, 2021). Iceland, like other Nordic nations, espouses access to nature in early childhood for the purpose of advancing child health and well-being and cultivating sustainable attitudes amongst children (Norðdahl & Jóhannesson, 2015). Forming a relationship with nature is considered part of a "good childhood" in Nordic nations (Bergnéhr, 2009) and therefore sustainability (including respect for nature) is one of the core pillars in Icelandic's national preschool curriculum (Ministry of Education, Science, and Culture, 2011). Further, nature is not viewed as separate from daily life but as a familiar and valued presence woven into family routines, educational practices, and cultural narratives (Norðdahl & Jóhannesson, 2015). Thus, rather than examining ENC in a context where nature access may be limited or contested, this study explores how young children describe their experiences with nature in a setting where interaction with natural environments is widely standardized. These conditions create opportunities for young children to engage regularly with natural environments, making Iceland a revealing case (Flyvbjerg, 2006) for exploring how ENC may be expressed under conditions of high nature access and social encouragement.

Purpose and Research Questions

Despite growing interest in ENC, relatively little research has examined how young children themselves describe their relationships with nature. Much existing research relies on adult-derived constructs or retrospective self-reports, limiting our understanding of how ENC is expressed in young children.

To address this gap, the present study adopts a child-centered qualitative approach using draw-and-tell interviews with Icelandic preschool children. Guided by a tripartite conceptualization of ENC encompassing emotional,

cognitive, and behavioral domains - and shaped by sociocultural and biosystemic contexts - this study explores how young children describe their relationships with nature.

The study addresses the following research questions:

1. Emotional domain: How do young children express feelings about and toward nature?
2. Cognitive domain: How do young children describe and interpret nature and their relationship to it?
3. Behavioral domain: How do young children describe actions related to caring for nature?
4. Contextual domain: How are children's everyday ecological and social environments reflected in their relationships with nature?

Methods

Participants

This study was embedded within a larger quantitative investigation of early nature connectedness among Icelandic preschool children (Orman et al., 2025). Participants for the larger study were recruited from four preschools in southwest Iceland (the capital region and Reykjanes peninsula) and one preschool in northern Iceland. The four schools in southwest Iceland were selected based on their previous participation in a national professional development course led by one of the authors and therefore constituted a convenience sample. Although the course focused on science, technology, and literacy within the preschool curriculum, it did not address nature connectedness specifically. The fifth preschool was recruited from a rural area in northern Iceland and also represented a convenience sample. Although the pedagogical philosophies of the participating schools differed, all were public preschools operating under the Icelandic National Curriculum Guide for Preschools (Ministry of Education, Science, and Culture, 2011). As such, they shared common curricular goals related to outdoor play, environmental awareness, and child-centered learning.

All Icelandic-speaking children aged 4-6 years enrolled in the participating schools were invited to participate. A total of 123 children participated in the larger study. The Nature Connectedness Draw-and-Tell Task (NC-DTT) drawing activity was administered to all children so that each could engage in the creative component of the study. For the qualitative analysis presented here, 26 children (four to six from each school) were selected for transcription and translation of their interviews. This sampling approach was guided by expectations that thematic saturation would likely occur within this range of interviews (Francis et al., 2010).

Children were selected to participate in the NC-DTT interviews based on three criteria:

1. age, prioritizing older children within the sample to support more developed verbal expression (Berger, 2021);
2. completion of a background survey by parents as part of the larger study; and
3. gender, to ensure representation of boys and girls (the only genders reported in the dataset).

During transcription review, we discovered that children at the rural school had not been asked all interview questions. As a result, those five interviews were excluded from analysis. The final analytic sample consisted of 21 children (11 boys) aged 5-6 years ($M = 68$ months) from urban preschools in Iceland.

The sample was intentionally small and focused, consistent with qualitative descriptive research. The goal was not to estimate the prevalence or distribution of nature connectedness among Icelandic children, but rather to explore how preschool-aged children express their relationships with nature through drawings and conversation.

Materials

To examine children's perspectives on nature connectedness, we developed the Nature Connectedness Draw-and-Tell Task (NC-DTT). In this task, children were asked to draw themselves doing something in nature and then participated in a brief one-on-one interview about their drawing.

Drawings have long been used in psychological research to explore children's beliefs, perceptions, and feelings through non-written forms of expression (Cvencek & Meltzoff, 2015; Finson et al., 1995). In environmental psychology, drawing methods have been used to examine children's perceptions of environments such as schoolyards (Cronin-Jones, 2005), rainforests (Bowker, 2007; Pellier et al., 2014), and nature more broadly (Fraijo-Sing et al., 2020; Günindi, 2012).

The NC-DTT builds on the draw-and-tell technique (Driessnack, 2006), in which children create a drawing and then describe it verbally. This method has been shown to help elicit children's perspectives by providing visual retrieval cues and supporting narrative organization while reducing the social demands of a verbal-only interview (Driessnack, 2005). Because young children may find it difficult to articulate their thoughts and feelings through language alone, the drawing served as a visual prompt to facilitate conversation about their experiences with nature.

Although draw-and-tell approaches have previously been used to examine children's perceptions of nature (e.g., Ahi & Atasoy, 2019; Kalvaitis & Monhardt, 2015), they have rarely been used to explore children's nature connectedness specifically. The NC-DTT was designed to prompt children to reflect on nature not simply as a background setting but as a space of interaction and relationship. Rather than asking children to "draw yourself in nature," we asked them to depict themselves doing something in nature, based on the premise that active engagement would be more likely to elicit reflections related to emotional, cognitive, and behavioral dimensions of nature connectedness.

Example interview questions included:

- "Point to the nature in your drawing."
- "How does the nature in your drawing make you feel?"
- "Do you feel like you are a part of nature?"

The full NC-DTT protocol and interview prompts are provided in Appendix A.

Data Collection

Ethical approval for all aspects of the study was obtained from the University of Iceland Science Ethics Committee, followed by approvals from participating municipalities, school principals, teachers, parents, and children.

Data collection took place in preschools between February and March 2023. Prior to interviews, teachers administered the drawing task in Icelandic using a standardized prompt asking children to "draw yourself doing something in nature." Teachers were instructed not to provide examples or define nature in order to encourage children's own interpretations. At one preschool site, a teacher reported using the word "outside" as a follow-up prompt (e.g., "Think about yourself doing something outside in nature"). Children's drawings from that site were qualitatively similar to those from other schools, suggesting that this additional wording did not systematically influence responses. Appendix B includes examples of children's drawings.

Within 24 hours of completing the drawing activity, researchers conducted semi-structured interviews with children individually in a quiet location at the preschool (e.g., an empty classroom or resource room). Children aged 5-6 years have been shown to accurately recall events from the previous day (Busby & Suddendorf, 2005), making it likely they would remember what they had drawn. The interviews were conducted by senior undergraduate psychology

students who were native Icelandic speakers and had been trained on the research protocols. All interviewers had prior experience working with young children through family caregiving, babysitting, or formal and informal early childhood education contexts, and the study design and analytic procedures were overseen by the first author, who has more than 10 years of professional experience working in early childhood education settings. Prior to conducting interviews, researchers spent approximately 30 minutes in each classroom interacting with children to build rapport (Parkinson, 2001). Children were informed about the activity and asked whether they wished to participate. Participation required verbal assent, and children were reminded that they could stop the interview and return to class at any time. Interviews were audio-recorded using a tablet-based recording application and later transcribed and translated from Icelandic to English by a bilingual research assistant.

Data Analysis

All interview transcripts were uploaded and coded using Dedoose (Version 9.0.107). We employed qualitative content analysis as the overarching analytic approach (Mayring, 2014; Smith et al., 1992), which provides a systematic framework for analyzing textual and visual data while allowing patterns to be examined in relation to theoretically informed categories.

Because early childhood nature connectedness remains an emerging area of research, we used deductive content analysis guided by a theoretically informed coding framework. The initial codebook was developed based on a tripartite conceptualization of nature connectedness encompassing emotional, cognitive, and behavioral domains. Additional domains were included to capture theoretically relevant features of early childhood experiences with nature, including sociocultural context, ecological situatedness, and imaginative engagement. Together, these domains provided a structured framework for examining how children expressed relationships with nature across multiple dimensions of experience.

The six analytic domains were defined as follows:

1. **Emotional responses to nature** included explicit or implicit expressions of affective state, emotional evaluation, or feelings associated with nature, being in nature, or elements of nature (e.g., “fun,” “scary,” “beautiful”).
2. **Cognitive responses to nature** included statements reflecting perception, awareness, interpretation, evaluation, or conceptual reasoning about nature, such as observational attention, environmental evaluation, conceptual distinctions, and early environmental reasoning. Although interest in nature is affectively supported, references to interest in *studying nature* were interpreted as cognitive expressions because they reflected children’s orientation toward observing, learning about, and making sense of environmental features.
3. **Behavioral engagement with nature** included descriptions of actions children performed in nature or with natural elements. Because children were explicitly asked to draw themselves “doing something in nature,” behavioral engagement was expected; coding therefore focused on the types and meanings of behaviors described rather than the presence of behavior itself.
4. **Sociocultural embeddedness** included references to people, relationships, or culturally meaningful social roles associated with nature experiences. Because children were asked who they were with or wanted to be with in nature, coding focused on which relational partners were present and how children situated nature experiences within social contexts.
5. **Ecological situatedness** included references to specific living organisms, environmental features, and nearby ecological settings that reflected how children described their experiences of nature as embedded within the sensory and ecological contexts of their everyday environments.

6. **Imaginative and anthropomorphic engagement** included fantasy, magical thinking, anthropomorphism, or imaginative transformation involving nature. These expressions were interpreted as developmentally appropriate forms of meaning-making through which children expressed relationships with natural environments.

In addition to domain-level coding, we attended to children's expressions of empathy for nature, defined here as affiliative orientation, concern, or care toward natural elements or environments (Li et al., 2024). In early childhood research, empathy is often expressed through relational language (e.g., describing nature as a friend), concern about harm to living or environmental systems, or actions intended to protect or support nature (Giusti et al., 2014; Sobko et al., 2018). In the present study, empathy for nature was not treated as a separate analytic domain. Rather, empathy for nature was identified across emotional, cognitive, and behavioral responses when children expressed concern about environmental harm (e.g., removing trash so the Earth would not be damaged), described caring relationships with living things or natural environments, or reported actions intended to protect or support nature.

These six domains were treated as overlapping expressions of early nature connectedness rather than mutually exclusive categories, and multiple codes could be applied to the same segment when appropriate. Within each domain, subcodes were developed inductively to capture recurring patterns in children's responses. Coding focused on the meanings children attributed to nature rather than simply the presence of activities or social contexts prompted in the task. Codes were applied to meaningful statement units, and multiple codes could be assigned to the same segment when appropriate.

The first author conducted the primary coding. A second coder independently coded 10% of the interviews using the finalized codebook. The two coders applied the same codes to the same segments in nearly all cases; discrepancies related primarily to differences in the number of code applications rather than differences in code selection. These discrepancies were discussed until consensus was reached. Based on the analytic process and recurring patterns across interviews, data saturation was considered to have been reached within the final sample of 21 interviews (Francis et al., 2010).

Findings

Using deductive content analysis, children's responses were coded across six theoretically informed domains of ENC: emotional, cognitive, behavioral, sociocultural, ecological, and imaginative expressions. Because the draw-and-tell interview included structured prompts about children's activities, companions, and experiences in nature (see Appendix A), the analysis focused not simply on whether children mentioned these elements but on how they interpreted and described them.

Across domains, children articulated relationships with nature through affective experiences, observational judgments, everyday stewardship practices, familiar social relationships, locally recognizable ecological features, and, in some cases, imaginative elements.

Emotional Experiences of Nature Connectedness

Children's emotional responses to nature were most visible in their answers to questions such as:

"How does the nature in your drawing make you feel?"

"Are you fond of nature?"

"Do you feel scared or calm in nature?"

Across interviews, children frequently described their feelings about nature using positively valenced affective language, suggesting that enjoyment formed a central feature of how they articulated their relationships with natural environments. Nature was described as "fun," "entertaining," and "so enjoyable." Several children explained that they were friends with nature because "I love nature," "I love the stars," "it's so entertaining," and because

"she is good to me." One child said they were a friend of nature because "I think it's fun to listen to the bird songs." When asked whether they were fond of nature, children gave similar responses describing nature as "entertaining" and "so cool."

In some cases, however, children's responses extended beyond enjoyment to include expressions of concern for nature. For example, several children explained that they were fond of nature "because nature is really fragile," or "because I don't want the Earth to break" and they wanted to "care for the Earth." These responses suggest that emotional affinity toward nature sometimes included early expressions of empathy for the natural world.

Children also frequently associated nature with calmness or comfort. When asked whether they felt scared or calm in nature, most children reported feeling relaxed, with some explaining this was because "everything is so relaxed there" or because "it's so beautiful in nature." These responses suggest that natural environments were often experienced as emotionally regulating or pleasant spaces.

Although positive affect predominated children's responses, some described feeling fear or nervousness in particular situations. These emotional responses were typically associated with being alone in nature rather than with nature itself. For example, one child explained that they were scared when they were in nature without "mama and papa ... protecting me," while another reported feeling nervous "because I don't want to go away from mama." On the other hand, some expressed confidence in being alone in nature, with one child saying they are not afraid in nature "because I am older... so I'm not afraid of anything." These responses indicate that children's emotional experiences of nature were shaped not only by environmental features but also by the presence (or absence) of familiar caregivers.

Together, these findings suggest that children's emotional relationships with nature included both positive affinity and situational uncertainty, often structured by familiarity, perceived safety, and relational context.

Cognitive Experiences of Nature Connectedness

Cognitive expressions of nature connectedness were most visible in responses to questions such as:

"Can you point to the nature in your drawing?"

"Do you like to study nature?"

"Is the nature here clean or dirty?"

"Do you feel like you are a part of nature?"

When asked to identify the nature in their drawings, all children pointed to natural features of the environment (e.g., flowers, sun, grass), indicating that they were able to recognize and differentiate natural from built environmental elements. One child even pointed to the snowflakes they had drawn on their sweater, indicating those - but not the sweater - were part of nature. These responses suggest that children were able to identify nature as a distinct category within their surroundings rather than treating outdoor environments as undifferentiated spaces.

When asked whether they liked to study nature, most children responded affirmatively. Some described studying animals, while others referred to looking for or collecting trash in outdoor environments. Although these responses were typically brief, they suggest that children associated studying nature with observing living things and attending to conditions in their surrounding environments.

Children also demonstrated evaluative interpretations of environmental quality. When asked whether the nature in their drawing was clean or dirty, most children reported that it was clean and that this made them feel good. A smaller number of children focused specifically on the presence or absence of trash. For example, one child reported feeling bad "because so much trash has been thrown there [in nature]," while others described bottles or litter as making nature dirty. These responses suggest that children interpreted environmental conditions in normative terms and, in some cases, linked environmental quality with concern about harm to nature, consistent with early expressions of empathy for the natural world.

Children were also asked directly whether they felt like they were part of nature. To our knowledge, questions of this kind are rarely posed to children in this age range, in part because it has often been assumed that preschool-aged children may not yet be able to engage with abstract relational questions about humans' place within the natural world. In the present study, however, children were able to respond meaningfully to this prompt, even though their interpretations varied.

Several children answered "yes," sometimes providing affective explanations such as "because it's so much fun," "because I feel so well," "because [nature] is so very very VERY good to me," and "because I love to go out into nature." Other children offered categorical explanations for inclusion, such as "nature has trees and stuff," suggesting that they understood themselves as part of the broader category of nature, or "I am just a person," indicating that being human was understood as compatible with being part of nature. Some children answered "no," reporting they were not a part of nature because nature was "not fun," while one child explained they were not part of nature "because I am with mama and papa." This response suggests that belonging to nature may sometimes be interpreted through immediate social relationships, with the child positioning themselves as part of their family rather than as part of the natural environment.

Rather than reflecting a single shared understanding of belonging to nature, these responses suggest that children interpreted the question through multiple forms of reasoning, including affective experience, categorical inclusion, activity-based preferences, and references to familiar social relationships. Importantly, these findings indicate that preschool-aged children were able to engage meaningfully with questions about whether humans are part of nature, offering interpretable explanations grounded in their everyday experiences. This suggests that young children may be capable of reflecting on human-nature relationships earlier than is often assumed, even when their responses remain situated in concrete and relational understandings rather than abstract ecological reasoning.

Behavioral Expressions of Nature Connectedness

Behavioral expressions of nature connectedness were most visible in children's responses to prompts asking what they were doing in their drawings and what they did when spending time in nature. Because children were explicitly asked to depict themselves "doing something in nature," references to activities were expected; the analysis therefore focused on the types of actions children described and the meanings they attributed to those actions, rather than the presence of activity itself.

Across interviews, children described a range of activities in nature, many of which reflected direct engagement with natural environments through play and exploration. These included activities such as playing outside, walking, digging for worms, and camping. Other children described observational activities, such as looking at nature, watching birds, or noticing features of the sky. For example, one child explained: "I am looking at the moon, and the stars, and the rainbows, and...and relaxing in the grass, and also looking at the trees." These responses suggest that children often described their relationships with nature through attentive presence and exploratory interaction with environmental features.

In addition to play and observation, several children described stewardship-oriented behaviors. For example, one child described growing flowers, another described watering trees, and another explained they were "trying not to step on the flower." Across multiple interview questions, many children also referred to picking up trash in natural environments and sometimes described this activity as "fun" or "just fine," while only one child described trash collection as "boring." These behavioral descriptions suggest that, in early childhood, nature connectedness may be expressed through participation in observable and familiar activities rather than through abstract statements of environmental responsibility.

Together, these findings indicate that children expressed behavioral connections with nature through play, observation, and concrete acts of care, suggesting that early nature connectedness was often enacted through everyday interactions with living things and outdoor environments. In several cases, children framed these actions

in terms of preventing harm to nature, indicating that empathy for the natural world was sometimes expressed through action-oriented stewardship practices embedded in routine experiences.

Sociocultural Embeddedness of Nature Connectedness

Sociocultural expressions of nature connectedness were most visible in children's responses to prompts asking who they were with in their drawings and who they wanted to spend time with in nature. Because children were explicitly asked to identify companions in their drawings and nature experiences, references to other people were expected; analysis therefore focused on which relationships children described and how those relationships shaped the meaning of nature experiences.

Across interviews, many children described being in nature with family members, particularly parents and siblings. For example, several children explained that they were in nature with "mama and papa," while others described spending time in nature with extended family members. These responses suggest that children often situated their experiences of nature within familiar caregiving relationships rather than describing nature as an individual setting. Children also frequently referenced spending time in nature with friends, describing nature as a place for shared play and social interaction. Pets were also mentioned by a few children, indicating that some children included companion animals as part of their relational experiences in natural environments.

When asked who they wanted to be with in nature and why, most children indicated that they preferred to be with other people and reported feeling "very badly" or "afraid" when imagining themselves alone in nature. In one case, a child responded to this question in a tone suggesting that the answer was self-evident, explaining simply, "Because I don't want to be alone." This response suggests that, for some children, being with others in nature was treated as an expected or taken-for-granted aspect of nature experience rather than a deliberate preference. Other children explained that being with others made nature more enjoyable because they could play together.

At the same time, several children indicated that they sometimes preferred to be alone in nature. For example, one child stated, "I want to be alone in nature," while another explained they preferred being alone "because there's nobody to distract me." These responses suggest that children's experiences of nature were shaped both by expectations of shared activity and, in some cases, by opportunities for privacy and focused attention.

Taken together, these responses indicate that young children frequently experienced nature as a relational and socially facilitated context, structured by family routines, peer interactions, and shared everyday activities. Rather than describing nature as a primarily solitary setting, children often interpreted nature experiences through the presence - or absence - of familiar social partners, suggesting that relationships with caregivers, peers, and companion animals form an important context through which early nature connectedness is experienced and interpreted.

Ecological Situatedness of Nature Connectedness

Ecological features of children's nature connectedness were most visible in responses describing where the nature in their drawings was located and what elements were present in those environments. Rather than depicting generalized or symbolic representations of nature, children consistently situated their drawings within familiar and locally meaningful places.

Across interviews, many children identified the settings in their drawings as specific locations connected to everyday experience, including their homes, school grounds, nearby forests, gardens, or places associated with extended family members. For example, children described drawing nature "in the garden at home," "at the playschool," "directly across from where I live," or at relatives' homes in nearby towns. These responses suggest that children most often represented nature as something encountered within ordinary routines rather than as distant wilderness environments.

Children's drawings also reflected recognizable ecological features of their immediate surroundings. Many included grass, flowers, trees, moss-covered stones, birds, rain, and coastal or weather-related elements such as rainbows or sea sounds. In some cases, children incorporated highly specific features linked to their personal environments, such as watching birds with parents in a forest setting, digging worms in a home garden, or standing on a deck outside their house. These details indicate that children's representations of nature were closely tied to lived experience rather than abstract environmental categories.

Several drawings also reflected features associated with particular institutional or family contexts. For example, children depicted playground areas at school, nearby wooded spaces used for family activities such as camping, and trees or plants located in home environments. In some cases, children included environmental features that appeared to correspond to recently altered landscapes, such as tree stumps remaining after removal of trees. Together, these responses suggest that children's representations of nature were shaped by the specific ecological settings in which their everyday lives unfolded.

Notably, children's drawings did not emphasize large or iconic landscape features often associated with representations of Icelandic nature, such as mountains or volcanoes. Instead, children primarily depicted small-scale, familiar elements such as grass, trees, flowers, birds, stones, and nearby forested areas. This pattern suggests that children's experiences of nature were grounded in proximal and routinely encountered environments rather than in culturally prominent but less frequently inhabited landscapes.

Taken together, these findings indicate that children's representations of nature were strongly situated within local ecological contexts and everyday activity spaces. Rather than depicting nature as a distant or abstract category, children most often represented nature as something embedded within familiar places, relationships, and routines.

Imaginative and Anthropomorphic Expressions of Nature Connectedness

Imaginative expressions of nature connectedness were most visible in children's descriptions of what was happening in their drawings and how they interpreted the environments they depicted. These prompts invited children to explain their activities in nature, and several children incorporated fantasy, transformation, or narrative elements into their accounts.

Some children described natural environments as places where imaginative transformations could occur. For example, one child described watering a tree to create a "magic cave," while another described a tree that could transform into multiple objects, including a trampoline and an airplane. Other children incorporated unusual or symbolic elements into otherwise familiar natural settings, such as eating avocados growing in place or encountering imagined creatures in forest environments. These responses suggest that children sometimes interpreted natural environments as flexible and creative spaces shaped through imaginative play and storytelling.

In addition to narrative transformations, two children represented natural elements using anthropomorphic features, drawing faces on the sun or flowers. Notably, faces were not drawn on non-natural objects within the same drawings. Although children did not explicitly describe these elements as watching or responding to them, the selective use of facial features on natural elements suggests that some children represented components of nature as socially meaningful or relationally expressive.

Taken together, these responses indicate that imaginative play formed one way that children interpreted and described their experiences in nature. In early childhood, such imaginative and anthropomorphic representations may reflect developmentally appropriate forms of meaning-making through which children engage with natural environments as active and meaningful components of their experiential worlds.

Discussion

The present study examined how preschool-aged children described their experiences of nature through drawings and interviews using a multidimensional framework of ENC. Across emotional, cognitive, behavioral, relational,

ecological, and imaginative expressions, children consistently described nature as enjoyable, socially shared, locally situated, and embedded in familiar routines. Together, these findings suggest that ENC is structured less by abstract environmental concepts than by everyday relationships, places, and experiences.

Early Nature Connectedness as Socially Structured

Research on ENC consistently describes young children's relationships with nature in affective and relational terms, including enjoyment, curiosity, empathy, and care for living things (Barrable, 2019b; Beery et al., 2020; Chawla, 2020). Measures developed for preschool-aged children similarly conceptualize connectedness through dimensions such as enjoyment of nature, empathy for nature, and responsibility toward nature (e.g., Beery et al., 2024; Rice & Torquati, 2013; Sobko et al., 2018). Together, this work suggests that ENC is strongly relational. However, most of this literature has focused on children's relationships with nature itself rather than on the social contexts through which those relationships are experienced and interpreted.

In the present study, children's descriptions of nature experiences were consistently embedded within familiar interpersonal relationships, particularly those involving parents, siblings, friends, and companion animals. When asked who they preferred to be with in nature, most children indicated that they wanted to be with others rather than alone, and several described feeling uncomfortable when imagining themselves alone in nature. In one case, a child explained that they preferred to be with family members simply "because I don't want to be alone," suggesting that shared experience was treated as an expected feature of being in nature rather than a deliberate preference. This pattern is consistent with previous studies showing that children often include parents, peers, extended family members, and teachers in their drawings of nature (Ahi & Atasoy, 2019; Fraijo-Sing et al., 2020; Günindi, 2012). Across these studies, including the present one, references to home environments and parent relationships were especially prominent in children's descriptions of nature experiences. Notably, this pattern was observed even in a context such as Iceland, where outdoor time in preschool settings is common, suggesting that family relationships may remain central to early nature experiences even when institutional opportunities for nature engagement are extensive (Chawla, 2020; Passmore et al., 2020).

In some instances, children also interpreted questions about whether they were part of nature through these same relational frameworks. For example, one child explained they were not part of nature "because I am with mama and papa," indicating that belonging to nature was understood through social belonging rather than as an abstract ecological category. This suggests that questions about human-nature relationships may be interpreted through familiar relational frameworks in early childhood.

This interpretation is consistent with ecological and sociocultural theories of development, which emphasize that children's understandings of the world emerge through participation in everyday relationships and routines (Bronfenbrenner & Morris, 1995; Elliott & Davis, 2020; Rogoff, 2003). Research in childhood geography similarly demonstrates that children's experiences of place are structured through family practices, peer relationships, and local mobility patterns rather than through abstract spatial categories (Corvalán & Ther-Ñancuvilú, 2025; Min & Lee, 2006; Rasmussen, 2004). Further, recent intervention research in Swedish school-age education settings shows that collaborative nature experiences with peers and teachers support children's emotional engagement with nature and sense of connectedness (Wünsche et al., 2025). Within environmental education research, studies have also shown that meaningful nature experiences in early childhood often occur through shared activities with caregivers and peers (Ardoin & Bowers, 2020; Norðdahl & Einarsdóttir, 2014; Sihvonen et al., 2024; Smedsrud et al., 2023).

Together, these findings suggest that ENC is not only relational with respect to the natural world itself but also socially structured through the relationships within which children encounter and interpret nature, indicating that social belonging may form an important context through which young children interpret their place within the natural world.

Early Nature Connectedness is Local, Familiar, and Routine - Not Wilderness-Based

In the present study, children's expressions of ENC were grounded primarily in familiar everyday environments rather than in remote or wilderness settings. Most children drew themselves at home or school, while others depicted nature experiences at a friend's or relative's house or in nearby forested areas. These findings suggest that young children most often represent nature as something encountered within routine microsystem contexts rather than as a distant or exceptional environment. Notably, children did not typically depict large or iconic landscape features often associated with representations of Icelandic nature, such as mountains, further suggesting that ENC is grounded in lived ecological experience rather than symbolic environmental imagery.

This pattern is consistent with theoretical perspectives emphasizing the importance of local ecological experience in early childhood development (Beery et al., 2020; Chawla, 1992). It also aligns with previous drawing-based studies showing that young children in Turkey and Mexico most often depict nature within everyday environments such as homes, schools, parks, cities, hospitals, and zoos (Ahi & Atasoy, 2019; Fraijo-Sing et al., 2020; Günindi, 2012). Together, these studies suggest that children's representations of nature tend to reflect the immediate environments in which they live rather than broader regional or culturally iconic landscapes.

In the present study, children's drawings also reflected characteristics of Iceland's local ecological context. For example, while animals were among the most frequently depicted features in comparable studies conducted in other countries (Fraijo-Sing et al., 2020; Günindi, 2012), very few animals appeared in children's drawings in this sample beyond humans and one butterfly. This pattern likely reflects the relatively limited terrestrial fauna in Iceland (Baldursson, 2014), suggesting that children's representations of nature correspond closely to the ecological features available within their everyday surroundings.

Importantly, these findings indicate that young children were connecting with the nature immediately accessible within their daily lives rather than with distant or idealized forms of nature. This contrasts with research on adults, in which "nature" is often conceptualized as separate from everyday environments and associated with locations away from home or routine activity settings (Clayton, 2003; Nisbet et al., 2009). The present findings therefore suggest that ENC may emerge through engagement with nearby ecological features embedded in children's microsystem contexts.

This interpretation is further supported by research showing that regular experiences in local nature settings - particularly those embedded in daily routines - are associated with stronger nature affinity in early childhood (Barrable & Booth, 2020a; Giusti et al., 2014; Kokkonen et al., 2022; Sauli et al., 2025). Together, these findings highlight the importance of everyday environments such as schoolyards, home gardens, neighborhood green spaces, and nearby forests as meaningful contexts for ENC. Further, because these environments are widely accessible compared to remote natural areas, supporting children's relationships with nearby nature may represent an important pathway for promoting equitable opportunities for early nature engagement.

Preschoolers Can Meaningfully Interpret Questions About Belonging to Nature

Children in the present study were able to respond meaningfully to questions about whether they felt like they were part of nature, offering both affirmative and negative answers as well as explanations for their responses. This finding aligns with Fraijo-Sing and colleagues (2020), who similarly reported that many young children described themselves as part of nature, although children in that study were not asked to explain their reasoning. In contrast, children in the present study provided explanations that offered insight into how they interpreted the question.

Children's explanations reflected multiple forms of reasoning. Many responses were affective, with children describing themselves as part of nature because nature was "fun," "beautiful," or "good" to them. Other responses reflected categorical or descriptive reasoning, such as identifying humans as part of the natural world or distinguishing between people and other environmental elements. In a small number of cases, children interpreted belonging to nature through relational contexts, for example explaining that they were not part of nature "because I am with mama and papa." Together, these responses suggest that preschool-aged children interpret questions

about belonging to nature through experiential, conceptual, and relational frameworks rather than treating them as abstract or inaccessible ideas.

This finding is notable given that several existing measures of ENC have avoided or modified items related to “oneness with nature” because they were assumed to be developmentally inappropriate for young children. For example, in adapting the Connectedness to Nature Index for Parents of Preschool Children (CNI-PPC), items referring to oneness with nature were replaced with items assessing awareness of nature after parents reported difficulty interpreting the construct for preschool-aged children (Sobko et al., 2018). Similarly, a systematic review by Arola and colleagues (2023) found that some quantitative studies removed items related to human–nature connectedness because children appeared not to understand them, raising questions about whether these difficulties reflected developmental limitations or mismatches between measurement language and children’s own ways of describing their relationships with nature. Relatedly, Beery and colleagues (2024) reported that children sometimes interpreted pictorial “overlapping circles” measures as representing physical proximity rather than psychological belonging, further complicating interpretation of ENC measures.

Although affective explanations for belonging to nature might appear less conceptually explicit than cognitive accounts of human-nature connectedness, they are developmentally meaningful in early childhood. Affective experience plays a foundational role in shaping children’s emerging interpretations of the world and their relationships within it (Barrett, 2017; Frijda et al., 2000). In this way, early affective expressions of belonging to nature may contribute to the later development of more explicit understandings of human-nature relationships, including a sense of oneness with the natural world (Beery et al., 2020; Cheng & Monroe, 2012; Schultz, 2000).

Importantly, all children in the present study were able to provide either affirmative or negative responses to the question of whether they were part of nature. While this pattern may reflect the concrete response styles typical of early childhood (Berger, 2021), it also suggests that preschool-aged children were able to engage with the question itself and interpret it in meaningful ways. Taken together, these findings indicate that early understandings of human-nature belonging may be more accessible in early childhood than is often assumed and that attending to children’s own interpretations of these questions may provide new opportunities for studying the development of nature connectedness across early childhood (Chawla, 2007, 2020; Whitburn et al., 2020).

Anthropomorphic Representation Appears Selectively Applied to Natural Elements

One exception to the generally concrete and place-based nature of children’s drawings involved anthropomorphic representations of natural elements. In the present study, only two children drew facial expressions on components of nature (a butterfly and the sun). Similar patterns have been reported in drawing-based studies conducted in other cultural contexts, where children depicted faces on plants, animals, and environmental features such as clouds or the sun (Fraijo-Sing et al., 2020; Günindi, 2012; Profice, 2015). Notably, in the present study children did not draw facial expressions on non-natural elements. This pattern suggests that anthropomorphic features may be selectively applied to natural rather than built elements in children’s representations of the environment.

Previous research indicates that anthropomorphic thinking is common in early childhood and may reflect developmentally typical ways of interpreting non-human entities. For example, children between approximately five and nine years of age frequently attribute emotions, intentions, or mental states to animals and natural phenomena (Severson & Woodard, 2018; Severson & Lemm, 2016). Drawing-based studies across cultural contexts similarly document anthropomorphic features in representations of suns, plants, and other non-animal natural elements (Fraijo-Sing et al., 2020; Profice, 2015). Related research has also shown that children’s understandings of human-nature relationships may include both anthropocentric and ecocentric orientations during early and middle childhood (Hallås & Heggen, 2018), suggesting variability in how children position humans relative to other elements of the natural world.

Importantly, research also indicates that anthropomorphic and animistic representations of nature vary across cultural contexts. For example, Profice (2018) found that drawings by Indigenous Tupinambá children in Brazil included animistic features such as faces on environmental elements far more frequently than drawings by children

in New York, interpreting this difference as reflecting cultural traditions in which nature is understood as a living and relational presence. Similarly, Merewether (2019) describes “enchanted animism” in Australian early childhood contexts, where children treated trees, rocks, weather, and landforms as intentional relational partners rather than as passive background elements. Related experimental research with Ngöbe communities in Panama suggests that animist reasoning may reflect ecocentric conceptual frameworks in which agency is inferred through relationships and interactions rather than through human-like mental states (Mays et al., 2020). Research with Menominee and European American children likewise demonstrates that culturally distinct epistemological orientations shape how children organize ecological knowledge and understand humans’ place within nature (Bang et al., 2014).

In comparison with studies conducted in other cultural contexts, anthropomorphic representations were relatively infrequent in the present study. One possible explanation is the strong emphasis on sustainability and environmental education within Icelandic early childhood settings, where children’s encounters with nature are often structured through regular engagement with local environments as part of broader commitments to environmental responsibility and the Sustainable Development Goals (Norðdahl et al., 2025; Norðdahl & Jóhannesson, 2015). At the same time, research in other contexts suggests that anthropomorphic representations of animals and nature can support concern for animal welfare and environmental protection (Wan et al., 2020). The relatively limited use of anthropomorphism observed in the present study may therefore reflect a sustainability-oriented educational context rather than a general developmental pattern, highlighting that anthropomorphic representations may play different roles across cultural and pedagogical settings.

Taken together, these findings suggest that while anthropomorphic representations form one way that some children express relationships with nature, they were not the dominant mode through which ENC was represented in this sample. Instead, children’s drawings more often reflected direct engagement with familiar environmental features, with anthropomorphic elements appearing selectively and in relation to natural rather than built components of the environment.

Implications for Early Childhood Environmental Education

The findings of this study offer several implications for early childhood environmental education. First, children frequently described their experiences in nature in terms of enjoyment, relaxation, and pleasant feelings. These responses suggest that positive emotional experiences play an important role in how young children relate to natural environments. For educators, this highlights the importance of providing opportunities for children to experience nature as a place of exploration, play, and enjoyment rather than focusing exclusively on formal environmental instruction. Previous research similarly suggests that early affective experiences in nature support the development of long-term environmental concern and engagement (Chawla, 2007; 2020; DeVille et al., 2021; Rosa et al., 2018). As research suggests, opportunities for unstructured outdoor play, exploration of natural materials, and regular engagement with nearby natural environments may therefore support children in forming meaningful early relationships with nature (Barrable, 2019a; Barrable & Booth, 2020a; Beery, 2025).

Second, many children described caring for nature through concrete actions, particularly removing trash or participating in activities such as planting or watering plants. These examples suggest that environmental care in early childhood may be most meaningful when it is embedded in visible and accessible activities that children can participate in directly. Early childhood programs may therefore benefit from incorporating everyday stewardship practices - such as gardening, caring for plants, or participating in simple cleanup activities - into nature-based learning experiences. Such activities align with research showing that participation in routine nature-based practices can support children’s developing sense of environmental responsibility and belonging (Barrable & Booth, 2020a; Giusti et al., 2014).

Third, children frequently described nature experiences in relation to familiar people and places, including family members, friends, preschool environments, and recognizable outdoor locations. These findings highlight the relational and place-based nature of young children’s experiences with the natural world. Environmental education initiatives for young children may therefore benefit from recognizing the importance of everyday outdoor spaces - such as schoolyards, gardens, neighborhood parks, and other familiar environments - as meaningful contexts for

nature engagement. Further, this reflects recent findings from school-age settings in Sweden where collaborative activities with peers and teachers in nearby natural environments support children's sense of connectedness and provide opportunities for both curricular and exploratory learning (Wünsche et al., 2025).

In the present study, children's drawings also reflected features of their local ecological surroundings, suggesting that nature connectedness was grounded in nearby environments rather than distant or idealized landscapes. Supporting children's engagement with familiar ecological settings - particularly those embedded within daily routines - may therefore represent an important pathway for promoting equitable opportunities for early nature connection (Beery et al., 2020; Giusti et al., 2014).

Finally, the imaginative elements present in some children's narratives suggest that creative and playful engagement can be part of how young children interpret their experiences in nature. Outdoor environments may offer opportunities for imaginative play, storytelling, and exploration that support children's engagement with natural spaces. At the same time, research suggests that imaginative engagement with nature varies across cultural and educational contexts, reflecting different epistemological orientations toward the more-than-human world (Bang et al., 2014; Merewether, 2019; Profice, 2018). Within many early childhood settings, playful interaction with natural environments has been associated with curiosity, meaning-making, and emotional connection to place (Malone, 2016; Kahn & Kellert, 2002; Sobel, 1996). Taken together, these findings suggest that imagination represents one pathway through which children interpret their relationships with nature, while the form and significance of such engagement are shaped by the cultural and pedagogical contexts in which nature experiences occur.

Cumulatively, these findings highlight the importance of culturally responsive approaches to early childhood environmental education. Children's descriptions of nature were closely connected to everyday routines, relationships, and locally meaningful environments rather than abstract or universalized ideas about the natural world. This suggests that early environmental learning may be most meaningful when it builds on children's existing relationships with their environments and communities. Culturally responsive environmental education frameworks emphasize recognizing multiple ways of knowing and relating to nature, including those grounded in family practices, community contexts, and local ecological knowledge (Bang et al., 2007; Evans, 2023; Merewether, 2019). Rather than focusing primarily on environmental knowledge acquisition, programs that support children's emotional, social, and experiential engagement with nearby environments may provide important foundations for later environmental learning and stewardship (Ardoin et al., 2020; Barrable, 2019a; Chawla, 2007).

Limitations

Several limitations should be considered when interpreting the findings of this study. First, the sample was relatively small and drawn from a limited number of urban preschools in Iceland. Although the interviews yielded varied descriptions of children's experiences in nature, the sample does not capture the full range of ways young children may relate to natural environments. In particular, children in this study were enrolled in preschools where outdoor play and sustainability-oriented nature education were common, which may influence the types of experiences and narratives children described. The goal of the study was descriptive rather than to estimate the prevalence of particular expressions of nature connectedness; nevertheless, the sample characteristics limit the generalizability of the findings. Future research could include larger and more diverse samples across different geographic, cultural, and educational contexts to explore how expressions of early nature connectedness may vary across settings.

Second, the draw-and-tell interview method shaped the types of responses children provided. Children were asked to draw themselves doing something in nature and to describe who they were with, which meant that references to activities and companions were expected. While these prompts helped create a developmentally appropriate way for children to talk about their experiences, they may also have influenced the structure of children's responses, including the emphasis on familiar locations and everyday social relationships. Importantly, however, children's drawings and narratives varied widely in the types of activities, relationships, and environmental features they described, suggesting that children interpreted the prompts in diverse ways. Future research could complement draw-and-tell interviews with additional observational or play-based methods to capture children's experiences in nature in different ways.

Third, although the draw-and-tell method allowed children to express their thoughts and experiences through both drawings and conversation, the approach still relies on children's verbal explanations of their drawings. Young children may have internal experiences or emotional responses - such as empathy for living things or feelings of awe - that are difficult to articulate verbally. As a result, the interviews likely capture only part of children's experiences in nature. Future studies could incorporate additional methods, such as observations of outdoor play, narrative reenactments, or child-led storytelling, to better capture the range of ways young children experience and interpret the natural world.

Finally, as with all qualitative research involving young children, the interpretation of themes involves an element of researcher interpretation. To support transparency and minimize interpretive bias, the analysis prioritized children's own language and included direct quotations to illustrate patterns identified in the data. Coding was guided by a deductive framework informed by existing literature on nature connectedness while remaining attentive to patterns that emerged within children's narratives. Nevertheless, the themes presented here should be understood as interpretive descriptions of patterns in children's responses rather than definitive claims about how young children experience nature.

Conclusion

This study explored how preschool-aged children described their experiences in nature through interviews and drawings. The findings suggest that young children's nature connectedness was most often expressed through familiar places, everyday activities, and relationships with people who were part of their regular experiences in natural environments. Rather than describing nature primarily as distant or symbolic landscapes, children represented nature as something encountered within local settings and shared routines. In addition, children were able to respond meaningfully to questions about whether they felt they were part of nature, suggesting that early understandings of human-nature relationships may be more accessible in early childhood than is often assumed. Anthropomorphic elements appeared selectively in children's drawings and were applied only to natural rather than built features, indicating that some children represented components of nature as socially meaningful elements within their environments.

Together, these findings highlight the importance of considering early nature connectedness as socially structured, locally situated, and grounded in everyday experience. By examining children's own narratives about nature, this study contributes to a growing body of research seeking to better understand how relationships with the natural world are expressed in early childhood. These insights suggest that early childhood environmental education may benefit from approaches that support children's engagement with nearby ecological environments, familiar social contexts, and opportunities for exploration and play as foundations for later environmental learning and stewardship.

AI Disclosure Statement

The authors used ChatGPT (OpenAI, GPT-5.3) to assist with reviewing and revising the manuscript. The tool was used to provide feedback on the organization, clarity, and presentation of the analysis and to simulate reviewer-style critique during the revision process. The AI system did not generate data, conduct coding, or independently determine analytical findings. All data analysis, coding decisions, interpretations, and final manuscript content were conducted and approved by the authors.

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Appendix A

The NC-DTT (Nature connectedness Draw-and-Tell Task) Protocol

1. Protocol for Drawing Task (Teacher)
 - a. Provide the child with a blank piece of paper, crayons and/or colored pencils. Ask the child: "Can you draw yourself while doing something in nature?"
 - b. *Note for teacher:* It is important not to make any suggestions about what "nature" is or what they might be doing in nature, but to give the child the opportunity to show you what they think nature is.
2. Follow-up Interview Questions (Researcher)
 - a. What is in your drawing? (*label elements on drawing*)
 - b. What are you doing in your drawing?
 - c. Can you point to the nature in your drawing?
 - d. Who is in your drawing? (*label people on drawing*)
 - e. Where is this happening? (At home, in school, somewhere else?)
 - f. What do you hear in nature?
 - g. What do you want to touch in the nature?
 - h. Do you like to study nature? Why?
 - i. Is the nature here clean or dirty? How does this make you feel?
 - j. Are there other people you like to be in nature with besides who is in your drawing? Who else do you like to be with in nature? Why do you like to be in nature with them?
 - k. How does the nature make you feel? Why does it make you feel this way?
 - l. Are you friends with the nature? Why or why not?
 - m. Are you fond of nature? Why or why not?
 - n. Do you feel like you are a part of nature? Why or why not?
 - o. Do you feel scared or calm in nature? Why or why not?

Appendix B



Figure 1. Example drawing from the Nature Connectedness Draw-and-Tell Task (NC-DTT), with objects labeled by the child and recorded by the research assistant.



Figure 2. Example drawing from the Nature Connectedness Draw-and-Tell Task (NC-DTT), with objects labeled by the child and recorded by the research assistant. An "X" indicates the element the child identified as nature.



Figure 3. Example drawing from the Nature Connectedness Draw-and-Tell Task (NC-DTT), with objects labeled by the child and recorded by the research assistant. An “X” indicates the element the child identified as nature.

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