



Urban children and adolescents' perspectives on the importance of nature

Ryan J. Keith, Lisa M. Given, John M. Martin & Dieter F. Hochuli

To cite this article: Ryan J. Keith, Lisa M. Given, John M. Martin & Dieter F. Hochuli (2022): Urban children and adolescents' perspectives on the importance of nature, Environmental Education Research, DOI: [10.1080/13504622.2022.2080810](https://doi.org/10.1080/13504622.2022.2080810)

To link to this article: <https://doi.org/10.1080/13504622.2022.2080810>



Published online: 30 May 2022.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)



Urban children and adolescents' perspectives on the importance of nature

Ryan J. Keith^a , Lisa M. Given^b , John M. Martin^{a,c}  and Dieter F. Hochuli^a 

^aSchool of Life and Environmental Sciences, The University of Sydney, Sydney, NSW, Australia; ^bResearch and Innovation, RMIT University, Melbourne, VIC, Australia; ^cTaronga Institute of Science & Learning, Taronga Conservation Society Australia, Mosman, NSW, Australia

ABSTRACT

People who regard nature as important and personally meaningful are often compelled to conserve it. This compulsion is increasingly vital in a world where global climate and biodiversity crises are worsening, with younger generations set to bear most of the resulting ecological burden. By understanding why children and adolescents value nature, we can gain insights into how they might act for its benefit. In this study, we asked over 1000 Australian students (aged 8–14) to explain why 'nature' was—or was not—important to them. Qualitative responses were gathered via a survey methodology using an online questionnaire, with thematic analysis used to identify key findings. Results show that respondents valued nature for its ability to keep humans alive and resourced, also appreciating nature as beautiful and relaxing. Respondents frequently commented on how nature made them feel: happiness, love, freedom, and calm featured prominently. A small number of students reported ambivalence about nature, or even feelings of fear. These results demonstrate substantial depth to students' understandings of nature and the ways they choose to engage with their surroundings. Encompassing a diversity of perspectives on nature allows us to better engage with youth on environmental matters.

ARTICLE HISTORY

Received 27 October 2021

Accepted 17 May 2022

KEYWORDS

Conservation; aesthetic; restorative; affective; connection to nature

Introduction

Children think systematically about environmental issues and are invested in environmental outcomes (Barraza, 2001; Wylie et al., 1998). Recently, this has manifested as global youth activism *en masse*, through collective acts such as School Strikes for Climate (Fisher, 2019), and class action lawsuits petitioning governments and corporations to behave in environmentally responsible ways (Powers, 2018). Children and adolescents are demanding their voices be heard on these matters and speaking on the world stage at the United Nations assembly and the World Economic Forum (Skilbeck, 2020). They are demonstrating agency by changing the discourse to better reflect their lifeworlds (Hahn, 2021).

Importantly, the voices of children and adolescents are also becoming more prominent in environmental education research, though more remains to be done in this regard. The question

'Where are children and young people in environmental education research?' was posed less than a decade ago (Cutter-Mackenzie, 2014, p. 103). Unfortunately, few projects ask children what they think about important topics, directly, despite the fact that they 'have a rich working knowledge of the social and environmental circumstances and living patterns in which they find themselves, including concepts like 'nature' or 'the environment' which are so central to environmental education' (Payne, 1998, p. 20). The research reported here addresses this gap by presenting data on the importance of nature to children and adolescents, in their own words.

Background

Despite its complexity and contestation (Mcphie & Clarke, 2020), the concept of 'nature' has always been present in mainstream environmental education (Sauvé, 2005), with nature study serving as a cornerstone of the field for more than a century (Liddicoat & Krasny, 2013). Two and a half decades ago, environmental educators started to formally investigate urban Australian children's perceptions of nature, reporting that 'Most children conceived nature as living and non-living things existing naturally in the external environment' (Payne, 1998, p. 21), with particular emphasis on 'animals and plants' (Kelihier, 1997, p. 241); we adopted this as a guiding definition to inform our project design. Around the same time, researchers began designing indices to measure people's affinity for nature, in the hopes that quantifying the strength of an individual's bond with nature might explain their motivation to protect it (Kals et al., 1999). As this field of inquiry grew rapidly, dozens of tools for measuring 'connection to nature' were created (Salazar et al., 2021; Tam, 2013). Yet a decade passed before any such indices were developed for use with children or adolescents (Chawla, 2020). A legacy of this academic history is that the corpus of research on connection to nature is dominated by quantitative analyses and is primarily adult-focused (Tseng & Wang, 2020). Some researchers have engaged adults as research participants even when children's interactions with nature are the objects of study (e.g. Fägerstam, 2012). Though parents and teachers can offer valuable insights, it is ultimately children and adolescents themselves who are experts on their own lives (Kellett, 2005). Children experience environments and understand nature differently from adults (Barker & Weller, 2003; Hyun, 2005; James, 1990), necessitating their direct engagement in study designs.

Recently, a 'new nature study' (op de Beeck, 2018) has emerged alongside a 'new nature movement' that seeks to reconnect children with nature (Malone, 2016, p. 43). It is in this context, where nature has resurged in public visibility, that we investigate the importance of nature to children and adolescents. To date, very few studies have considered children's perceptions of their own connections to nature and the potential benefits thereof (Tillmann et al., 2019). This may seem surprising, given the frequency and vociferousness of adults' declarations that modern children are disconnected from nature (Birch et al., 2020), an idea popularised by *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder* (Louv, 2005). As Birch et al. (2020, p. 2) note, 'Research in this field has been dominated by bibliographies, literature reviews, and often commissioned reports detailing how little children spend time 'in nature', and their inability or lack of desire to roam independently'. However, these sources—typically from the United States or United Kingdom—rarely give voice to children themselves, instead concentrating on a narrowly-defined version of nature rooted in adult sentimentality and nostalgia (see Malone, 2016; Duhn et al., 2017). Internationally, a growing number of researchers are critiquing and rethinking calls to reconnect children with nature (e.g. Birch et al., 2020; Clarke & Mcphie, 2014; Dickinson, 2013; Kraftl et al., 2019; Malone, 2016; Novotný et al., 2021). This highlights an urgent need for new approaches, including 'more qualitative studies across different age groups, cultures and countries' (Tseng & Wang, 2020, p. 127).

In exploring connections to nature, we draw on approaches from the field of childhood studies. Valuing children's and young people's voices is a key convention in childhood studies research (Tisdall & Punch, 2012). This tradition of practice—often associated with the new

sociology of childhood—emerged from a critique of adult-centred family studies and child development paradigms (Esser, 2016) where researchers ‘come up against the perennial problem of ‘second-hand data’ ... [and] learn about how children view their worlds from the perspective of significant adult figures’ (Wyness, 2006, p. 187). By contrast, research in childhood studies enables young voices to be heard and taken seriously (Punch, 2020), acknowledging children as potentially competent social actors and ‘worthwhile informants’ for research (Lange & Mierendorff, 2009, p. 82). Therefore, ‘the main task is to understand and to interpret children’s expressions - namely to get access to the so-called perspective of children’ (Lange & Mierendorff, 2009, p. 82). By exploring the ways in which urban children and adolescents value nature, we can begin to gain insights into why they might act to conserve it.

Research design

This study was conceived as part of a larger research design incorporating qualitative and quantitative data collection across multiple sources and methodologies, including focus group interviews. The qualitative data presented in this paper were collected as an initial, exploratory phase of work, with the intention to expand upon emergent themes through subsequent investigations.

Questionnaire

Here, we focus on written qualitative responses collected via a questionnaire exploring students’ cognitive, emotional, and experiential connectedness with nature. Alongside the quantitative data gathered using this instrument (see Keith et al., 2021), we included open-ended questions designed to capture qualitative data on respondents’ perceptions of the concept of ‘nature’, in their own words. The first two sections of the questionnaire asked students to answer the following questions: *What do you think the word ‘nature’ means?; Is nature important to you?* (yes/no), followed, respectively, by either *Why is nature important to you?* or *Why is nature not important to you?* We deliberately used the term ‘nature’ because—not in spite—of its ambiguity. This is a response to calls for research into children’s conceptualisations of nature itself, as opposed to its component elements, which will facilitate comparisons between studies around the world (see Collado et al., 2016). Our open-ended questions appeared at the very beginning of the survey, so as to capture students’ perceptions before they encountered potential sources of inspiration (e.g. quantitative indices of connection to nature). Participants were unable to go back and edit their responses to the questions analysed here.

Sampling and recruitment

Following receipt of ethics approval for this study,¹ we initiated the recruitment process with school principals.² Principals of public schools throughout Sydney, Australia, were approached to seek their involvement. Participating principals referred us to coordinating teachers who served as contacts for the study and organised recruitment of student participants.

In Australia, public schools are solely government-funded and free for citizens and permanent residents to attend. Most Australian children and adolescents are enrolled in public (vs. private) schools, and in the state of New South Wales (NSW)—where this study took place—they must commence compulsory attendance before the age of six and continue until they complete Year 10 or reach age 17. Sixteen schools took part in this research project. Eight of these were primary schools with classes from Kindergarten through Year 6 (ages ~5–11); eight were secondary schools with students in Years 7–12 (ages ~12–18). All but one of the schools were co-educational; an all-girls’ secondary school was also included in our sample. We recruited

respondents across Years 3–8 (ages ~8–14), with a goal of at least 50 students per Year. These age groups were selected for two reasons: 1) because the established instruments in our questionnaire were not designed for or validated with younger students; and 2) older students (Year 9 onwards) select from a range of elective curricular units, which introduces significant variability to school experiences. Until that point, they undertake studies in seven key learning areas: English, mathematics, science & technology, human society & its environment (i.e. principally history and geography), creative arts, languages, and personal development, health, & physical education.

For this study, coordinating teachers distributed Participant Information Statements to their students, with primary schoolers additionally receiving Parental Consent Forms. To participate, primary schoolers were required to assent to taking part in the study and to return a consent form completed by a parent/carer. Students in secondary school provided informed consent via an online survey platform. Those who consented were subsequently able to click through to our questionnaire. A total of 1,269 questionnaires were returned, with 1,248 responding to our open-ended questions. These formed the dataset analysed for this paper.

Classroom teachers supervised students as they completed the questionnaire in class, ensuring respondents did not consult any external resources prior to providing their answers. Participants were allowed at least 30 min to submit their answers, but three in four completed the task within 15 min.

Analysis

We used inductive qualitative analysis to derive conceptual themes from students' responses, focusing on the most common patterns emerging from the dataset, as well as anomalous data providing unique perspectives. A qualitative application of the knowledge organization model was used to explore coextensiveness, specificity, exhaustivity, precision, recall, and relevance of data during the coding process (see Given & Olson, 2003, for details). The lead author compiled and updated a codebook throughout, which the second author interrogated at intervals to ensure inter- and intra-indexer consistency in the analysis, prior to discussion and confirmation of themes with all authors. As is common in constructivist approaches to qualitative analysis (Charmaz, 2014), each round of coding involved an initial 'open' phase and a subsequent re-focused phase that led to the emergence of provisional categories where concepts interacted and converged. Codes and categories were refined through an iterative process, to ensure thematic content was mutually exclusive and to assign terms that best represented conceptual content.

Thematic analysis was complex and layered, taking place over several weeks and requiring multiple iterations across the two primary analysts: the lead author and the second author (i.e. a senior expert in qualitative research). Once initial themes were developed, authors three and four were involved in further refinement of concepts; given their expertise in ecology, this provided an additional lens for analysis. Working through more than 100 pages of data and 250 codes required six team meetings and 150 h of deep reading, reflection, and discussion. Through grouping and categorising like concepts, we formed major themes that were evident across hundreds of responses. For example, the theme 'nature is beautiful' arose from dozens of positive terms referring to the appearance of nature (e.g. 'pretty', 'gorgeous'), which were coded within statements referencing aesthetic appreciation and subsequently grouped together on account of conceptual similarity. However, unique concepts that did not correspond to any of the major themes were also noted during the coding and categorisation process; this resulted in the emergence of the minor theme 'nature is not for everyone', which gathered together concepts that were negative in orientation (e.g. nature is 'scary' or 'ugly'). It was critical to include this minor theme so that the range of children and adolescents' views were represented.

Findings

This section reports results across the four major themes and one minor theme that emerged from the qualitative dataset. The four major themes (i.e. nature supports life, nature is beautiful, nature is relaxing, and nature is loved) reflect the common patterns expressed by student respondents. The minor theme (i.e. nature is not for everyone) points to a contrasting perspective, noted by a small number of students. The proportion of respondents expressing each theme was consistent across age groups and genders. Overall, the dataset represents an overwhelmingly positive view of nature from these children's perspectives.

Nature supports life

The vast majority (68%) of respondents reported that nature is important because it keeps us alive. In their responses, students focused on fresh air, natural resources, and pollution relief. Most commonly, respondents talked about plants keeping people alive by providing 'fresh air' or 'oxygen'. As one student said, 'If we didn't have trees, humans would eventually die because we wouldn't have any oxygen'. Other students referred to 'supplies' or 'resources', including sources of food, water, shelter, and other products. One respondent noted 'trees give us shade and oxygen, some plants can be harvested and used as a food source, the animals provide us with eggs, milk, and they can also be killed as a source of protein'. Several students also commented on the ability of nature to mitigate pollution: 'without nature the earth would be full of pollution and all living animals and plants will die'; '[nature] helps us breathe in the fresh air instead of breathing the toxic air'; 'nature... cleans out the atmosphere'.

The centring of human needs in most students' answers is noteworthy. If nature is valued exclusively as a provider of resources for people to exploit (Pointon, 2014), then elements of nature that do not offer obvious material benefits to humans are at risk of being devalued and marginalised in public discourse on conservation (Ferguson, 2008). Under these circumstances, elements of nature that possess great ecological or intrinsic value (Vucetich et al., 2015) may go unrecognised if they are not also perceived as useful. It is striking to note, for example, that while hundreds of our respondents discussed the importance of trees for oxygen production, not one mentioned plankton, which produce most of the world's oxygen (Behrenfeld et al., 2001). Encountering trees in everyday life, or discussing them as examples of oxygen producers in classrooms, may provide a level of visibility and awareness for students that cannot be matched easily by other sources. Further, viewing nature through a life-and-death lens narrows the focus to a meagre portion of global biodiversity, most of which people could conceivably live without, however miserably (Safina, 2019). Still, acknowledging our ultimate dependence on nature could conceivably drive people to protect nature out of enlightened self-interest (Lenart, 2020).

By contrast, several respondents approached the question of nature's importance from a selfless position. They proffered that nature is important to more than just humans, playing an essential role in the lives of all animals. Though students were prompted to explain why nature was important to *them*, some clearly thought it necessary to go further and highlight the importance of nature to other beings. For example, one respondent noted that nature is 'not just important to me it's also important for the creatures living there'. Focusing on the value of nature to non-human entities shifts the perspective towards biocentrism (Kahn, 2002). In one case, a participant made this orientation quite explicit, saying 'all living things are important'. Clearly, some students appreciated nature from a position that apportions value according to criteria beyond human utility. The presence of biocentric perspectives in this study is notable because biocentrism treats conservation as a moral imperative regardless of its impact on human flourishing (Rottman, 2014).

Nature is beautiful

A major theme was that students valued nature for its beauty. They felt nature was important because it looks ‘nice’, ‘lovely’, ‘gorgeous’, ‘pretty’, or—most commonly—‘beautiful’. Respondents positioned nature as something that ‘beautifies the world’. As one student remarked, ‘I think that nature means the beauty of living things and the environment’. Accordingly, the absence of nature results in a world devoid of beauty; as one respondent explained, ‘if we didn’t have nature we wouldn’t have ... anything that makes this world beautiful’. The value of nature in making ‘the world look better’ was notable in the responses, as students made a clear distinction between natural and unnatural elements of their surroundings. There was a marked preference for vistas perceived as natural; as one respondent noted, ‘[nature is] nice to see when you’re outside rather than a city full of man-made [sic] objects which is visually unappealing’.

Our respondents provide valuable data attesting to an under-researched link between natural beauty and moral duty in youth populations. As one student unambiguously explained, ‘It is... important to protect nature because of the fact that it is so beautiful’. Another raised the idea that nature is ‘too beautiful to let go’, reflecting an awareness that nature is ‘beautiful to look at but it is slowly dying’. In these excerpts we see that some children and adolescents consciously consider nature’s beauty as a property worth protecting from degradation. This fits with the observation that children use natural beauty as an immediate premise for moral reasoning about conservation (Aslanimehr et al., 2018; Billmann-Mahecha & Gebhard, 2009; Pointon, 2014). For example, when asked why we should protect the environment, Maltese children as young as four have remarked that ‘Nature is beautiful ... and we must care for it’ (Spiteri, 2021, p. 181). Likewise, most Cypriot children cited beauty as a reason for conserving threatened plant species (Paraskeva-Hadjichambi et al., 2012). Children and adolescents often raise the topic of natural beauty in studies on perceptions of ‘nature’ (e.g. Sjöblom & Wolff, 2017), but it has rarely been explored in detail. Researchers typically categorise children’s thoughts about beauty as aesthetic valuations of nature (*sensu* Kellert, 1993) and quickly move to the next ‘biophilia value’ on their list (e.g. Freeman & Von Heezik, 2018, p. 155). Our respondents’ comments suggest that we need to take a different approach and explore the role of engagement with natural beauty as a motivational basis for children’s environmentalism. To our knowledge, just one in-depth investigation into children’s aesthetics of nature currently exists, finding that German students ‘do not have an adult-like, introspective, scenery-focused aesthetics of nature’ (Billmann-Mahecha & Gebhard, 2009, p. 38). Instead, children seemingly attribute beauty to nature more directly than adults do (Collado et al., 2016). Our respondents often put it simply: ‘nature is beautiful’. What this means for the burgeoning field of environmental aesthetics is unknown, as current discourse in this area (reviewed in Brady & Prior, 2020) does not explicitly include children or adolescents.

Our respondents shared insights into why they valued natural beauty so highly. Statements such as ‘[nature] makes me feel happy because it’s beautiful and I like seeing all the animals and plants’ suggest that some students derived affective benefits from viewing nature. Thus, they might be motivated to conserve nature less for the sake of its own beauty and more for the way that natural beauty makes them feel (Billmann-Mahecha & Gebhard, 2009). By contrast, some of Pointon’s (2014) student participants apparently thought beauty bestowed an inherent intrinsic value on nature that was independent of its ability to evoke pleasure in people. Whatever the link between natural beauty and perceived value may be, we do know that some children judge harm against natural entities as more severe in cases where the entity is beautiful. Spanish students considered the act of physically harming an attractive animal to be a moral transgression equivalent to hurting other children, whereas harming an unattractive species was regarded as less serious than contravening a social convention such as classroom seating order (Collado et al., 2022). Adults, too, are more willing to conserve species if they are beautiful (de Pinho et al., 2014; Gunnthorsdottir, 2001; Marešová & Frynta, 2008), with natural beauty playing a role in promoting people’s happiness and wellbeing (Capaldi et al., 2017; Proyer et al., 2016; Richardson & McEwan, 2018).

However, it is most likely beauty itself and not its associated ‘feel-good factor’ (*sensu* Dallimer et al., 2012) that endows animals with moral standing (Klebl, Luo, & Bastian, 2022; Klebl, Luo, Tan, et al., 2021). This may explain why choosing beautiful animals as flagship species is an effective means of attracting funds for conservation (Veríssimo et al., 2017); the demise of natural beauty is often seen as morally wrong. It also highlights a risk of relying on aesthetic judgments as a basis for conservation. Research has already illuminated an association between appreciating beauty and conserving the source of that beauty; further investigation is needed to explore whether something is not considered worth saving when it lacks beauty.

Though most respondents who spoke of ‘beauty’ used the term to describe nature as a whole, a small minority pointed out the duality of nature or the limits of its beauty. For example, one student remarked that ‘[nature] is something that involves both beauty and ugliness’ and another observed that ‘nature can be beautiful in some forms’. Given the fact that qualifiers can be placed on nature’s beauty, it begs the question: can we afford to lose the elements of nature that are not perceived as beautiful? Though beauty and ecological function can be positively related (reviewed in Tribot et al., 2018b), the opposite case has also been observed (e.g. Tribot et al., 2018a), leading to the neglect of ecologically important but visually unimpressive entities (Lintott, 2006; Parsons, 1995). When unattractive elements of nature are essential to the health and function of ecosystems, we disregard them at our own peril (Small, 2011, 2012). This has necessitated the development of an ‘ecological aesthetic’ (Gobster et al., 2007, p. 959) wherein aesthetic and ecological values are aligned, for example, through environmental education. This seems like a particularly promising practice given the data presented here, which demonstrate that many students are comfortable discussing the aesthetics of nature.

Nature is relaxing

Another major theme was that students placed importance on nature in response to its calming effects. They conveyed this theme by speaking about two main concepts: nature’s ability to relax people, and nature’s ability to enable escape from life’s challenges. Students explained that when they feel ‘angry’, ‘frustrated’, or ‘stressed’, elements of nature calm them. The terms ‘calm’, ‘relaxed’, ‘peaceful’, and ‘tranquil’ were used to describe the way students felt when interacting with nature. As one student said, ‘I believe that I can feel a connection with nature that relieves all my stress’. This relief of negative emotions (e.g. anger) has been described as a ‘restorative experience’ that children derive from nature (Collado & Staats, 2016).

The respondents’ characterisation of nature as a relaxing space is consistent with a previous Australian study investigating students’ conceptions of ‘environment’ (Loughland et al., 2002). To those children, the environment was considered ‘a place... where humans can relax and be calm’ (Loughland et al., 2002, p. 194). Similarly, children in urban Detroit (United States) felt nature was ‘a peaceful place to think or reflect’ (Wals, 1994, p. 188), and those from the United Kingdom associated being in ‘natural places’ with relaxation, saying they would ‘feel peaceful and calm in places such as the woodland and meadow’ (Bonnett & Williams, 1998, p. 164). This indicates that the calming features of nature may be widely appreciated by children around the world and enduring over multiple decades.

There was also a consistent perception among respondents that nature provides a means of ‘escaping’ or ‘getting away’ from the demands and stresses of daily life. For example, one student described nature as ‘a way to escape when stress gets a hold of you’. Another presented nature as their only source of peaceful escape: ‘without [nature]... there would be no place that you can get away to if you want peace’. Although respondents typically used general terms like ‘school’ or ‘busy life’ to describe what they wished to escape, one student identified ‘fighting and loud noises’ as challenges in their life. Australian children have previously commented on the role of natural features in providing ‘escape and relaxation from fights at home’ (Payne, 1998, p. 23). Likewise, some British children conceive of nature as ‘an escape or sanctuary from

everyday life and troubles' (Bonnett & Williams, 1998, p. 164). In this way, nature affords children 'therapeutic opportunities' (Payne, 1998, p. 24) when they are upset; once they can distance themselves from trouble, they are able to recover. This process, which our respondents describe as 'getting away', is a key concept in research on restorative environments (e.g. Panno et al., 2020). It is a central component of the 'conventional theoretical narrative' around the psychological benefits of experiencing nature (Hartig, 2021, p. 97); namely, stress recovery (Ulrich, 1983) and attention restoration (Kaplan & Kaplan, 1989).

Placing a high value on restorative experiences could conceivably lead children and adolescents to protect the elements of nature most associated with restoration. Though the potency of restorative experiences in motivating conservation behaviours in children and adolescents is largely unknown (Collado & Staats, 2016), we do know the perceived restorativeness of schoolyards positively predicted Spanish children's environmental attitudes and self-reported environmental behaviours (Collado & Corraliza, 2015). Students can derive restoration from green spaces both on campus (Bagot et al., 2015; Chawla et al., 2014) and outside of school (reviewed in Barger et al., 2021). Studies of children's favourite places have shown that areas perceived as natural are often associated with relaxation and restoration, but these benefits can also stem from time spent at home or in ecologically degraded locations such as sports fields (Abbott-Chapman, 2006; Korpela, 2002; Korpela et al., 2002; Owens & McKinnon, 2009). This highlights a potential incongruence between elements of nature that are appreciated by children and those that conservation scientists would most value, i.e. biodiverse and functional ecological communities (Taylor et al., 2020; Taylor & Hochuli, 2015). For example, children living in urban New Zealand have demonstrated a strong affiliation for gardens and yards as opposed to relatively biodiverse 'wild' greenspaces (Hand et al., 2017). Although biodiversity has been positively linked to restorativeness (Marselle et al., 2021; Nghiem et al., 2021), people may struggle to recognise biodiversity (Dallimer et al., 2012). Instead, *perceived* biodiversity (Schebella et al., 2019) and 'naturalness' (Van den Berg et al., 2014) seem to correspond best with restorative experience. This presents a challenge to environmental educators: can we design interventions (e.g. Lindemann-Matthies, 2006) that might improve children's biodiversity identification skills and hence help align wellbeing with conservation?

Nature is loved

The final major theme emerging from the responses was students' expressed love for nature. While some children and adolescents described a general love of nature, others specified particular elements of nature (e.g. animals) as the focus of their love. When respondents spoke of loving nature in generic terms, they sometimes associated certain characteristics of nature with their love. Some loved the experience of 'being outside'. Others particularly loved sensory contact with 'the smell of nature' and its sounds: 'it is all I hear in the morning and I really love it'. When these emotional connections strengthen in a meaningful way, nature becomes an especially important aspect of a child or adolescent's life. As one respondent explained:

Nature is important to me in so so so so many different ways. Too often, we find ourselves stuck in the known, the comfortable, the familiar. The physical spaces of most everyday urban and suburban life... houses, classrooms, offices, sidewalks, roads (or worse: roads with no sidewalks) all reinforce this. Nature is my home, my personality, I love nature, I love the plants, the animals and many many many more. It is who I am.

This respondent clearly appreciates many elements of nature but lists 'plants' and 'animals' by name. Flora and fauna were commonly identified as important to the students surveyed in this study. For example, 'I am in love with plants and animals so if I lost that for the generation before [sic] me, we would all have no purpose living on earth'. Though very few respondents provided an elaboration as to why they felt strongly about plants, one offered the following: 'I love flowers because they smell nice and they're pretty'. This personal reasoning contrasts with

the more detached appreciation of trees discussed in the previous section 'Nature supports life'. The sights and smells of plants appeal to children on an individual level, engaging them via sensory stimulation (Beery & Jørgensen, 2018). Sensory contact constitutes one of five key pathways to nature connection alongside beauty, meaning, compassion, and emotional attachment (Richardson et al., 2020).

An emotional attachment between child and nature is clearly evident in the statement 'I love [nature] and it loves me back'. It connotes reciprocity between two active parties (Beery & Lekies, 2021). Taken literally, this description of a mutually loving relationship (*sensu* Antal & Drews, 2015) attributes a level of agency bordering on personhood to the entity of nature. There is a striking parallel between this framing of nature and the one underpinning a popular quantitative measure of connection to nature, the Inclusion of Nature in Self (INS) scale, which was developed from interpersonal relationship theory (Schultz, 2002). We observed an apparent convergence between self and nature in statements such as 'I feel as though [nature] is a part of me. I don't know what I would do without it'. The statement 'It is who I am' epitomises this affinity, which is expressed as the respondent's 'environmental identity' (Clayton, 2003). The fact that some of our respondents chose to articulate their relationship with nature in these terms is exciting, given the likelihood that children will conserve nature as a result of identifying with it (Kals & Ittner, 2003). Many more students identified strongly with particular elements of nature. Though plants and animals were often mentioned together, it was the animals that received the most love from our respondents (see also Amprazis & Papadopoulou, 2020). Several students self-identified as animal-lovers; for example, 'I am an animal-lover, so I care for them deeply'. It is clear that, for these respondents, loving animals created inroads to valuing nature as a whole; it was important to them because—as one student commented—'I love animals and animals are a part of nature and they also need nature to survive'. Statements such as these indicate that animals—which are regarded as more 'loveable' than plants—might be capable of engaging children in emotionally impactful ways and hence leading them to appreciate nature in general (Lindemann-Matthies, 2006). This aligns with new experimental findings regarding conservation messaging, which show that focusing on the loss of animals (vs. landscapes) can attract greater empathy from children, thereby stimulating pro-environmental behavioural intent via heightened anticipatory guilt (Pearce et al., 2021). Thus, animal-loving children might be motivated to spring into action in defence of nature.

Nature is not for everyone

Although the overwhelming majority of comments about nature were positive, a small number of respondents explained that nature was either not important to them or was not pleasurable. Some students made clear that they were indifferent towards nature, others had no 'use' for it, and the remainder were fearful or even hated nature.

Most students for whom nature was unimportant noted that they did not 'think about', 'pay attention to', or 'care about' it. Some believed that nature was irrelevant to their existence: 'it doesn't affect my life that bad'. According to Newman and Dale (2013), this view has arisen in urban contexts, where some people do not consciously interact with natural elements, so they are taken for granted, backgrounded, or rendered invisible by inattention. This may be cause for concern, given the many health and wellbeing benefits afforded by contact with nature (Mygind et al., 2019).

Another group of respondents reported that nature was unimportant because they did not derive utility from it. As these students felt they did not 'own', 'use', 'live in', or 'spend time in' nature, it did not hold any special value to them. One student expressed this position using the language of performativity: 'I don't *do* nature'. These responses highlight the risk of undervaluing nature that arises when we reduce it to a collection of resources for our use. When a lack of knowledge hampers an understanding of the myriad ways we rely on nature in our daily lives, it becomes disposable from a utilitarian perspective (Small, 2011).

Lastly, some respondents described an aversion to nature motivated by fear and hatred. Nature was described as ‘scary’, with one student explaining that ‘trees make bushfires and cause somebody’s life to be lost’. This comment shows that regard for nature can be adversely influenced by witnessing these traumatic events. As one respondent noted, nature can be ‘ugly’. Ugly aspects of nature are, at times, confronting and even fearsome for children (Soga et al., 2020). This is known as biophobia (Zhang et al., 2014); however, it is important to prevent this negative visceral reaction from spilling over to affect people’s appreciation of nature in general. If children avoid nature as a consequence of fear (e.g. Larkin, 2019), then they will also be alienated from all the ‘good things’ in nature (Harvey et al., 2020, p. 1). This may even occur in cases where nature is maligned: ‘I hate going outside because of the noise and people always watching what you do even if you just want to be you’. In this case, past negative experiences of going outside have precluded a respondent from appreciating nature.

Conclusions and suggestions for further research

Overwhelmingly, students in this study viewed nature in a positive way, as life-sustaining, beautiful, and calming. Most valued nature because elements such as trees were understood to support human life, though this concept did not seem to inspire a particular fervour for conservation. By contrast, some passionate individuals expressed a love of nature, especially animals, to the point where it formed an important part of their identity. Several respondents associated natural beauty with a moral imperative for environmental protection. But whilst some children appreciated restorative experiences in nature, a small minority regarded nature as unimportant, irrelevant, or a cause for concern.

Together, these key findings indicate that children and adolescents connect—or fail to connect—with nature via several different pathways, some of which offer promising means for further engaging youth with conservation. In the following paragraphs, we detail three main implications for the practice of environmental education: 1) educators should mobilise natural beauty and restorative experiences as means of engaging with nature; 2) providing opportunities to develop empathetic human-animal relationships is important; and 3) explicitly addressing students’ negative feelings towards nature is essential for successful nature-based learning.

Focusing on environmental education strategies associated with all four of our key themes will be critical to fully reflect children’s and adolescents’ views in curricula and pedagogy. In the case of beauty, although it may diminish through natural processes such as ageing, Safina (2019) notes that severe anthropogenic degradation of relatively undisturbed ecosystems can endanger natural beauty and create oppressive spaces that threaten human dignity. When faced with such extreme degradation, people who appreciate the aesthetics of nature may be doubly incentivised to protect it. Educating on the value of natural beauty, and the conservation imperatives from that standpoint, may be a useful approach to take in educating children and adolescents in urban settings. Additionally, our respondents described interactions with places and animals that caused them to associate positive emotions such as calm and love with nature. Overcoming barriers to accessibility of these natural elements may help children and adolescents nurture mutually beneficial relationships with nature into the future.

Self-described ‘animal lovers’ in our sample are a cohort of particular interest, as their relationship with nonhuman animals seems to spill over to an ethic of care for nature in general. This suggests that educators and parents aiming to engage children with nature might be well served to promote interactions with focal animal species as a starting point (Barthel et al., 2018). Establishing empathy for animals through activities such as perspective-taking (e.g. Angantyr et al., 2016) might lead children and adolescents to be more responsive towards animal-focused conservation messaging (Pearce et al., 2021). Our findings suggest that featuring visually attractive species, in particular, as ambassador animals could be doubly impactful, as it may also engage children and adolescents who are most responsive to natural beauty.

Still, we found that nature was not universally regarded by children and adolescents as important or benign. This indicates that environmental education programs should not proceed from the presumption that youth innately harbour positive views towards nature. It is important to acknowledge that children and adolescents who demonstrate a lack of concern or affiliation with nature may not respond to nature exposure in a positive manner. Thus, nature-based pedagogy might be underappreciated or resisted by some students, especially those who harbour fears or concerns. Educators should foresee this as a potential issue and prepare to navigate children's apprehensions around experiential environmental education. This is especially important given the observation that unmanaged fear can marginalise some outdoor learners (Reed & Smith, 2021), and the consistent research finding that anxiety and fear stifle children's learning (Jackson, 2015). To prevent and mitigate these impacts, environmental educators might start by discussing students' feelings about nature—both positive and negative—and designing the scope and sequence of programming so that activities perceived as safe and non-threatening precede a gradual introduction of challenge (see Lekies et al., 2015). It may also be prudent to work with youth to adapt programming so that it is more inclusive of diverse viewpoints. For example, directly addressing the challenges of natural disasters, and including strategies to cope with fear and grief around climate change (Baker et al., 2021), may work to manage some students' negative views of the natural world.

Examinations of diverse child-within-nature relationships could also be enhanced through future research embracing posthumanist ontologies (e.g. Rautio et al., 2017). By deeply interrogating urban children and adolescents' interactions with other beings, these approaches can illuminate how undesired or potentially harmful experiences, in particular, arise (Nxumalo & Pacini-Ketchabaw, 2017). Through understanding these scenarios, environmental educators can assist urban children and adolescents in navigating potentially troubling experiences. Additional research is needed to further explore attitudes that point to ambivalence and fear; reaching these students and understanding the implications of their understandings of nature is critical, as this view of nature has not been well-documented in previous studies and may not yet inform approaches to nature-based education. Efforts must be made to ensure these children and adolescents are heard on matters related to nature.

Future research is needed to determine whether children and adolescents who feel nature is important for human survival are willing to conserve only those few elements that explicitly serve a life-sustaining purpose. Further investigation is also required to determine how age might impact children's perspectives on the importance of nature. Considering this study's participants experienced an 'adolescent dip' in nature connectedness (see Keith et al., 2021), it would be important to investigate how older adolescents and younger children value nature, and whether that reflects the themes described here. Studies recruiting Majority World participants are also necessary if we are to understand how childhood nature connection manifests across cultures (Chawla, 2020).

A massive opportunity for future research exists in the currently embryonic field of children's environmental aesthetics. Given the increasing attention being paid to aesthetics in the conservation community (e.g. in discussions of cultural ecosystem services), and the identification of beauty as one of five key pathways to nature connection in adults (*sensu* Lumber et al., 2017), child-focused studies in this area are overdue. In 2008, Billmann-Mahecha & Gebhard noted that 'the current discourse on approaches to the aesthetics of nature does not relate to children; ontogenetic issues do not play a role.' (p. 27). This has not changed in the decade since. It is exciting to see researchers beginning to include beauty in the discourse around 'good things' children notice in nature (Harvey et al., 2020), but empirical studies wholly devoted to children's and adolescents' aesthetics of nature are required if we are to understand how appreciation of natural beauty might link to youth environmentalism. The data we present here offer a starting point for further focused analyses in this area.

A major strength of this study is that it reflects the thoughts and feelings of urban children and adolescents; a group of citizens who may be ignored and excluded from consultation on

a swath of issues including environmental matters (Rios & Menezes, 2017). Importantly, our participants were a large cohort spread all throughout an urban centre, which allowed us to engage individuals with a wide range of perspectives that enriched our analyses. However, gauging the importance of nature to our respondents via a questionnaire did limit the depth and complexity with which we could delve into students' conceptions and valuations of nature (which were typed vs. spoken). This could be remedied by collecting additional qualitative data via alternative, in-depth methods such as diaries, interviews, or focus groups. Ideally, these would include a more gradual and nuanced introduction to the topic of discussion (e.g. a drawing task), as opposed to brief prompts such as 'Is nature important to you?' from our questionnaire. Similarly, we acknowledge that the specific lexical positioning of 'nature' relative to the individual (i.e. 'you', the respondent) may in some way oversimplify the complex emergence of entangled urban/nature/child assemblages (e.g. Somerville & Hickey, 2017). By employing alternative methodologies such as ethnography, researchers can follow participants through these entanglements (see Rautio et al., 2017). This study's findings set the stage for a diversity of approaches to be used, in future, to extend investigations of how urban children and adolescents view nature.

Despite the contention in some academic circles that 'nature' is an empty signifier (e.g. Swyngedouw, 2011), here we show it is nonetheless important to urban children and adolescents. Almost all our respondents quickly formulated and expressed meaningful thoughts about nature. Rather than reifying an 'othered' nature, the act of asking urban children and adolescents about nature gave them opportunities to define their own unique relationships with it. Some of these relations dissolved arbitrary boundaries between human and non-human entities; none echoed the adult nostalgia permeating 'children in nature' discourses (Duhn et al., 2017, p. 1363). This suggests that instead of uncritically promoting a romantic version of nature or doing away with the concept entirely, researchers can learn more about how children and adolescents continually operationalise 'nature' as they go about their lives. The important thing is to ask.

Notes

1. Ethical protocols were approved via both the University of Sydney's Human Research Ethics Committee (#2016/961) and the New South Wales Government's State Education Research Applications Process (#2016467).
2. Approval from principals was stipulated by the NSW State Education Research Applications Process as a prerequisite for subsequent participation of their students.

Acknowledgements

We sincerely thank all the students who took part in this research, as well as the parents and teachers who facilitated their participation.

Disclosure statement

We declare that no competing interests exist.

ORCID

Ryan J. Keith  <http://orcid.org/0000-0002-5603-3261>
Lisa M. Given  <http://orcid.org/0000-0003-1840-6175>
John M. Martin  <http://orcid.org/0000-0003-2731-9292>
Dieter F. Hochuli  <http://orcid.org/0000-0002-6673-4475>

References

- Abbott-Chapman, J. 2006. "Time out in 'Green Retreats' & Adolescent Wellbeing." *Youth Studies Australia* 25 (4): 9–16.
- Amprazis, A., and P. Papadopoulou. 2020. "Plant Blindness: A Faddish Research Interest or a Substantive Impediment to Achieve Sustainable Development Goals?" *Environmental Education Research* 26 (8): 1065–1087. doi:10.1080/13504622.2020.1768225.
- Angantyr, M., E. M. Hansen, J. H. Eklund, and K. Malm. 2016. "Reducing Sex Differences in Children's Empathy for Animals through a Training Intervention." *Journal of Research in Childhood Education* 30 (3): 273–281. doi:10.1080/02568543.2016.1178198.
- Antal, M., and S. Drews. 2015. "Nature as Relationship Partner: An Old Frame Revisited." *Environmental Education Research* 21 (7): 1056–1078. doi:10.1080/13504622.2014.971715.
- Aslanimehr, P., E. Marsal, B. Weber, and F. Knapp. 2018. "Nature Gives and Nature Takes: A Qualitative Comparison between Canadian and German Children about Their Concepts of 'Nature.'" *Childhood & Philosophy* 14 (30): 483–515. doi:10.12957/childphil.2018.30037.
- Bagot, K. L., F. C. L. Allen, and S. Toukhsati. 2015. "Perceived Restorativeness of Children's School Playground Environments: Nature, Playground Features and Play Period Experiences." *Journal of Environmental Psychology* 41: 1–9. doi:10.1016/j.jenvp.2014.11.005.
- Baker, C., S. Clayton, and E. Bragg. 2021. "Educating for Resilience: Parent and Teacher Perceptions of Children's Emotional Needs in Response to Climate Change." *Environmental Education Research* 27 (5): 687–705. doi:10.1080/13504622.2020.1828288.
- Barger, B., J. Torquati, L. R. Larson, J. M. Bartz, C. Johnson-Gaither, A. Gardner, E. Moody, et al. 2021. "Measuring Green Space Effects on Attention and Stress in Children and Youth: A Scoping Review." *Children, Youth and Environments* 31 (1): 1–54. doi:10.7721/chilyoutenvi.31.1.0001.
- Barker, J., and S. Weller. 2003. "'Is It Fun?' Developing Children Centred Research Methods." *International Journal of Sociology and Social Policy* 23 (1/2): 33–58. doi:10.1108/01443330310790435.
- Barraza, L. 2001. "Perception of Social and Environmental Problems by English and Mexican School Children." *Canadian Journal of Environmental Education (CJEE)* 6 (1): 139–157. <https://cjee.lakeheadu.ca/article/view/292>.
- Barthel, S., S. Belton, C. M. Raymond, and M. Giusti. 2018. "Fostering Children's Connection to Nature Through Authentic Situations: The Case of Saving Salamanders at School." *Frontiers in Psychology* 9: 928. doi:10.3389/fpsyg.2018.00928.
- Beery, T. H., and K. A. Jørgensen. 2018. "Children in Nature: Sensory Engagement and the Experience of Biodiversity." *Environmental Education Research* 24 (1): 13–25. doi:10.1080/13504622.2016.1250149.
- Beery, T. H., and K. S. Lekies. 2021. "Nature's Services and Contributions: The Relational Value of Childhood Nature Experience and the Importance of Reciprocity." *Frontiers in Ecology and Evolution* 9: 251. doi:10.3389/fevo.2021.636944.
- Behrenfeld, M. J., J. T. Randerson, C. R. McClain, G. C. Feldman, S. O. Los, C. J. Tucker, P. G. Falkowski, et al. 2001. "Biospheric Primary Production during an ENSO Transition." *Science* 291 (5513): 2594–2597. doi:10.1126/science.1055071.
- Billmann-Mahecha, E., and U. Gebhard. 2009. "'If we Had No Flowers...' Children, Nature, and Aesthetics." *Journal of Developmental Processes* 4 (1): 24–42.
- Birch, J., C. Rishbeth, and S. R. Payne. 2020. "Nature Doesn't Judge You - How Urban Nature Supports Young People's Mental Health and Wellbeing in a Diverse UK City." *Health & Place* 62: 102296. doi:10.1016/j.healthplace.2020.102296.
- Bonnett, M., and J. Williams. 1998. "Environmental Education and Primary Children's Attitudes towards Nature and the Environment." *Cambridge Journal of Education* 28 (2): 159–174. doi:10.1080/0305764980280202.
- Brady, E., and J. Prior. 2020. "Environmental Aesthetics: A Synthetic Review." *People and Nature* 2 (2): 254–266. doi:10.1002/pan3.10089.
- Capaldi, C. A., H.-A. Passmore, R. Ishii, K. A. Chistopolskaya, J. Vowinckel, E. L. Nikolaev, and G. I. Semikin. 2017. "Engaging with Natural Beauty May Be Related to Well-Being Because It Connects People to Nature: Evidence from Three Cultures." *Ecopsychology* 9 (4): 199–211. doi:10.1089/eco.2017.0008.
- Charmaz, K. 2014. *Constructing Grounded Theory*. (2nd ed). Thousand Oaks: SAGE Publications.
- Chawla, L. 2020. "Childhood Nature Connection and Constructive Hope: A Review of Research on Connecting with Nature and Coping with Environmental Loss." *People and Nature* 2 (3): 619–642. doi:10.1002/pan3.10128.
- Chawla, L., K. Keena, I. Pevec, and E. Stanley. 2014. "Green Schoolyards as Havens from Stress and Resources for Resilience in Childhood and Adolescence." *Health & Place* 28: 1–13. doi:10.1016/j.healthplace.2014.03.001.
- Clarke, D. A. G., and J. Mcphie. 2014. "Becoming Animate in Education: Immanent Materiality and Outdoor Learning for Sustainability." *Journal of Adventure Education and Outdoor Learning* 14 (3): 198–216. doi:10.1080/14729679.2014.919866.
- Clayton, S. 2003. "Environmental Identity: A Conceptual and an Operational Definition." In *Identity and the Natural Environment: The Psychological Significance of Nature*, 45–65. Cambridge, MA: MIT Press.

- Collado, S., and J. A. Corraliza. 2015. "Children's Restorative Experiences and Self-Reported Environmental Behaviors." *Environment and Behavior* 47 (1): 38–56. doi:10.1177/0013916513492417.
- Collado, S., L. Íñiguez-Rueda, and J. A. Corraliza. 2016. "Experiencing Nature and Children's Conceptualizations of the Natural World." *Children's Geographies* 14 (6): 716–730. doi:10.1080/14733285.2016.1190812.
- Collado, S., R. Rodríguez-Rey, and M. A. Sorrel. 2022. "Does Beauty Matter? The Effect of Perceived Attractiveness on Children's Moral Judgments of Harmful Actions against Animals." *Environment and Behavior* 54 (2): 247–275. doi:10.1177/00139165211014626.
- Collado, S., and H. Staats. 2016. "Contact with Nature and Children's Restorative Experiences: An Eye to the Future." *Frontiers in Psychology* 7: 1885. doi:10.3389/fpsyg.2016.01885.
- Cutter-Mackenzie, A. 2014. "Where Are Children and Young People in Environmental Education Research?" *Australian Journal of Environmental Education* 30 (1): 103–105. doi:10.1017/ae.2014.32.
- Dallimer, M., K. N. Irvine, A. M. J. Skinner, Z. G. Davies, J. R. Rouquette, L. L. Maltby, P. H. Warren, P. R. Armsworth, and K. J. Gaston. 2012. "Biodiversity and the Feel-Good Factor: Understanding Associations between Self-Reported Human Well-Being and Species Richness." *BioScience* 62 (1): 47–55. doi:10.1525/bio.2012.62.1.9.
- de Pinho, J. R., C. Grilo, R. B. Boone, K. A. Galvin, and J. G. Snodgrass. 2014. "Influence of Aesthetic Appreciation of Wildlife Species on Attitudes towards Their Conservation in Kenyan Agropastoralist Communities." *PLoS One* 9 (2): e88842. doi:10.1371/journal.pone.0088842.
- Dickinson, E. 2013. "The Misdiagnosis: Rethinking 'Nature-Deficit Disorder.'" *Environmental Communication* 7 (3): 315–335. doi:10.1080/17524032.2013.802704.
- Duhn, I., K. Malone, and M. Tesar. 2017. "Troubling the Intersections of Urban/Nature/Childhood in Environmental Education." *Environmental Education Research* 23 (10): 1357–1368. doi:10.1080/13504622.2017.1390884.
- Esser, F. 2016. (Ed.). *Reconceptualising Agency and Childhood: New Perspectives in Childhood Studies*. Routledge, Taylor & Francis Group.
- Fägerstam, E. 2012. "Children and Young People's Experience of the Natural World: Teachers' Perceptions and Observations." *Australian Journal of Environmental Education* 28 (1): 1–16. doi:10.1017/ae.2012.2.
- Ferguson, T. 2008. "'Nature' and the 'Environment' in Jamaica's Primary School Curriculum Guides." *Environmental Education Research* 14 (5): 559–577. doi:10.1080/13504620802345966.
- Fisher, D. R. 2019. "The Broader Importance of #FridaysForFuture." *Nature Climate Change* 9 (6): 430–431. doi:10.1038/s41558-019-0484-y.
- Freeman, C., and Y. Von Heezik. 2018. *Children, Nature and Cities: Rethinking the Connections*. Abingdon: Routledge.
- Given, L. M., and H. A. Olson. 2003. "Knowledge Organization in Research: A Conceptual Model for Organizing Data." *Library & Information Science Research* 25 (2): 157–176. doi:10.1016/S0740-8188(03)00005-7.
- Gobster, P. H., J. I. Nassauer, T. C. Daniel, and G. Fry. 2007. "The Shared Landscape: What Does Aesthetics Have to Do with Ecology?" *Landscape Ecology* 22 (7): 959–972. doi:10.1007/s10980-007-9110-x.
- Gunnthorsdottir, A. 2001. "Physical Attractiveness of an Animal Species as a Decision Factor for Its Preservation." *Anthrozoös* 14 (4): 204–215. doi:10.2752/089279301786999355.
- Hahn, E. R. 2021. "The Developmental Roots of Environmental Stewardship: Childhood and the Climate Change Crisis." *Current Opinion in Psychology* 42: 19–24. doi:10.1016/j.copsyc.2021.01.006.
- Hand, K. L., C. Freeman, P. J. Seddon, M. R. Recio, A. Stein, and Y. van Heezik. 2017. "The Importance of Urban Gardens in Supporting Children's Biophilia." *Proceedings of the National Academy of Sciences of the United States of America* 114 (2): 274–279. doi:10.1073/pnas.1609588114.
- Hartig, T. 2021. "Restoration in Nature: Beyond the Conventional Narrative." In *Nature and Psychology: Biological, Cognitive, Developmental, and Social Pathways to Well-Being*, edited by A. R. Schutte, J. C. Torquati, & J. R. Stevens, 89–151. Berlin: Springer International Publishing. doi:10.1007/978-3-030-69020-5_5.
- Harvey, C., J. Hallam, M. Richardson, and R. Wells. 2020. "The Good Things Children Notice in Nature: An Extended Framework for Reconnecting Children with Nature." *Urban Forestry & Urban Greening* 49: 126573. doi:10.1016/j.ufug.2019.126573.
- Hyun, E. 2005. "How is Young Children's Intellectual Culture of Perceiving Nature Different from Adults?" *Environmental Education Research* 11 (2): 199–214. doi:10.1080/1350462042000338360.
- Jackson, C. 2015. "Affective Dimensions of Learning." In *The SAGE Handbook of Learning*, edited by D. Scott & E. Hargreaves, 353–362. Thousand Oaks: SAGE Publications.
- James, S. 1990. *Is There a 'Place' for Children in Geography?* *Area* 22 (3): 278–283. <https://www.jstor.org/stable/20002871>.
- Kahn, P. H. 2002. "Children's Affiliations with Nature: Structure, Development, and the Problem of Environmental Generational Amnesia." In *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*, 93–116. Cambridge, MA: MIT Press.
- Kals, E., and H. Iltner. 2003. "Children's Environmental Identity: Indicators and Behavioral Impacts." In *Identity and the Natural Environment* 135–157. Cambridge, MA: MIT Press.
- Kals, E., D. Schumacher, and L. Montada. 1999. "Emotional Affinity toward Nature as a Motivational Basis to Protect Nature." *Environment and Behavior* 31 (2): 178–202. doi:10.1177/00139169921972056.

- Kaplan, R. and S. Kaplan. 1989. *The Experience of Nature: A Psychological Perspective*. Cambridge: Cambridge University Press.
- Keith, R. J., L. M. Given, J. M. Martin, and D. F. Hochuli. 2021. "Urban children's connections to nature and environmental behaviors differ with age and gender." *PLoS One* 16 (7): e0255421. doi:10.1371/journal.pone.0255421.
- Keliher, V. 1997. "Children's Perceptions of Nature." *International Research in Geographical and Environmental Education* 6 (3): 240–243. doi:10.1080/10382046.1997.9965051.
- Kellert, S. R. 1993. "The Biological Basis for Human Values of Nature." In *The Biophilia Hypothesis*, edited by S. R. Kellert & E. O. Wilson, 42–69. Washington, DC: Island Press.
- Kellett, M. 2005. *How to Develop Children as Researchers: A Step-by-Step Guide to Teaching the Research Process*. Thousand Oaks: SAGE Publications.
- Klebl, C., Y. Luo, and B. Bastian. 2022. "Beyond Aesthetic Judgment: Beauty Increases Moral Standing through Perceptions of Purity." *Personality and Social Psychology Bulletin* 48 (6): 954–967. doi:10.1177/01461672211023648.
- Klebl, C., Y. Luo, N. P.-J. Tan, J. T. Ping Ern, and B. Bastian. 2021. "Beauty of the Beast: Beauty as an Important Dimension in the Moral Standing of Animals." *Journal of Environmental Psychology* 75: 101624. doi:10.1016/j.jenvp.2021.101624.
- Korpela, K. 2002. "Children's Environment." In *Handbook of Environmental Psychology*, edited by R. B. Bechtel & A. Churchman, 363–373. New York: John Wiley & Sons.
- Korpela, K., M. Kyttä, and T. Hartig. 2002. "Restorative Experience, Self-Regulation, and Children's Place Preferences." *Journal of Environmental Psychology* 22 (4): 387–398. doi:10.1006/jevp.2002.0277.
- Kraft, P., J. A. P. Balestieri, A. E. M. Campos, B. Coles, S. Hadfield-Hill, J. Horton, P. V. Soares, M. R. N. Vilanova, C. Walker, and C. Zara. 2019. "(Re)Thinking (Re)Connection: Young People, "Natures" and the Water–Energy–Food Nexus in São Paulo State, Brazil." *Transactions of the Institute of British Geographers* 44 (2): 299–314. doi:10.1111/tran.12277.
- Lange, A. and J. Mierendorff. 2009. "Method and Methodology in Childhood Research." In *The Palgrave Handbook of Childhood Studies*, edited by J. Qvortrup, W. A. Corsaro, & M.-S. Honig, 78–95. New York: Palgrave Macmillan.
- Larkin, D. B. 2019. "Before Today I Was Afraid of Trees: Rethinking Nature Deficit Disorder in Diverse Classrooms." In *Teaching Science in Diverse Classrooms: Real Science for Real Students*, by D. B. Larkin, 68–76. Abingdon: Routledge.
- Lekies, K. S., G. Yost, and J. Rode. 2015. "Urban Youth's Experiences of Nature: Implications for Outdoor Adventure Recreation." *Journal of Outdoor Recreation and Tourism* 9: 1–10. doi:10.1016/j.jort.2015.03.002.
- Lenart, B. A. 2020. "A Wholesome Anthropocentrism: Reconceptualizing the Value of Nature within the Framework of an Enlightened Self-Interest." *Ethics and the Environment* 25 (2): 97–117. doi:10.2979/ethicsenviro.25.2.05.
- Liddicoat, K. and M. E. Krasny. 2013. "Research on the Long-Term Impacts of Environmental Education." In *International Handbook of Research on Environmental Education*, edited by R. B. Stevenson, M. Brody, J. Dillon, & A. E. J. Wals, 1st ed., 289–297. Abingdon: Routledge. doi:10.4324/9780203813331-45
- Lindemann-Matthies, P. 2005. "'Loveable' Mammals and 'Lifeless' Plants: How Children's Interest in Common Local Organisms Can Be Enhanced through Observation of Nature." *International Journal of Science Education* 27 (6): 655–677. doi:10.1080/09500690500038116.
- Lindemann-Matthies, P. 2006. "Investigating Nature on the Way to School: Responses to an Educational Programme by Teachers and Their Pupils." *International Journal of Science Education* 28 (8): 895–918. doi:10.1080/10670560500438396.
- Lintott, S. 2006. "Toward Eco-Friendly Aesthetics." *Environmental Ethics* 28 (1): 57–76. doi:10.5840/enviroethics200628139.
- Loughland, T., A. Reid, and P. Petocz. 2002. "Young People's Conceptions of Environment: A Phenomenographic Analysis." *Environmental Education Research* 8 (2): 187–197. doi:10.1080/13504620220128248.
- Louv, R. 2005. *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder* (1st ed.). Chapel Hill: Algonquin Books.
- Lumber, R., M. Richardson, and D. Sheffield. 2017. "Beyond Knowing Nature: Contact, Emotion, Compassion, Meaning, and Beauty Are Pathways to Nature Connection." *PLoS One* 12 (5): e0177186. doi:10.1371/journal.pone.0177186.
- Malone, K. 2016. "Reconsidering Children's Encounters with Nature and Place Using Posthumanism." *Australian Journal of Environmental Education* 32 (1): 42–56. doi:10.1017/ae.2015.48.
- Marešová, J., and D. Frynta. 2008. "Noah's Ark is Full of Common Species Attractive to Humans: The Case of Boid Snakes in Zoos." *Ecological Economics* 64 (3): 554–558. doi:10.1016/j.ecolecon.2007.03.012.
- Marselle, M. R., T. Hartig, D. T. C. Cox, S. de Bell, S. Knapp, S. Lindley, M. Triguero-Mas, et al. 2021. "Pathways Linking Biodiversity to Human Health: A Conceptual Framework." *Environment International* 150: 106420. doi:10.1016/j.envint.2021.106420.
- Mcphie, J., and D. A. G. Clarke. 2020. "Nature Matters: Diffracting a Keystone Concept of Environmental Education Research – Just for Kicks." *Environmental Education Research* 26 (9–10): 1509–1526. doi:10.1080/13504622.2018.1531387.
- Mygind, L., E. Kjeldsted, R. Hartmeyer, E. Mygind, M. Bølling, and P. Bentsen. 2019. "Mental, Physical and Social Health Benefits of Immersive Nature-Experience for Children and Adolescents: A Systematic Review and Quality Assessment of the Evidence." *Health & Place* 58: 102136. doi:10.1016/j.healthplace.2019.05.014.

- Newman, L., and A. Dale. 2013. "Celebrating the Mundane: Nature and the Built Environment." *Environmental Values* 22 (3): 401–413. doi:10.3197/096327113X13648087563827.
- Nghiem, T. P. L., K. L. Wong, L. Jeevanandam, C. c. Chang, L. Y. C. Tan, Y. Goh, and L. R. Carrasco. 2021. "Biodiverse Urban Forests, Happy People: Experimental Evidence Linking Perceived Biodiversity, Restoration, and Emotional Wellbeing." *Urban Forestry & Urban Greening* 59: 127030. doi:10.1016/j.ufug.2021.127030.
- Novotný, P., E. Zimová, A. Mazouchová, and A. Šorgo. 2021. "Are Children Actually Losing Contact with Nature, or is It That Their Experiences Differ from Those of 120 Years Ago?" *Environment and Behavior* 53 (9): 931–952. doi:10.1177/0013916520937457.
- Nxumalo, F., and V. Pacini-Ketchabaw. 2017. "'Staying with the Trouble' in Child-Insect-Educator Common Worlds." *Environmental Education Research* 23 (10): 1414–1426. doi:10.1080/13504622.2017.1325447.
- op de Beeck, N. 2018. "Children's Ecoliterature and the New Nature Study." *Children's Literature in Education* 49 (1): 73–85. doi:10.1007/s10583-018-9347-9.
- Owens, P. E., and L. McKinnon. 2009. "In Pursuit of Nature: The Role of Nature in Adolescents' Lives." *Journal of Developmental Processes* 4 (1): 43–58.
- Panno, A., A. Theodorou, G. Carrus, C. Imperatori, G. Spano, and G. Sanesi. 2020. "Nature Reappraisers, Benefits for the Environment: A Model Linking Cognitive Reappraisal, the "Being Away" Dimension of Restorativeness and Eco-Friendly Behavior." *Frontiers in Psychology* 11: 1986. doi:10.3389/fpsyg.2020.01986.
- Paraskeva-Hadjichambi, D., K. Korfiatis, A.Ch. Hadjichambis, and M. Arianoutsou. 2012. "Conservation Reasoning and Proposed Actions for the Protection of Threatened Plant Species: Insights from a Sample of Rural and Urban Children of Cyprus." *Society & Natural Resources* 25 (9): 868–882. doi:10.1080/08941920.2011.642461.
- Parsons, R. 1995. "Conflict between Ecological Sustainability and Environmental Aesthetics: Conundrum, Canard or Curiosity?" *Landscape and Urban Planning* 32 (3): 227–244. doi:10.1016/0169-2046(95)07004-E.
- Payne, P. 1998. "Children's Conceptions of Nature." *Australian Journal of Environmental Education* 14: 19–26. doi:10.1017/S0814062600003918.
- Pearce, H., L. Hudders, D. V. de Sompel, and V. Cauberghe. 2021. "Motivating Children to Become Green Kids: The Role of Victim Framing, Moral Emotions, and Responsibility on Children's Pro-Environmental Behavioral Intent." *Environmental Communication* 15 (7): 917–969. doi:10.1080/17524032.2021.1934056.
- Pointon, P. 2014. "'The City Snuffs out Nature': Young People's Conceptions of and Relationship with Nature." *Environmental Education Research* 20 (6): 776–794. doi:10.1080/13504622.2013.833595.
- Powers, M. 2018. "Juliana v United States: The Next Frontier in US Climate Mitigation?" *Review of European, Comparative & International Environmental Law* 27 (2): 199–204. doi:10.1111/reel.12248.
- Proyer, R. T., F. Gander, S. Wellenzohn, and W. Ruch. 2016. "Nine Beautiful Things: A Self-Administered Online Positive Psychology Intervention on the Beauty in Nature, Arts, and Behaviors Increases Happiness and Ameliorates Depressive Symptoms." *Personality and Individual Differences* 94: 189–193. doi:10.1016/j.paid.2016.01.028.
- Punch, S. 2020. "Why Have Generational Orderings Been Marginalised in the Social Sciences Including Childhood Studies?" *Children's Geographies* 18 (2): 128–140. doi:10.1080/14733285.2019.1630716.
- Rautio, P., R. Hohti, R.-M. Leinonen, and T. Tammi. 2017. "Reconfiguring Urban Environmental Education with 'Shitgull' and a 'Shop.'" *Environmental Education Research* 23 (10): 1379–1390. doi:10.1080/13504622.2017.1325446.
- Reed, J., and H. Smith. 2021. "'Everything We Do Will Have an Element of Fear in It': Challenging Assumptions of Fear for All in Outdoor Adventurous Education." *Journal of Adventure Education and Outdoor Learning Ahead-of-Print*: 1–13. doi:10.1080/14729679.2021.1961092.
- Richardson, M., J. Dobson, D. J. Abson, R. Lumber, A. Hunt, R. Young, and B. Moorhouse. 2020. "Applying the Pathways to Nature Connectedness at a Societal Scale: A Leverage Points Perspective." *Ecosystems and People* 16 (1): 387–401. doi:10.1080/26395916.2020.1844296.
- Richardson, M., and K. McEwan. 2018. "30 Days Wild and the Relationships between Engagement with Nature's Beauty, Nature Connectedness and Well-Being." *Frontiers in Psychology* 9: 1500. doi:10.3389/fpsyg.2018.01500.
- Rios, C., and I. Menezes. 2017. "'I Saw a Magical Garden with Flowers That People Could Not Damage!': Children's Visions of Nature and of Learning about Nature in and out of School." *Environmental Education Research* 23 (10): 1402–1413. doi:10.1080/13504622.2017.1325450.
- Rottman, J. 2014. "Breaking down Biocentrism: Two Distinct Forms of Moral Concern for Nature." *Frontiers in Psychology* 5: 905. doi:10.3389/fpsyg.2014.00905.
- Safina, C. 2019. The real case for saving species: We don't need them, but they need us. *Yale Environment* 360. <https://e360.yale.edu/features/the-real-case-for-saving-species-we-dont-need-them-but-they-need-us>.
- Salazar, G., M. C. Monroe, C. Jordan, N. M. Ardoin, and T. H. Beery. 2021. "Improving Assessments of Connection to Nature: A Participatory Approach." *Frontiers in Ecology and Evolution* 8: 498. doi:10.3389/fevo.2020.609104.
- Sauvé, L. 2005. "Currents in Environmental Education: Mapping a Complex and Evolving Pedagogical Field." *Canadian Journal of Environmental Education (CJEE)* 10 (1): 11–37. <https://cjee.lakeheadu.ca/article/view/175>.
- Schebella, M. F., D. Weber, L. Schultz, and P. Weinstein. 2019. "The Wellbeing Benefits Associated with Perceived and Measured Biodiversity in Australian Urban Green Spaces." *Sustainability* 11 (3): 802. doi:10.3390/su11030802.

- Schultz, P. W. 2002. "Inclusion with Nature: The Psychology of Human-Nature Relations." In *Psychology of Sustainable Development*, edited by P. Schmuck & W. P. Schultz, 61–78. New York: Springer. doi:10.1007/978-1-4615-0995-0_4.
- Sjöblom, P., and L.-A. Wolff. 2017. "It Wouldn't Be the Same without Nature"—the Value of Nature according to Finnish Upper Secondary School Students." *The Journal of Environmental Education* 48 (5): 322–333. doi:10.1080/00958964.2017.1367637.
- Skilbeck, A. 2020. "A Thin Net over an Abyss: Greta Thunberg and the Importance of Words in Addressing the Climate Crisis." *Journal of Philosophy of Education* 54 (4): 960–974. doi:10.1111/1467-9752.12485.
- Small, E. 2011. "The New Noah's Ark: Beautiful and Useful Species Only. Part 1. Biodiversity Conservation Issues and Priorities." *Biodiversity* 12 (4): 232–247. doi:10.1080/14888386.2011.642663.
- Small, E. 2012. "The New Noah's Ark: Beautiful and Useful Species Only. Part 2. The Chosen Species." *Biodiversity* 13 (1): 37–53. doi:10.1080/14888386.2012.659443.
- Soga, M., M. J. Evans, T. Yamanoi, Y. Fukano, K. Tsuchiya, T. F. Koyanagi, and T. Kanai. 2020. "How Can we Mitigate against Increasing Biophobia among Children during the Extinction of Experience?" *Biological Conservation* 242: 108420. doi:10.1016/j.biocon.2020.108420.
- Somerville, M., and S. Hickey. 2017. "Between Indigenous and Non-Indigenous: Urban/Nature/Child Pedagogies." *Environmental Education Research* 23 (10): 1427–1439. doi:10.1080/13504622.2017.1325451.
- Spiteri, J. 2021. "Can You Hear Me? Young Children's Understanding of Environmental Issues." *International Studies in Sociology of Education* 30 (1-2): 191–213. doi:10.1080/09620214.2020.1859401.
- Swyngedouw, E. 2011. "Depoliticized Environments: The End of Nature, Climate Change and the Post-Political Condition." *Royal Institute of Philosophy Supplement* 69: 253–274. doi:10.1017/S1358246111000300.
- Tam, K.-P. 2013. "Concepts and Measures Related to Connection to Nature: Similarities and Differences." *Journal of Environmental Psychology* 34: 64–78. doi:10.1016/j.jenvp.2013.01.004.
- Taylor, L., and D. F. Hochuli. 2015. "Creating Better Cities: How Biodiversity and Ecosystem Functioning Enhance Urban Residents' Wellbeing." *Urban Ecosystems* 18 (3): 747–762. doi:10.1007/s11252-014-0427-3.
- Taylor, L., E. H. Leckey, P. J. Lead, and D. F. Hochuli. 2020. "What Visitors Want from Urban Parks: Diversity, Utility, Serendipity." *Frontiers in Environmental Science* 8: 243. doi:10.3389/fenvs.2020.595620.
- Tillmann, S., B. Button, S. E. Coen, and J. A. Gilliland. 2019. "Nature Makes People Happy, That's What It Sort of Means: Children's Definitions and Perceptions of Nature in Rural Northwestern Ontario." *Children's Geographies* 17 (6): 705–718. doi:10.1080/14733285.2018.1550572.
- Tisdall, E. K. M., and S. Punch. 2012. "Not so 'New'? Looking Critically at Childhood Studies." *Children's Geographies* 10 (3): 249–264. doi:10.1080/14733285.2012.693376.
- Tribot, A.-S., Q. Carabeux, J. Deter, T. Claverie, S. Villéger, and N. Mouquet. 2018. "Confronting Species Aesthetics with Ecological Functions in Coral Reef Fish." *Scientific Reports* 8 (1): 11733. doi:10.1038/s41598-018-29637-7.
- Tribot, A.-S., J. Deter, and N. Mouquet. 2018. "Integrating the Aesthetic Value of Landscapes and Biological Diversity." *Proceedings of the Royal Society B: Biological Sciences* 285 (1886): 20180971. doi:10.1098/rspb.2018.0971.
- Tseng, Y.-C., and S.-M. Wang. 2020. "Understanding Taiwanese Adolescents' Connections with Nature: Rethinking Conventional Definitions and Scales for Environmental Education." *Environmental Education Research* 26 (1): 115–129. doi:10.1080/13504622.2019.1668354.
- Ulrich, R. S. 1983. "Aesthetic and Affective Response to Natural Environment." In *Behavior and the Natural Environment*, edited by I. Altman & J. F. Wohlwill, 85–125. New York: Springer. doi:10.1007/978-1-4613-3539-9_4.
- Van den Berg, A. E., A. Jorgensen, and E. R. Wilson. 2014. "Evaluating Restoration in Urban Green Spaces: Does Setting Type Make a Difference?" *Landscape and Urban Planning* 127: 173–181. doi:10.1016/j.landurbplan.2014.04.012.
- Veríssimo, D., G. Vaughan, M. Ridout, C. Waterman, D. MacMillan, and R. J. Smith. 2017. "Increased Conservation Marketing Effort Has Major Fundraising Benefits for Even the Least Popular Species." *Biological Conservation* 211: 95–101. doi:10.1016/j.biocon.2017.04.018.
- Vucetich, J. A., J. T. Bruskotter, and M. P. Nelson. 2015. "Evaluating Whether Nature's Intrinsic Value is an Axiom or Anathema to Conservation." *Conservation Biology* 29 (2): 321–332. doi:10.1111/cobi.12464.
- Wals, A. E. J. 1994. "Nobody Planted It, It Just Grew! Young Adolescents' Perceptions and Experiences of Nature in the Context of Urban Environmental Education." *Children's Environments* 11 (3): 177–193. <http://www.jstor.org/stable/41515260>.
- Wylie, J., N. Sheehy, C. McGuinness, and G. Orchard. 1998. "Children's Thinking about Air Pollution: A Systems Theory Analysis." *Environmental Education Research* 4 (2): 117–137. doi:10.1080/1350462980040201.
- Wyness, M. G. 2006. *Childhood and Society: An Introduction to the Sociology of Childhood*. New York: Palgrave Macmillan.
- Zhang, W., E. Goodale, and J. Chen. 2014. "How Contact with Nature Affects Children's Biophilia, Biophobia and Conservation Attitude in China." *Biological Conservation* 177: 109–116. doi:10.1016/j.biocon.2014.06.011.