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Diversifying tree-child relations: making the case for epistemological and methodological shifts in environmental education research

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ABSTRACT

This article argues for embracing epistemological and methodological diversity in order to advance recent shifts in environmental education that call for alternative spaces for learning. The article narrates our fieldwork experiences of conducting creative research working with children aged 7–9 years old in two primary schools in England, while exploring the children's immersive experiences with/of treescapes. Through featuring two case study examples, the article demonstrates what happens when children are positioned as co-researchers in inquiries related to environmental education. The work provides an example of 're-imagining' the future of environmental education research, while challenging the common framing of children as 'the future', those who should be tasked or inspired to develop their understanding of environmental issues. Instead, the article shifts the focus towards children's existing knowledge of their natural worlds and emphasises how and why adults should pay attention to these insights and their becoming with a particular focus on diversity.

Introduction

In this article we explore the complexity and diversity that characterise children's relationships with trees based on their accounts, experiences and engagement with the different research activities we narrate here. We embrace this diversity as a much-needed conceptual and methodological frame that contributes to complexifying knowledge beyond Euro-centric imaginings of the natural environment. As such, we pursue epistemological and methodological diversity as important components of advocating for environmental justice. To elaborate our thinking in this area, we present and analyse two case studies from our fieldwork. In Case Study 1, the authors collaborated with 30 Year 3 children. In Case Study 2, the authors, along with other research team members, worked with 90 children in Years 3 and 4. Bringing the two cases together, this work offers extensive ways of recognising children's diverse experiences and their knowledge with/about trees.

The article draws on a three-and-a-half year project called [Voices of the Future], which was supported by the UKRI Future of UK Treescapes programme and the Natural Environment Research Council [NERC]. The project was about children and young people and their

perceptions of urban and semi-urban treescapes. The term 'treescapes' offers an expansive umbrella word for trees in different landscapes including trees from different countries and places around the world (Ambreen, Badwan, and Pahl 2024). It includes trees from places familiar to children and young people, such as their homes, gardens, schools, streets and local and national parks as well as trees from places outside the UK.

The starting point for this work is based on the belief that immersing children in the exploration of trees, nature and environments is essential for discovering their existing knowledge systems while also creating the conditions for enriching their knowledge and engendering the connections necessary to address the interrelated global climate crisis (Chawla 2020). One of the core aspects of environmental education should be to enable children to make informed decisions and take both individual and collective actions to transform and protect the planet (Ojala et al. 2021).

This work contributes to the growing educational shift that aims to make environmental education programmes more relevant to children and more attuned to their surroundings (Altmeyer and Dreesmann 2021). Jickling et al. (2018) use the term 'alternative' to suggest recognising new, more attuned, embodied ways of being with the natural world while learning about individuals and their environments. Questioning human preoccupations, Jickling et al. (2018) encourage educators to attend to the more-than-human aspects of individuals' encounters with their natural worlds. Likewise, the 'Common Worlding(s)' framework enables educators to question the role of individualistic and humancentric views of learning about the natural world (Taylor, Zakharova, and Cullen 2021, 74). The 'Common Worlds' perspective as an ontological shift acknowledges the way children and the world are together, creating a temporal emergence and holding space and time for this worlding happenstance (Malone and Crinall 2023, 1189).

This shift brings significant methodological and pedagogical implications. For example, instead of simply listening to children and relying on articulated and recorded responses or survey data, researchers within this shift are encouraged to actively engage with children in more discursive ways (Rousell and Cutter-Mackenzie-Knowles 2020). Indeed, this involves shifting from conventional approaches of merely listening to children to more attuned, engaged, materially situated methods, empowering children and young people to produce stories of their engagement with their environments (Ambreen, Badwan, and Pahl 2024).

The contemporary conceptualisation of 'children as researchers' enables the view of children to shift from them being individuals to collective and relational beings (Spyrou 2019). Children interact with other human and more-than-human elements of their environments at the time of research, and this understanding requires researchers to engage children in research about their environments to look at after and beyond childhood (Kraftl 2020). Children's voices in research are considered multimodal (Hackett 2022), moving beyond the borders of verbal and written modes of language and communication (Ambreen at al., 2024).

Building on these calls, our work argues that encouraging children to explore their environments, to talk and to share stories more freely in research could lead to creative and diverse insights about their engagement with the natural world. The case studies described in this article include data from two different settings, and we listened to snippets of talk and video from children about their relationships with trees in both cases.

In the first case study, the children who worked with us, had diverse socio-cultural experiences and backgrounds. Some belonged to families who migrated from different parts of the world, settling in [Greater Manchester] as first, second, third and fourth generations. We focused on these children's experiences (Mayall 2020), appreciating their unique cultural practices and histories of attunement with various and changing places across the globe. We focused on recognising and valuing hidden, untold stories of tree–child relations within multilingual and culturally diverse urban city, highlighting the need to attend to the transnational and global beyond the common focus on the local and immediate. We argue for a conceptual framing that focuses on diversifying tree–child relations. Our work not only

highlights the interdependence between humans and the more-than-human world but also incorporates the unique histories associated with ethnically diverse children (Truman 2023). In the second case study, our work embraced many forms of knowing and being with children and trees. Moving away from extractivist modes of knowing (Spyrou 2024), we explored a methodology that recognises the children not only as research participants but as key contributors who have shaped our perspectives and theoretical becoming as educators and researchers.

Diversifying tree–child relations

Our thinking in this section focuses on the concept of diversity, using the modes of thinking demonstrated by the children in our case studies as a touchstone. We emphasise the importance of diversity in environmental education, particular through the lens of culturally diverse and child-led methodologies. We advocate for moving away from Euro-centric views of nature (Somerville and Hickey 2017) and for adopting an anti-colonial approach (Nxumalo 2016) to understand tree–child relationships. We also argue for a creative research environment (Pahl 2002) that empowers children to express their ideas and participate actively, interacting with both human and more-than-human actors during the research process.

Building on Nxumalo's work, we highlight how coloniality limits access to diverse knowledge and experiences (Nxumalo 2016). By rethinking children's relationships and treescapes, we aim to challenge the 'colonial imaginary' (Truman 2023) and promote diverse modes of thinking and researching. Nxumalo (2016) asserts that coloniality normalises taken-for-granted dominant Euro-centric, racialised and binary ideologies, limiting access to knowledge and experiences for all individuals. Drawing from her work with children and educators, Nxumalo (2016) uses the concept of 'refiguring presence' as a framework to unsettle everyday place relations in early childhood studies and invites us to adopt new and different perspectives when looking at everyday pedagogical encounters of children with colonial places.

Applying this to our work has involved rethinking children's relations with place and treescapes in the multicultural urban city of [Greater Manchester]. We were able to include diversity as a mode of thinking and as a tool for researching. This then reflected the children's diverse ethnic heritages, allowing the emergence of an anti-colonial lens that challenges what we call the 'colonial imaginary', drawing on Truman (2023). Truman (2023) stresses the importance of exploring correlations between the climate crisis and colonial crises: 'We're in a climate crisis, and it is a crisis of humanism, capitalism, and the coloniality of imagination' (Truman 2023, 117). To this end, she critiques the colonial imaginary, which is still part of the existing literature (taking English as an example), limiting individuals from thinking otherwise and imagining futures that are both different and independent from Euro-Western humanism and racial capitalism. Engaging with the critical work of anti-colonial literary scholars, Truman (2023) unsettles established literary content and suggests expanding the literature for students and teachers in ways that attune to different racial contexts.

Dutta's project (Dutta 2023) in Mumbai is presented as an example of such alternate imaginaries of climate education. Dutta engaged 40 Grade 8 students and teachers in co-creating an urban farm as a source of learning about food science and ecology and explains how students engaged in intimate ways that could be described as enchantment (Bennett 2010) while being involved in undirected and unconstrained explorations of the site. Being part of the farm was a unique, creative and affective learning experience, enabling pragmatic care-based relations between students and the place. This approach opens up a new mode of exploring the natural environment, creating a space of exploration and discovery, which itself is important.

In another example, Korteweg, Gonzalez, and Guillet (2010) explore the affordances of Indigenous picture books and the ways in which they offer accessible and immersive Indigenous sources of knowledge and worldviews as part of decolonising environmental education. By

considering Indigenous land-based value systems, they reconsider environmental crisis by including Indigenous sources of knowledge and worldviews in environmental curricula.

Commenting on the usefulness of sensory experiences in dissolving the stigmatisation of immigrant children as 'the other', Jørgensen and Martiny-Bruun (2020) urge practitioners and researchers to attend to children's relationships with the more-than-human. They question taken-for-granted approaches to immigrant children and nature in their work on sustainability education in early childhood in Denmark. Through their work with Syrian refugee children, they explore children's sensuous and aesthetic relationships with wind, trees, Indian ink and paper during their outdoor learning sessions. By describing the messy entanglements of the human and the non-human that emerged as part of children's encounters with outdoor place, Jørgensen and Martiny-Bruun (2019) critique the assumption that immigrant children experience nature as something separate that needs to be integrated or intertwined. As such, they offer important decolonial insights into how nature is perceived in different non-Western worldviews.

A diverse relationship to trees requires a complex, relational pedagogical account that takes on aesthetic dimensions such as enchantment (Olsson 2023). We understood children + trees as an entity that itself was porous and complex, rather than seeing children and trees as two separate entities. For example, Arvidsen (2018), in an exploration of den-building, argued that 'in-between children and materials is a field of two-way open-endedness where dens are growing' (p. 289). Starting with trees + children together with a diverse lens produces a different ontology that sees both as species of the planet. Therefore, in this article, rather than understanding children's relationships to trees as something about two things dialogically entwined with each other, we understand there to be a diversity of responses between trees and children.

We also found very few examples in the literature of children as leading and developing a research agenda. This finding echoes Rousell and Cutter-Mackenzie-Knowles (2020) perception that 'a very small contingent of the literature is orientated towards child-framed approaches to climate change education, which draws on the unique perspectives and experiences of children and young people to inform new frameworks and methods for teaching and learning about climate change' (Hart, 1992; Lawler and Patel 2012; Tanner 2010, 202). Part of the challenge for adult researchers in children's spaces is the need to get out of the way and listen to children's complex stories (see Yates et al. 2022). We used the idea of having a go and recognised that many forms of adult research interventions into children's lives (e.g. interviews, focus groups and questionnaires) might not necessarily be modes that the children themselves would select or respond to. They also represent linguistic forms of data that might privilege some children's voices over others. Many children prefer to draw, make films or narrate their worlds away from adults, which is why we used creative and collaborative methodologies as we demonstrate in this article.

Working with a non extractivist epistemology

In this research, our project team developed ways of working that involved listening to children and being with them, rather than extracting data from them. We resisted extractivist practices of knowledge production (Spyrou 2024), which unthinkingly take data from children. Instead we considered how we could work with children as co-researchers. Building on the work of Pahl and Pool (2021) and extending the Mosaic approach from Clark and Moss (2011), we offered the children in our study the opportunity to be co-researchers.

We developed participatory methodological tools in collaboration with children in two primary schools in the North-West of England. These tools enabled children to take the lead in making decisions and conducting research activities in ways that suited them. The tools allowed us, as adult researchers, to listen differently through attending to children's voices as distributed across language, bodies, spaces, artifacts and material entanglements (Ambreen, Badwan, and Pahl 2024; Badwan, Nunn, and Pahl 2024; Johnson and Badwan 2023). They also entailed asking

the children to interview one another, take photos, draw images, design woodlands for the future, plant trees of their choice and engage in different tree care activities.

This approach began with an ethics session where we outlined the concept of 'being a researcher' and the creative practice of 'doing research', inviting the young people to take on this role. Within this practice, we provided a range of data collection tools, including audio, video and still photography, as well as fieldnotes. This enabled the children to record their activities, sometimes sporadically, while they were engaged in them. Our stance, as Spyrou says, was to:

> …become more playful in research with children by experimenting and developing non-extractivist methodologies which reflect an underlying sense of relational epistemic humility; a kind of humility which recognizes the epistemic authority of the other as well as the limits of the adult researcher's own understanding which motivates epistemic collaboration and more egalitarian and socially aware ways of knowing based on trust… (Spyrou 2024, 5)

We privileged the moments when the children would take the lead, picking up their pens, becoming explorers or using iPads or fieldnotes to record ideas. This became a more relational process; for example, it opened up space for us to learn from the children rather than trying to make them provide answers to questions we did not know the answers to. We encouraged the children to take the lead in their interactions with trees. Working with multilingual communities, we were interested in stories from the children. We honoured what they knew and attuned to their multilingual and multimodal ways of doing things, including gestures and emotional responses. We drew on artistic and creative methods, including drawing, film, collage and experiential modes of thinking and doing, to learn with and from the children.

Research work with children in two primary schools

Here we present two case studies to describe our research with children in two different primary schools. Ethical approval for conducting this research in both settings was obtained from ethics committee at the Faculty of Health and Education at Manchester Metropolitan University with reference number (48088). Consent to work with children in both settings was obtained from children, their parents, teachers and the head teachers. A special ethics session was held with children in Case Study 1, and an ethics assembly in Case Study to discuss participant information sheets and consent forms with the children. Parents were given copies of the participant information sheets and consent forms by the schools, to confirm participation on behalf of their children. Our work in both schools took place over a period of a year and involved regular visits to the schools, focusing on children between 7 and 8 years old. One of the schools was in [Greater Manchester], one of the most culturally diverse cities in the United Kingdom. According to the GMCA Ethnicity Census (GMCA (Greater Manchester Combined Authority) 2023), 56.8% of the population in [Greater Manchester] are White, 20.9% are Asian British, 12% are Black British and 5.2% have mixed ethnicities, with 5.1% belonging to other ethnicities. The other school was in the semi-rural area of [Bolton) in [Greater Manchester], which was less diverse but included some multilingual children. In one research setting (Case Study 1: School A), the researcher (first author) regularly visited the school, which is situated in a central urban area, for eight months. In the other setting (Case Study 2: Research Setting B), the team visited a school situated in a semi-rural area over a period of six months to carry out tree-planting and tree-measuring activities, along with curricula work involving hopes and/or wishes of the children and information about trees. We include a table below (see Table 1) summarising the data generation activities in both schools.

During these activities, the children recorded their responses, impressions or thoughts differently. Some children drew pictures. Others wrote poems or used live worms to create wriggling fieldnotes on a piece of paper (see Ashcroft 2023). Surrounded by the richness of response,

Table 1. Research work with children in Schools A and B.

Case Study 1: School A				
Date	Activity	Indoor	Outdoor	Aims
19.10.2023	Research ethics	x		Children learned about research by reading participant information sheets and consent forms in small groups to understand the project's goals.
02.11.2023	Being co-researchers	x		Children learned about their roles and their rights as co-researchers.
23.11.2023	*The Tree of Hope* story session	x		Children listened to *The Tree of Hope* story by Kehhashan Basu and were inspired to create and share their own stories about trees, tree care, hope and change.
07.12.2023	Tree welfare	x		Children created a 'Tree Welfare Checklist' to identify healthy relationships between trees and humans. They discussed actions to protect trees.
18.01.2024	Listening to the languages of trees	x		Children learned how trees help each other in the forest through the storybook *Listen to the Languages of the Trees* by Tera Kelley.
08.02.2024	All being role play	x		Children role-played as both human and non-human characters to understand the interdependence of living and non-living entities within an ecosystem.
14.03.2024	Walking with trees	x	x	Children explored trees and recorded their findings, and shared their observations in small groups.
25.04.2024	Tree and care (story listening session)	x		Children listened to *The Boy Who Could Repair Everything* by Maaike Engelen and discussed the importance of caring for trees and forests, exploring the concept of restoring things to their original state.
02.05.2024	Treescapes and children session	x		Children recapped their project work from the past few months and created 'key messages' about the future of trees and children in the city by writing postcards for the future.
Case Study Two: School B				
Date	Activity	Indoor	Outdoor	Place (Location)
11.11.2022	Research ethics	x		In the school assembly hall, children were introduced to the project and research ethics.
11.11.2022	Thinking with trees	x		Children participated in a 'thinking about trees' activity, where they shared stories of their engagement with trees and drew their favourite trees.
05.12.2022	Designing the woodland	x	x	Children participated in outdoor learning walks to identify different tree species in the school playground. Later, they designed new woodlands by planning and mapping areas where they planted trees a month later.
11.01.2023	Hopeful stories	x		Children participated in a story reading activity, featuring *The Tree of Hope* story by Kehhashan Basu. They were then encouraged to share their own stories about trees, tree care, hope and change.
07.03.2023	Planting the woodland		x	Children planted 900 trees in various parts of the school woodland, collaborating with practitioners from a local community forest organisation [City of Trees].
14.03.2023	In the school woodland (forest school area)		x	Members of the research team interviewed a forest school practitioner who led outdoor activities in the school's woodland area.
27.03.2023	In the school woodland (forest school area)		x	Researchers worked with the children in the school's woodland area.
07.04.2023	Measuring trees	x	x	Children collaborated with scientists to learn about carbon sequestration and measured tree diameters to estimate carbon absorption in their school playground.
29.04.2024	Caring for trees	x	x	Children worked with a local community forest organisation [City of Trees], to learn about weeding and wood chipping for tree care and woodland maintenance.

we stepped away from talking about 'the data' and instead we immersed ourselves in the happenstance and the intra-actions. By doing this, we were resisting models of 'the researcher' as knowing best or extracting best. Instead, we position children as producers of knowledge rather than as sites of extraction (Spyrou, 2024). We learned from the children's inter-/intra-actions with trees about trees. We worked with forms of knowledge production alongside children as

co-researchers, while attending to their diversions and digressions along the way (Gallacher and Gallagher 2008). This meant attuning to children's own ways of knowing and forms of languaging their responses (Badwan 2021). As a research team, we focused on children's capacities as co-researchers, while learning to let go, not being in charge, and creating a culture of mild chaos where children's ideas could thrive and develop in unexpected ways.

Case Study 1: storytelling opening up a space of diversity

Our first example focuses more on diverse epistemologies and ways of knowing. It comes from a storytelling activity, based on a story called *The Tree of Hope* by Basu et al. (2017). This is a story about a tree planted in a desert by a little girl. The tree provides shade, and the birds come. Rains come because of the tree. The tree produces more saplings, which lead to a new forest. The story demonstrates the life that comes to life as a result of planting a single tree. For example, the tree has a tremendous effect on the climate conditions and the lives of the children living in the desert, enabling them to play with birds outdoors in the afternoon in its shade. Our intention in telling this story was to enable the children to think about the important role of the tree in affecting the planet and climate change through a book which positions the tree as the main character, with agency and the ability to do things and enact changes in the ecosystem.

The story was written by a young writer, Kehkashan Basu. It is situated in a desert, which provides the children in our project with a text that represents and recognises non-Western contexts (Truman 2023). The depiction of children's lives in the desert and how they were transformed by the tree was an attempt to re-imagine hopeful futures from a global perspective. In dialogue with the story, the children recorded their story-listening activity using iPads and digital voice recorders. In doing so, they captured nearly 40 audio recordings, 28 video snippets and more than 40 still images reflecting their experiences.

The children were sitting in rows while the (first author) was standing and walking around in the classroom. The story-listening activity was ongoing, and dialogues about the text and pictures of the story took place in the classroom. However, there was much more going on during the story-listening part of the session. When the children were positioned as 'co-researchers', they started exploring the storybook, and this went beyond just listening to the story. For instance, we include an example below (Figure 1) to illustrate how a child recorded the story-listening activity in their classroom.

Some children captured the story-listening part of the activity using the audio recorders provided to them. While they were expected to use the recorders after the story-listening part, when they would work on their own stories later in the activity, some children decided to record during the quiet story-listening part itself. We include examples of the children's audio recordings in the table below (Table 2).

Figure 1. *The Tree of Hope* storytelling session recorded by a child.

Table 2. Children's audio recording.

Background: The first author was reading the story (*The Tree of Hope*) to the children. The children were engaged in dialogues with the author. A part of the story-listening activity was recorded by the children:

Author: Do we have a similar hot weather in the UK like Khadra has?

Children: No.

A: How is the weather in the UK different from the desert?

Child 2: It always rains here.

A: It always rains… yes, but do we have sunshine?

Children: Hmm.

A: Yes, we do, but is it so hot that we cannot go outside?

Children: No

A: And what do we have that keeps the air cool, which Khadra does not have?

Child 1: She has a lot of sun.

A: Yes, we have sun as well, but we have something which protects us from the hot sun, right?

Child 1: The shade… some shade

A: The shade

Child 2: Shelters like some people have shelters.

A: Yes, some people do live in shelters. So, what is happening in Khadra's village that children have no shade or shelter and have to wait for the sun to set to play outside? Yes, there are children in some parts of the world where they do not have shelter and shade like us so it is important that we talk about them when we talk about protecting trees.

Child 2: Yes, and there is less oxygen in those areas.

A: Yes, and we go on page 3, in this picture, Khadra is hoping to get things to change? What is she hoping for?

Child 1: She is hoping for the weather to cool down so she can play outside.

Child 2: She is hoping for climate change to stop.

Episode#02

Child 1: Stop cutting down trees.

Child 2 (asking Child 1): Save trees….

Child 1 (saying it loudly in the recorder): Save treeeees!

Figure 2. Children sharing their tree stories.

After listening to the story, the children were asked to think about their favourite trees and to share their experiences. The children chose different ways to share their stories; some drew pictures, while others conducted interviews with peers in groups. The children also made paper leaves, expressing their hopes about trees. Since it was Christmas time, they decided to hang these leaves on their Christmas trees at home, if they had one. We include pictures of the children's tree stories and wishes, which were drawn, written and displayed on flip charts and paper leaves, in Figure 2 below:

While children were engaged in group discussions, creating and sharing their tree stories, the author walked around, interacting with different groups. In one group, she conversed with two children:

One child of South Asian (Chinese) descent shared their experiences of planting a tree with their grandfather in China. Another child of African Caribbean descent talked about the hot weather and lack of water in Zimbabwe, and how it is bad for children. When asked whether the child had been to Zimbabwe,

knew or had met those children, the child replied that he had heard his parents talking about them and had watched a TV show at home about them. (Fieldnotes 23.11.2023)

The story-listening activity did not explicitly reveal what the children had learned from the story about the Tree of Hope or what they had shared through their drawings and creative art pieces. Instead, the session focused more on research as a process (Benjamin 2021). Respecting the children's choices and allowing them to engage in their activities was crucial to fostering a mutual, reciprocal and caring research engagement with them (Spyrou, 2024). In doing so, the children also considered the discussions that went beyond trees as part of their research. Such stories and histories might seem unrelated or devalued by traditional adult-led research practices. However, embracing and valuing these hidden and untold stories is essential to appreciating the diverse forms of knowing and being in tree–child relationships within a multicultural city [Greater Manchester].

Case Study 2: diversity and children's relationship to trees

In the second example, we explore the concept of methodological diversity in terms of children's responses to and relationships with trees, collecting videos made by the children which were taken when they were working with scientists to measure trees. Our argument is to consider a more diverse lens for children's communicational and embodied relationships to trees with a focus this time on multimodal and haptic and sensory engagement.

We situate the work within a small school on the outskirts of [Bolton], attended by 315 children aged 4 to 11 years (Schoolguide.co.uk 2023). The project team worked with children from Years 3 and 4 (aged 7–8) across three classes, developing a programme that involved the children designing, planting and then measuring trees. The children planted 900 trees within the school grounds in collaboration with a forest organisation [City of Trees] and the class teachers, together with the project team. Our team included a philosopher, [Johan Siebers], a human geographer and childhood studies academic [Peter Kraftl], artist and filmmaker [Steven Pool] and Samyia Ambreen and Kate Pahl [co-authors of this piece]. Our team was augmented by a science team, focused on measuring the above- and below-ground tree growth to calculate the carbon capture of the trees.

In this section, we present some snippets of video (see Figures 3–9) taken by children during the 'tree measuring' day. Two scientists invited the children to measure the trees using various methods, including diameter tapes and a full laser-scanner. At the same time, the children spontaneously hugged and held the bark of the trees and used video to explore the arc of the trees into the sky. We analysed over 300 video snippets, which revealed how the children related to the trees in diverse ways, including hugging, circling and exploring through the camera lens.

Below we present seven snippets of video, shown in the order they were taken, which capture moments to learn from. These videos enabled us to identify the ways in which the children constructed their relationship to trees. The multiple and diverse modes of interaction became, in turn, a 'lexicon of experience' to describe the children's ways of relating to trees:

1. *Hugging.* There were multiple examples of children hugging trees. This occurred because the tree measuring day involved scientists demonstrating how to measure trees using diameter tapes, which measure the circumference of the tree. In this example (see Figure 3), the child's body is close to the tree, and their hand lightly touches the bark as she hugs the tree.
2. *Circling.* Circling a tree involved a number of children holding hands and dancing around a tree to form a protective circle. In this figure (see Figure 4), the children moved around the trees, sometimes close and sometimes further away, as a form of movement.

Figure 3. Tree hugging.

Figure 4. Tree circling.

Figure 5. Leaning against a tree.

Figure 6. Talking to a tree.

Figure 7. Tree as actor.

Figure 8. Bark.

3. *Turning your back on a tree.* Sometimes a child would turn their back and lean on a tree. This was another form of engagement with the tree, not modelled by adults but found and improvised upon by the child (see Figure 5).
4. *Talking to the tree.* Children often talked to the tree directly as if it would speak (Buber 1937). In this example (see Figure 6), the child is directly addressing the tree as an interlocutor in the conversation.

Figure 9. Tree as climbing.

5. *Tree as actor*. In some images the tree was portrayed as the main actor, with the child neither necessarily visible nor important. In this image (see Figure 7), the tree appears large against the smaller human buildings of the school.
6. *Bark*. In this image (see Figure 8), the close-up of the bark highlights its tactile quality, evoking a sense of attentiveness to the tree. This close-up itself is a form of listening to the tree.
7. *Tree as climbing*. In this image (see Figure 9), the space within the tree is captured, highlighting areas for climbing and experiencing the tree as a form of spatial change. Many of the children saw the trees as potential sites for climbing and looked upward to ascertain the trees' climb-ability.

In these small snippets of video (see Figures 3–9), the tree and the child are engaged in a spatial dialogic dance, exploring bark, spaces to climb, the roundness of the tree, and the tree as actor in a series of encounters. By breaking down these moments of interaction and capturing them in the visual images, the variety and complexity of the interactions are revealed. The visual and haptic, the felt sense of bark and the tree against the child's back, as well as the visual opening up of the tree as something tall and high, reveal a diversity of multimodal responses to the engagement with the trees.

Conclusion

The examples discussed here reveal different forms of diversity experienced as an approach to researching children's relationships to trees. We argue for a shift in the ways in which children are listened to, which involves respecting their knowledge systems and working with a focus on methodological and epistemic diversity in nature-based work. Environmental education itself needs to become a diverse practice of knowing (Taylor, Zakharova, and Cullen 2021) that can encompass what children already know, as well as the ways in which they come to know and communicate their ideas and becoming to know in/with/as a result of nature. Moving beyond the exclusively linguistic into creative and visual methodologies opens up these ways of knowing. Researching multilingually (Badwan 2021) opens a space of practice to discover what children know from different worldviews. Our work can be enriched by children's knowledge and can open a window into rich avenues for pedagogy, ethics, practice and scholarship in the field of environmental education.

In the first example we demonstrated the need to introduce stories that speak of/to different non-Western contexts (Truman 2023). The *'Tree of Hope'* story explored the different living conditions of children who lived in a desert compared to those living in an city. Using this story

as an example of how small actions by children can impact the local environment opened up a space of practice where children could re-imagine futures in global (not Euro-centric) contexts. These were the intentions, but the way the listening activity unfolded, returning to Spyrou (2024), opened up a space of experimentation with other means of research. The children played with the voice recorder, flip chart and Sharpies. Rather than listening, they engaged with different materials. This example confirms the need to recognise conceptual and methodological diversity when working with children in the classroom. By focusing on Global South contexts, it creates a space where children can potentially see themselves and other places that matter to them in the story (Nxumalo and Montes 2023).

In the second example, by enabling the children to record and document a tree-measuring activity, the multiplicity of the tree and diversity of responses to it were revealed. The children could become researchers alongside adults, and their epistemological alertness to the tree and its possibilities was highlighted. The many responses to the trees, revealed through the videos the children produced, were very complex and not necessarily visible to the adults around them. However, the range of responses and conceptual framings of the trees opened up a new space for exploration and understanding (Ambreen, Badwan, and Pahl 2024). There was a reciprocity in these relations that draws on the work of Yoon and Templeton (2019) in 'hearing children out'.

Taken together, the two examples are spaces of experimentation and exploration. They demonstrate the affordances and challenges associated with the different configurations of 'diversity' that we call for in this article. They create a messy roadmap (Pahl 2002), rather than a definite map, for embedding methodological diversity that accommodates different types of creative and participatory methodological tools, for embracing epistemological diversity that allows the flow of knowledge from different directions: child-centred, south-centred, popular, embodied and not easily storied. Essentially, these diversity practices are enablers to reimagining environmental education in ways that are different, socially just and anchored in the complexity and diversity of the human experience.

Authors' contributions

All authors, including Samyia Ambreen, Khawla Badwan, and Kate Pahl, conceived and planned the research. Samyia Ambreen conducted the fieldwork for case study 1. Samyia Ambreen and Kate Pahl conducted the field work for case study 2. Samyia Ambreen and Kate Pahl contributed to the data interpretation for both case studies. Samyia Ambreen led the manuscript writing, while Khawla Badwan and Kate Pahl provided critical feedback. All authors contributed to the development of the final version of the manuscript.

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No potential conflict of interest was reported by the author(s).

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