



THE MUDBOOK

Nature Play Framework



PUBLICATION DETAILS

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Dedication

We dedicate this Nature Play Framework to the passionate, creative and dedicated early childhood educators and children who participated in the Queensland Government Horizon Project, Mapping Scientific Concepts through Nature Play in Early Childhood Education: Achieving Excellence in STEM through Evidence-Based Pedagogies. Without the educators' rich contributions to the project, informed by a combined total of over 555 years' experience working in early childhood, together with the children's open, thoughtful and fascinating insights into nature play and the learning of scientific concepts, this Mudbook Nature Play Framework would not exist. We thank the educators and children sincerely for their participation, commitment and generosity in sharing their wisdom and experience.

South East Queensland sites (10)*

Birdwings Forest School – Guanaba
Clearview Early Learning and Kindergarten Nerang – Gold Coast
Community Kids Childcare and Early Education Centre Annerley – Brisbane
Green Leaves Early Learning Reedy Creek – Gold Coast
Kool Kids Early Learning Centre Nerang – Gold Coast
Kurilpa Community Child Care Centre – Brisbane
Pottsville Community Preschool and Nature Explorers – Pottsville (NSW)
Rise Early Learning Surfers Paradise – Gold Coast
Tamborine Mountain Community Kindergarten – Tamborine Mountain

Central and Far North Queensland sites (10)

Blackwater Tiny Tots Centre - Blackwater
C & K Emerald South Childcare – Emerald South
C&K Weipa Kindergarten & Preschool - Weipa
C&K nGundanoo Imbabee Community Childcare Centre – Rockhampton
Green Leaves Early Learning Forest Springs – Gladstone
Le Smileys Kindergarten and Childcare Berseker - Rockhampton
Le Smileys Kindergarten – Gracemere
Le Smileys Childcare – Gracemere
Rockhampton South Kindergarten – Rockhampton
Rainbow Valley Early Learning Centre – Gladstone

** All early childhood education settings above-mentioned have granted consent to be identified. One early childhood education setting did not provide consent and is therefore de-identified in this publication.*

TABLE OF CONTENTS

PUBLICATION DETAILS	2
ACKNOWLEDGEMENT OF COUNTRY	4
GROUNDING NATURE PLAY	8
MUDDY OPENINGS	10
What does past research tell us about nature play?	10
How is nature conceptualised in childhood?	11
How is play conceptualised?	12
How did we research nature play in this study?	12
What has the research revealed about nature play?	13
CHILDHOODNATURE	15
MUDDY BARRIERS	17
STEM AND NATURE PLAY	20
Earth	24
Weathering.....	24
Relations	24
Materials	24
Bodies	25
Time	25
Ecologies.....	25
NATURE PLAY PRACTICES AND PEDAGOGIES	27
Place/Country-responsive play	30
More than human play	32
Slow play.....	34
Sensorial play	36
Risky play	38
Imaginative play	39
Creative play.....	42
Discovery play	44
Death play	45
THE GRITTIENESS OF NATURE PLAY	48
NATURE PLAY ONLINE RESOURCES	58
REFERENCES	59

ACKNOWLEDGEMENT OF COUNTRY

I would like to acknowledge the traditional custodians of the country where our people are located across the dialect groups of the Minjungbal, Ngandowal and Yugambeh, of the Bundjalung Nation. We have cared and nurtured our land for many generations and continue to do so today. I pay my respects to Elders past and present, who have taught us cultural respect for country and each other. I give recognition to the cultural knowledge that has been passed down to me, which is important to not only me but also our community. The stories and history about land, water and skies help us connect to country, understanding how important it is and how nature supports our existence and our wellbeing.

It is vital for children to have opportunities to play and learn in the natural environment to gain an understanding of their world around them. Young children show a sense of wonder, they are inquisitive, ask questions, observe things and this inspires thinking. Children see, touch, feel, taste, and smell their surroundings. They use these senses to explore and learn about nature and appreciate the natural world. Giving children experiences in nature as they grow up gives them lifelong skills and may inspire or support them to study further, go on to research or take up a career path that helps look after the land and all that lives on it.

Southeast Queensland (QLD) and Northern New South Wales (NSW) is a region of high biodiversity with flora and fauna, in that we can still live off the land and water because it is so rich in resources in this area. It is referred to as the green and gold, with lush green rain forests and bush areas and the golden sand of our local beaches, with estuaries that run in between.

*To the audience of this book, the families and teachers, take time to connect with land and nature. Find opportunities to learn more about the culture within the community that you live, work and play – **Uncle Franc, Indigenous Cultural Educator, Fingal Head***

Uncle Franc, from the Saltwater people of the Bundjalung Nation, is an Indigenous Cultural Educator and local Aboriginal man that lives in Fingal Head. Uncle Franc has extensive knowledge of local history and flora and fauna of the local area. He has worked for many years to support educators and teachers to embed Indigenous practises and cultural heritage into their curriculums.



Figure 1: Photo taken by Jordi, age 4



Figure 2: Nature Explorers Pottsville, Southeast Queensland/Northern New South Wales



Figure 3: Birdwings Forest School Guanaba, Queensland, Australia



Figure 4: Birdwings Forest School Guanaba, Queensland, Australia

GROUNDING NATURE PLAY

We start everything we do with an acknowledgement. It feels right to us. It's really important to us that we help children to understand that we're all visitors on this land. That our role is to take care of not just each other but the environment, but also to generate - we sing this together so it helps us to generate - a sense of togetherness and stewardship for I guess the land and to acknowledge that it has been cared for tens of thousands of years before us. And we talk about this briefly now and then, and every now and then we'll add a bit more information for the children to remind them why we do this and it's also to help, we talk about this with the children to help introduce them to the land so that the land recognises them and the land will know their voices and it will know their bodies and it will welcome them and take care of them as well... That's something I learnt from Uncle Dez.

Uncle Dez taught us about that, a Welcome to Country is different we can't do that because we're not Kombumerri, but an Acknowledgement of Country the whole thing is saying here 'I am on this land will you look after me.' So we will look after the land but it's also an invitation to the land to look after us and we remind the children all the time throughout the day that we're here to look after things and it will look after us too. So, it just sort of comes up in conversations with our play.

We remind [the children] throughout the day "remember we made a promise this morning. We make the promise every morning so we won't pick these green leaves because I know you're not planning to eat those, and if you were going to eat them then you can pick them." So things like that and not taking all the rocks home in your pockets and that sort of thing. It belongs to the land and it can stay here". Jennifer McCormack, Birdwings Forest School, Guanaba.

All early childhood education is on Country. Acknowledging, welcoming and working on Country is critical not only in nature play, but in early childhood education more broadly (Moyle, 2019). While early childhood education is enmeshed in the "social and ecological legacies of colonialism" (Pacini-Ketchabaw & Taylor, 2015, p. 1), nature play holds considerable capacity and potential to unsettle such legacies. This Mudbook proceeds on this basis, offering generative openings. Awareness of and active engagement with local Aboriginal and Torres Strait Islander histories, cultures, and ways of knowing, being, doing and engaging with Country must underpin any and all nature play practices and pedagogies.

When we acknowledge Country... what we're trying to say is 'what are we valuing?', 'what are we respecting?', 'what are we appreciating?'. It's not just us, it's about how nature engages us, and we need to respect that and protect that, but we also need to respect how nature looks after nature as well. Liz Smith, C&K Weipa Children & Kindergarten, Weipa.

A lot of our [awareness and appreciation for the natural world] comes through the acknowledgement of country we do daily. Because we actually look at our land, our sea, our sky and ourselves, and what's happening around us, and we spend time just to be in that. We take time to think about that, to be thankful, [to consider] 'how are we going to care for our land, our people, our sky, our sea?' and things like that. Julia Greene, Rockhampton South Kindergarten, Rockhampton.



Figure 5: C&K Weipa Kindergarten and Preschool, Weipa

I really feel that we are a part of nature, that we are nature as well. And that's a difficult concept for some people to kind of understand, but I see us as a living organism just as any tree or bird or little bee buzzing around. I just think it's everything on earth and in nature... I think through Nature Explorers there's definitely that development of the children understanding the interdependence between humans and living things, like animals and plant life. I think that through the engagement of that program, that children realise how interconnected and interrelated everything is... all their actions, what they do and the impact it has on living things. So, I think they definitely are developing that awareness and understanding. Rebecca Burch, Nature Explorers, Pottsville.

MUDDY OPENINGS



Figure 6: Photo by Danny, age 4

Mud is a mixing of earth and water. Mud is the sticky matter that holds this framework together, put to work metaphorically herein to disrupt and extend traditional conceptions of nature play. The framework has been conceived and created together with early childhood educators and children who participated in the Queensland Government funded Horizon project, *Mapping Scientific Concepts through Nature Play in Early Childhood Education: Achieving Excellence in STEM through Evidence-Based Pedagogies*¹. The effectiveness of nature play is untested, making this a seminal study in early childhood education. This is significant because nature play is a core feature and tradition of early childhood education practice and pedagogy.

What does past research tell us about nature play?

Over the last ten years there has been a rapid resurgence in supporting 'open free nature play' in education settings (Cutter-Mackenzie-Knowles et al., 2019; Cutter-Mackenzie-Knowles, et al., 2011; Malone, & Barratt Hacking, 2020; Malone, 2016, 2018; Malone, et al., 2015; Malone, et al., 2016). The justification of this resurgence has been most prominently popularised by the introduction of 'forest kindergarten' models emanating from Scandinavian countries (Williams-Sieghfredsen, 2017), and recently commentaries (Louv, 2005, 2011, 2016). Nature play is not new, it has historical grounding in Indigenous ways and practices (Nxumalo,

¹ The project focussed on three research questions. Question 1: What are early childhood educators' conceptions of nature play and its associated scientific concepts?; Question 2: What are young children's conceptions of nature play and its associated scientific concepts?; and Question 3: How can nature play pedagogies best support young children's learning of scientific concepts?

2020; Somerville & Hickey, 2017; Tuhiwai Smith, et al., 2018; Whyte, 2018), and through the works of Socrates, Rousseau, Froebel, Steiner, Dewey and Reggio Emilia (Platz & Arellano, 2011).

Nature play has been readily conceptualised as unstructured play in natural settings involving child-initiated interactions with nature (Ernst, 2012). One of the earliest research studies on nature play and its impact on environmental learning in Australia was an ARC funded project entitled *Children's Environments* by Malone and Tranter (2003a, 2003b, 2005). The aim of this project was to explore the potential of schoolgrounds to provide natural learning opportunities during play for children throughout their school day. The results of the study determined that particular types of nature play behaviours were more prevalent according to the quality and quantity of nature play settings and the value placed on environmental learning as an important outcome of children's nature play by educators and school principals (Malone & Tranter, 2003a, 2003b, 2005; Tranter & Malone, 2004).

A study by Vadala et al. (2007) also empirically and explicitly studied nature play. This study has a focus on adult perspectives however, and it does not overtly consider nature play in an educational context nor does it problematise the nature/child binary. Notwithstanding, Vadala et al. (2007) identified two types of nature play, namely 'child-nature play' and 'child-child play in nature'. Participants were asked to recall and describe their outdoor childhood experiences. 'Child-nature play'² children, once adults, were more likely to be involved in environmental science (as professionals) than those adults who participated predominately in 'child-child play in nature'³. Their findings suggest that simply being outdoors is not necessarily enough to foster environmental understandings in ways that contribute to meaningful science and science-related careers or pro-environment behaviours in later adulthood (see also Dowdell, et al., 2011; James, et al., 2010). What is important is the child's orientation to nature and the fostering of this interest through conceptual resources, supported by parents.

How is nature conceptualised in childhood?

Recent analysis in childhood studies identifies that early childhood education has tended to frame childhood as a social or cultural construct with little consideration of nature (Australian Government Department of Education Employment and Workplace Relations, 2009; Cutter-Mackenzie-Knowles et al., 2019; Taylor, 2013)⁴. Wood and Attfield (2005) position Froebel, Rousseau and Dewey as seminal theorists in shifting views of early childhood education with play seen as critical to children's learning and development. However, these theorists placed the child at the centre of learning with the environment as a backdrop, prop, setting or even a 'third teacher' (Dodd-Nufrio, 2011). In backgrounding the environment as the passive context for children's social, physical, and mental development, they have not adequately considered the child and nature as interpenetrating and mutually entangled worlds, or what Cutter-Mackenzie-Knowles, et al. (2020) frame as childhoodnature. Contemporary

² Characterised by children's interests in collecting frogs, searching under logs for bugs and beetles or capturing fireflies, for example.

³ Using found objects in nature (such as stones, sticks or nuts) to play war games or build forts, for example.

⁴ The Australian Early Years Learning Framework (EYLF) (2009) positions nature as something for people to connect with, outside of them, rather than promoting a less hierarchical understanding. In this sense, the EYLF endorses a social and cultural construction of childhood.

posthuman theorising in early childhood has been at the forefront of disrupting the separation of children and nature by asking question such as: What is nature? Are humans nature? What happens when children are viewed as part of nature? (Lenz-Taguchi, 2011; Taylor, 2011; Malone, 2016)

How is play conceptualised?

Current research suggests that open-ended play requires adult interaction and guidance to support children's learning, and that children will not necessarily construct appropriate levels of understanding about particular concepts through participation in open-ended play alone (Colliver & Flee, 2016; Flee, 2010; Grieshaber, 2008). Research in this area has tended to focus on the need for increased adult interactions during play to support children's learning (Colliver & Flee, 2016; Samuelsson & Carlsson, 2008). Contemporary work by Cutter-Mackenzie and Edwards (2006; 2011; 2013a; 2013b; 2014; 2015) extended this focus by examining how different approaches to play-based learning inform teacher planning for children's learning about environmental science as a content area, as well as examining the pedagogical strategies teachers intend to use to support learning prior to play-activities being implemented. Cutter-Mackenzie et al. (2014) identified three explicit play-types (or pedagogies) as a means of supporting children's learning in environmental science, namely:

1. Open-ended or free play: play experiences where the educator provides children with materials suggestive of an environmental concept (e.g., biodiversity), and with minimal engagement and interaction allows them to examine and explore the materials as a basis for learning about environmental science;
2. Modelled-play: play experiences where the educator illustrates, explains and/or demonstrates the use of materials suggestive of an environmental concept prior to allowing children to use the materials with minimal adult interaction as a basis for learning about the environmental science concept; and
3. Purposefully-framed play: play experiences in which the teacher provides children with nature materials suggestive of an environmental concept and provides opportunities for open-ended play, followed by modelled-play and then educator-child interaction/engagement.

In a similar vein, Pyle and Danniels (2017) explore play as a continuum of child-directed, mutually-directed and teacher-directed play. There are obvious synergies between these broader conceptions of play, and they are particularly useful in challenging a common perception that play involves child-directed free play only, rejecting or downplaying the importance of the teachers' role in play-based learning. While the works of Cutter-Mackenzie-Knowles and Edwards (2006; 2011; 2013a; 2013b; 2014; 2015) and Pyle and Danniels (2017) have made important progress in understanding play, the sociocultural framing applied limited the respective studies somewhat. The intent of the Horizon Nature Play project was to substantively advance the early research on nature play through posthuman understandings of childhood.

How did we research nature play in this study?

Twenty early childhood education settings collaborated on this project. There were 10 sites in South-East Queensland and 10 sites in Central Queensland. In total, 31 early childhood educators and 152 children (aged 4-5) participated as researchers. The overarching

methodology of the Horizon Nature Play project was cartography; an educational research methodology of creating visual maps from observations, ideas and pedagogies for nature play. We drew upon Latour's (2013) model of cartography, which is focused on the relations between people, places and objects (Cutcher, Rousell, & Cutter-Mackenzie, 2015). Latour (2013) positions the cartographic network as domains of knowledge. In the context of this project, a cartography or mapping of scientific concepts promotes visual, symbolic and geometric thinking (Knight, 2016). This approach enabled the researchers to substantially access participant concepts and advance empirical and theoretical research in nature play, specifically exploring how nature play best supports children's learning of scientific concepts. The cartographic research design (Cutcher & Rousell, 2014; Knight, 2016; Lasczik Cutcher & Irwin, 2017) was devised around early childhood educators' planning and implementing three nature play experiences, and their broader nature play practice. The research methodology involved five explicit phases (see Figure 7). While each phase was explicitly qualitative, data was analysed applying rigorous qualitative and quantitative methods.

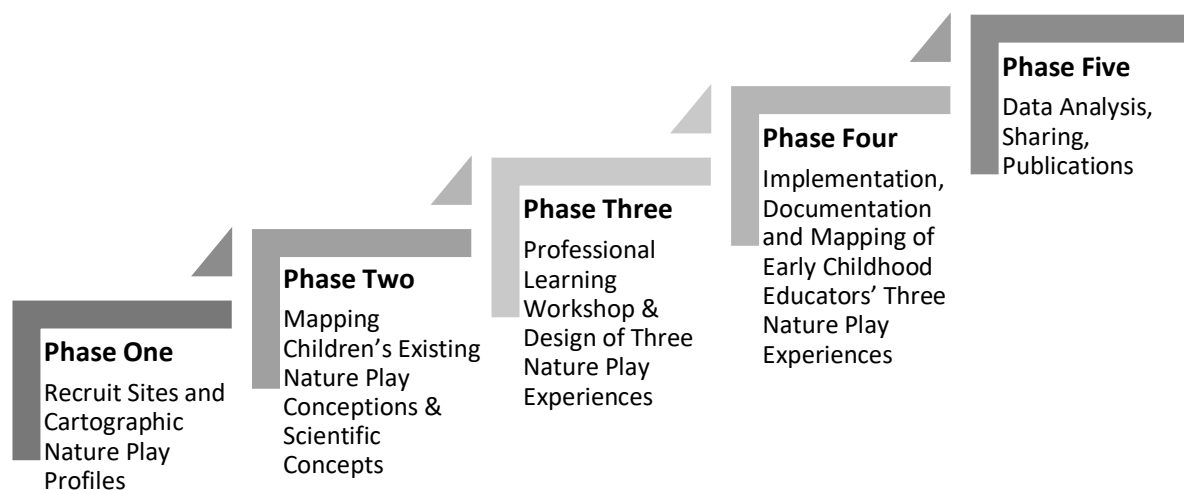


Figure 7: Phases of the Horizon Nature Play Project

What has the research revealed about nature play?

The project revealed that teachers' and children's conceptions of nature play and associated scientific concepts are complex and reveal different narratives to that of the contemporary literature and research. In many respects the data reveal a 'coming alive' of theory, the posthuman in particular⁵. What follows explores a topography of findings from the project, together with an exploration of posthuman concepts.

⁵ Posthuman ways of thinking is also a way of living – it is not just theory – it is about repositioning the way humans see themselves in relation to all other entities. So not greater than or equal to but entwined-with. It is about asking simple questions such as who do I share this place / my world with? How am I in relation with others? See for example, Cutter-Mackenzie-Knowles et al, 2019.



Figure 8: Pages from educator visual diary, Debbie Priest and Nettie Lester, Clearview Nerang, Queensland, Australia



Figure 9: Pages from educator Jennifer McCormack's visual diary, Birdwings Forest School Guanaba, Queensland, Australia

CHILDHOODNATURE

“Without soil, plants as we know them could not grow, and without plants, no land animals could survive” (Rachel Carson, *Silent Spring*, 1962, p. 61).



Figure 10: Photo by Elliott, age 4

All things, human and non-human are matter⁶. The presence of mud, earth, clay, soil – the thin layer of matter that covers the continents – is central to humanity’s existence. The materiality of this mud matter and our human relations with it are often integral to human creation stories, with mythologies inaccurately locating humans as central and as exceptional to other, nonhuman entities.

Scientific examination reveals that the chemical composition of soil and human is the same – both are composed of the shared building blocks of all life: carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulphur. Indeed, even beyond our own planet, recent research has demonstrated that humans and our galaxy share 97% of the same atoms (Howell, 2017). Human matter is in deep, elemental relation with mud/earth matter and indeed dependent upon it. It is kin. Indeed, all bodies perish and return to the soil, as compost.

This entanglement of matter and the ongoing relations of matter - being recycled through the earth system over time and place - is called *sympoiesis*. Sympoiesis comes from the Greek

⁶ Non-human refers to “nonhuman living and nonhuman-made inert entities, and elements that are typically separated into the valorized and exteriorized ‘nature’ camp – such as other animals, plants, weather, water and ‘natural’ materials” (Taylor, 2013, p. 118).

term ‘making together’, or ‘making with’ (Haraway, 2016). As a philosophical and scientific concept, it supports the view all beings are entangled – they are forever adapting, changing and evolving in relation with one another. Understanding is growing in the scientific field around the blurred and somewhat porous boundaries between where human bodies end and the nonhuman begins. Such a perspective has highlighted the need to shift focus from humans viewing themselves as being separate from nature, to understanding themselves as a complex entangled system dependent on nonhumans for survival.

Building from the notion of sympoiesis is the concept of *childhoodnature*, which explicitly recognises and grapples with children’s positionings *as* nature, rather than as separate to nature, but rather “interconnected with and part of the natural world” (Barratt Hacking, et al., 2020, p. 760). Childhoodnature is underpinned by posthuman theory, which is unpacked further in discussions pertaining to muddy barriers (see below). The concept of childhoodnature is deeply significant within nature play, as it encourages educators and parents to think deeply about child-nature relations, and what this might mean for practice, pedagogy and life. In particular, consideration of “children as nature rather than children in nature” explicitly challenges the common practice of positioning humans at the centre of learning experiences, education and society more broadly (Wee, 2020, p. 1035). This shift in understanding has dramatic consequences for the enactment of nature play, and children’s learning of scientific concepts more specifically.

Through the Horizon Nature Play Project, we explored children’s activities, ideas and beliefs around nature, and their relationships with/as nature. Understandings were diverse and ranged from seeing humans as separate from, to humans being part of nature – as nature. Centring childhoodnature as a vital foundation for nature play, with humans being understood as an entangled part of nature, is generative and helpful. Rejecting the pervasive opposition between humans and nature is of critical importance if moves towards more positive and generative ways of “being with and relating to ‘nature’” (Malone, 2015, p. 3) are to occur. In particular, the concept of childhoodnature supports shifting practice to learning *with*, rather than learning *about* nonhuman nature in engaging, authentic, useful and tangible ways. Understanding humanity’s place as part of nature, offers important insights educationally and existentially. We will all eventually just become another critter in the compost, after all.

When I’m outside I learn about nature. Nature is what we’re in now. [Interview was conducted in a nature reserve by a creek in Pottsville]. The trees are nature. The sky is nature. The creek is nature. The ants are nature. We are nature too, because we look after nature – and not break it. Bobby, Nature Explorers, Pottsville.

I see myself as nature ... because we're living breathing things, and so we're evolving, and I think that's nature... Because we're evolving and we're connected, and it's relational and that's what I think nature is, it's relational and connected. I didn't think that before, no, not at all. I literally thought nature play was playing outside or playing with natural resources, that's what I thought. But now I think the biggest thing from the project is the freedom of just taking away the boundaries... and considering, what can you do with that? Katrina Cupples, Rise Early Learning, Gold Coast.

MUDDY BARRIERS



Figure 11: Grappling with the muddy barriers of nature play

It could be stated that the explicit barriers to nature play are various. Some of the most obvious barriers may include time, weather, accessibility, safety, risk, and more specifically parents' and children's concerns and fears of nature, dangerous animals, injury, getting lost or taken, and more (Beery, 2020; Ernst, 2014). Barriers also emerge from the design, location and facilities of a centre; pedagogic barriers due to the knowledge base of educators; and cultural/social barriers due to the ideas and opinions held by families and consequently children themselves (Bai et al., 2020). Certainly, extreme heat, cold, rain, humidity, poor air quality, the presence of dangerous animals, and shade availability may impede upon nature play, as well as educators' confidence, experience and agency. Yet we have also found that despite some of these common perceived barriers, educators are effectively mitigating these obstacles in creative and captivating ways.

I think sometimes educators can be scared of litigation through the regulations. Sometimes they have their own bias that comes in that might say, 'children can't climb trees', 'children shouldn't be doing that'. They have preconceived ideas of children's capabilities. Cassy Read, Pottsville Community Preschool, Pottsville.

Whilst such barriers as those mentioned above surely impact engagement with, in and through nature play, arguably the most pressing barrier is a philosophical one. In the researchers' questions to both the children and the educators, we asked whether they considered themselves to *be* nature. The responses, as we have mentioned, were mixed. Many thought that nature was something else, apart from themselves, something that was 'out there'. One child noted that the Amazonian people were nature, but that he himself wasn't because he lives in a house. Other children noted that their cats and dogs were nature, even though they lived in their homes. Some educators struggled with this question, not quite willing to concede their nature self. Yet there was also a strong assertion that humans are indeed nature, as just one other (albeit dominant) species.

The resistance to conceptualising humans *as* nature presented as the preeminent barrier to engaging with nature play most effectively. The view that humans are somehow separate to nature requires a seismic shift in thought (Rousell & Cutter-Mackenzie-Knowles, 2020). This is where this research draws attention with respect to barriers, as it can be seen that once educators and children understand that humans are not separate or superior to other species and the earth (Rousell, et al., 2017) it will follow that nature play (and its links to authentically learning science concepts) will be more effectively engaged.

I think as an educator we have worked really hard on 'what are the conditions for nature play'? The children can't experience all of these things unless we've built an amazing back yard, or we choose to take them out of the space, or we choose to also notice those things. Being in tune with children is really important... that's an educator practice that has to happen... I fully believe... if you don't build the conditions for nature play then we might miss it, because we might look straight past it and be focussed on something else. Marion Hayes, Rainbow Valley Early Learning Centre, Gladstone.

Posthuman philosophy, upon which the foundational concept of childhoodnature explored earlier is based, gestures to a flattened ontology, which promotes an ahierarchical view of species dominance (Leopold, 1949, Thoreau, 1854/2014, Weston, 1994, Whitehead, 1920). Put simply, the posthuman, like the concept of childhoodnature (Cutter-Mackenzie-Knowles et al., 2020), argues that humans are not dominant, but rather one of myriad species on Earth. The concept that humans perceive themselves to have moral and ethical responsibility over other animals separates humans from other living organisms and assumes that humans are the dominant species and the pinnacle of all existence (Cutter-Mackenzie-Knowles, et al., 2019). Educators must instead deeply rethink human superiority; indeed, as mentioned above, humans are an entanglement of elements, organisms and even microplastics (Malone, 2016; 2018; Neimanis, 2017). In fact, it could be said that humans are more other-than-human than human, given the pervasive presence of bacteria and other microbes in human

bodies (Cutter-Mackenzie et al., 2019). Whilst posthuman philosophy has its issues, its most pertinent application in this context is the notion that humans are indeed, nature.

Posthumanism, and childhoodnature more specifically, impact upon nature play in understanding that nature is all things and all species, and that nature play is not predicated on being outdoors amongst the landscape or 'natural world'. This introduces the idea of common worlds, which is a conceptual framework that takes into account children's relations with all the others in their worlds – human, non-human, more than human (Taylor & Guigni, 2012). Whilst the concept of common worlds is inherently pedagogical, its strength is in foregrounding relationality and place. When engaging the posthuman, childhoodnature and common worlds in nature play, notions of entanglement, living together, ethics, inclusion, diversities, response-abilities and more come into focus. Such foci inevitably enhance learnings and specifically, science learnings.

I think we all know that nature is good for children, that children feel good when they're outside, it's good for their bodies. But I think we need to think deeper than finding ways to move children's bodies outdoors. It's got to be more than playing in muddy puddles and climbing trees. Nature play must be able to support children to experience what it's like to be a part of nature and I think perhaps early childhood teachers don't think about that deeply enough, probably because it involves time and risk as well. Jennifer McCormack, Birdwings Forest School, Guanaba.



Figure 12: Nature Explorers, Pottsville

STEM AND NATURE PLAY

...because we go to a diverse range of sites, it leads to a diverse variety of science explorations. Because we have the rainforests and we have more dry forest areas and we have the beach, it does lend itself to different science explorations. And when I think about science, I do think about it in that STEM approach, that it's not just experiments. I think it's a very narrow way to think 'if we do experiments, if we do a volcano in preschool, then we're covering science. You know, STEM is much more than that. And when they're building cubby houses there's all that engineering, and there's so much science when there having to get the right kind of sticks and the right strengths, and the right lengths and balance everything, and use lots and lots of problem solving. And so, there's lots of engineering in the things, when they make things. Like when they make the ladders, when they make the swings that are in the trees. And STEM in that mathematical approach, there's so much measurement... where we're using a measuring tape, or just the continual counting and estimations and approximations that they're doing. Like, 'that's a really tall tree'. When they're doing tree climbing, they're engaging in the size of the branches and whether they're the right width, and whether they're the right strength to hold the children's weight. They're making lots of hypotheses about all of those things. So yeah, I think it's more than just experiments and earth science, it is much more than that. Rebecca Burch, Nature Explorers, Pottsville.



Figure 13: Photo by Darth Vader, age 4

Research has long helped record children's natural desire and ability to explore, investigate and understand the world around them (Artinian, 2018; Cremin, et al., 2015). When considering embedding Science, Technology, Engineering, Mathematics (STEM) in early childhood, it is helpful to emphasise that "regardless of ability, young children are ready, willing, and able to engage in STEM activities" (Moomaw & Davis, 2010, p. 18). They are "capable, highly curious and motivated" to engage with science (Greenfield, et al., 2017, p. 15), technology, maths and engineering.

I think nature play impacts children's development of scientific concepts majorly. Because it's really hands-on experience and we might do all the research on paper, but then we test it and we trial it and we fail and we hopefully succeed, or not succeed. I think because they do it [themselves]... the learning sinks in, and not just on the surface. Sofia Machado, Nature Explorers, Pottsville.

Embracing STEM in early childhood need not be limited by educators' perceived lack of scientific knowledge or understanding of scientific concepts. Instead, a lack of science content knowledge can be reframed "as an opportunity rather than an embarrassment" (Hobbs, et al., 2012, p. 9) as motivation for educators to engage as active co-learners alongside children, rather than mistakenly considering themselves as needing to be the source of all knowledge. This shift in perspective was expressed frequently by educator participants in this project. Increasingly, educators are embracing their role as "scientists in action - teacher researchers solving problems and improving practices as they, together with children, investigate the world, uncover new ideas, construct theories, and explore with curiosity" (Bucher & Hernández, 2016, p. 17). This role as co-learners is fundamental to facilitating engaging nature play experiences and subsequent entangled scientific learning opportunities.

In particular, embracing the role of co-learner also demands a sense of joy, playfulness, enthusiasm, eagerness to experiment and investigate. STEM exploration in early childhood is not about knowing or finding out the right answer, but instead "exploring many possible answers" alongside the children (Bucher & Hernández, 2016, p. 18). Notably, such exploration affords significant opportunities for transdisciplinary learning, where boundaries between disciplines are porous and activities and learning experiences develop knowledge, understandings and skills across multiple fields simultaneously.

Through observations at centres, educators' video recordings and photographs of the three nature play experiences, together with the educators' visual diaries and interviews with children and educators, it became apparent that science understandings explored and developed through nature play were frequently related to environmental science – including for example, seasons, weather, geology, astronomy, biodiversity, lifecycles and germination. It is not the intention of this study to separate the sciences into disparate disciplines, however. Other popular scientific concepts explored through nature play included forces, gravity, floating and sinking, solids, liquids and gases, chemical reactions, engineering, construction, tools and mathematics.

constructed environments... including relationships with other living and non-living things” (Australian Government Department of Education Employment and Workplace Relations, 2009). Like all STEM disciplines, environmental science is emergent in the early years and will be extended and build in complexity throughout a child’s life. The divergent set of nature play pedagogies are central to enhancing transdisciplinary learnings of science concepts in early childhood. In the project’s explorations of nature play and the learning of scientific concepts in urban and regional early childhood settings in Queensland, we identified a vast number of key scientific concepts and terms explored through nature play. These were grouped under the key areas of earth, ecologies, relations, materials, bodies, time and weathering (see Figure 15 below).



EARTH: earth, soil, mud, compost, worms, geography, landscapes, water, air, fire, land



WEATHERING: weather, climate, seasons, atmosphere, drought, humidity, rain, heat, cool, global, local, movement



RELATIONS: human, nonhuman, Country, Indigenous, connection, disconnection, reliance, entanglement



MATERIALS: objects, entities, organic, inorganic, natural, rock, plastic, hard, soft, solid, blurred, porous, wild, tame, curated, messy



BODIES: beings, human, nonhuman, affective, alive, dead, agency, moving, static, virtual, hybrid



TIME: temporary, permanent, light, dark, day, night, sun, sky, moon, stars, deep time, ancient, dreaming, past, present, future, change, age, era, epoch, rhythm, pace



ECOLOGIES: ecological, animals, plants, bacteria, fungi, seeds, germination, pollination, lifecycles, energy, flows, systems, diversity, living, non-living, stable, fragile, enmeshed, growing, dying, conserve, sustain, regenerate, habitat, conservation

Figure 15: Common science concepts and terms identified within nature play

This is not a prescriptive list, nor are these the only scientific concepts nature play enables, rather, they are starting points to activate discussion and to help facilitate children's learning. We found through the study that where children were able to explore the outdoors and engage in a diversity of nature play pedagogies, a broad range of scientific concepts were explored. Additionally, when STEM concepts are inspired by the children's interests, curiosities and questions learning is more powerful and engaging. To offer inspiration to inform your own children's learning of scientific concepts through nature play practices and pedagogies we have shared educators' insights for each.

Earth

They've also developed a lot of sustainability knowledge because they sort their waste and they take their fruit and veggie scraps to the worms and those other scraps to the chickens, and we recycle paper and minimise waste. I think they learn about that side of conservation... I think they learn about how to grow vegetables, what a plant needs and things like composting. Julie McDonald, Tamborine Mountain Community Kindergarten, Tamborine Mountain.

Weathering

We have a lot of children that are interested in the weather, especially with the drought and the change of seasons. They tend to talk about their water tanks at home, 'we need rain, because we don't have enough water'. And we really have those conversations continually with the children... We have weather predictors that they like to go out and have a look at. We talk about 'look at the leaves on the trees', 'are they blowing?', 'is it a windy day?', 'what do the grey clouds and the white clouds mean?'. Tenille Abbott, Le Smileys, Waraburra.

Relations

I think through Nature Explorers there's definitely that development of [the children's] understanding of the interdependence between humans and living things, like animals and plant life. I think that through engagement [with Nature Explorers], that children realise how interconnected and interrelated everything is... all their actions, what they do and the impact it has on living things. So, I think they definitely are developing that awareness. Rebecca Burch, Nature Explorers, Pottsville.

Materials

One of our shelves is just covered in things that the children bring in. So we've got nests and rocks and all sorts of things. Magnifying glasses set up and those sorts of things. So, they just keep adding to it and taking it away, and if they find something interesting, they'll pop it on there. So that's their space again that they have ownership over. Deanna Cini, Rockhampton South Kindergarten, Rockhampton.

Bodies

[Exploring] perspective has led us [to ask] 'where do I find myself in space?'... At the same time there's a very, very strong group of little biologists who are out there really connected to spiders and bugs... So, we have been investigating our own bodies and there's lots of interesting things going on in the [art] studio around what we have inside us. Because with the emotions [we discussed] 'you feel sick to your stomach' and 'you feel butterflies in your tummy' and you know 'my brain taking over', we really wanted to investigate what's inside bodies. Marion Hayes, Rainbow Valley Early Learning Centre, Gladstone.

Time

We do something called Dadirri, which means deep listening. It's a concept that has come from Arnhem Land. By that age... the children still need the time to lie down and relax their body, but not many of them are sleeping. So that's the time we'll often do focused work together. So, we'll do things like sit spots... we'll do deep listening, and we'll lie down, and we'll talk about what we can see above us, what we can hear... We'll watch the birds, and we'll have conversations about what we can see. So it's also part of our acknowledgment, so we do a lot of conversation about biggie, which is the sun in Yuggera [language]. And dagan, which is the earth in Yuggera, and we'll talk about that quite a lot with the kids as well. 'What can we find on dagan?' and 'what can we see up near biggie?'... They do find it really interesting. It's always very relaxing, slowing down, laying down and looking at clouds and watching birds fly past and bugs fly past. Hannah Powell, Kurilpa Community Child Care Centre, Brisbane.

Ecologies

"A: What are you ultimately intending for children to learn through their nature play? G: To be at one with nature basically. J: And to respect nature... just learn about the environment and learn about how things grow – life cycles. G: And for me it's for them to understand how it all links together for them. It's not just a bird in a tree or a bug on a bush and a plant in the ground – they all rely on each other. J: Relationships. G: And we rely on that as well – we're part of that cycle – Gini Tangira and Jodie Petty, Blackwater Tiny Tots



Figure 16: Photo by Rosie, age 4



Figure 17: Photo by Danny, age 4

NATURE PLAY PRACTICES AND PEDAGOGIES

I think one of the key things about nature play is about learning in and with nature, the spontaneity, the sensory exploration and investigations... hands-on... I think the link to Indigenous perspectives is really important... and I think the interconnectedness to sustainable practices is important... I see nature play as being an opportunity to have very deep learning, deep connections, learning about land – on land, and those investigations coming from the children. Rebecca Burch, Nature Explorers, Pottsville.

Nature play practices and pedagogies are deeply entangled. Indeed, the Early Years Learning Framework defines pedagogies as “practices that are intended to promote children’s learning” (DEEWR, 2009, p. 49). For the purposes of this framework, practices refer to more intricate specifics of nature play, and pedagogies refer to the broader approaches to nature play that are explored through play types.

Nature play, and associated approaches, continue to grow in popularity, both in Australia and around the world, with Kahn, et al. (2020) describing nature preschools and kindergartens as a movement “gaining momentum” (p. 469). Research continues to demonstrate the positive and far-reaching benefits of nature experiences upon children’s cognitive, social and emotional skills (Kuo, et al., 2019). Nature play is variously referred to as nature experience, nature education, nature preschool, nature kindy, outdoor play, outdoor learning, environmental play, bush kindy, beach kindy and forest school. This diversity in names reflects the variety of ways nature play and associated approaches are embraced in the early childhood sector and beyond. Researching settings, practices, pedagogies, and educator roles through this project illuminated many intricacies of nature play, and the diverse opportunities such approaches afford for children, families and educators alike.

It is important to first acknowledge that the varied pedagogies early childhood educators engage with during their nature play practices are frequently entangled and interconnected, with messy, blurred boundaries. This research demonstrated that early childhood educators generally embrace an emergent, organic way of practicing that avoids explicit naming of nature play pedagogies and play pedagogies more broadly. Educators instead respond constantly to environments, materials, objects, places, and relations (with children and the nonhuman) to inform the practices and pedagogies they employ. These emergent pedagogies engage multiple play approaches concurrently and facilitate rich opportunities for transdisciplinary learning. It is important to be aware that through enacting diverse pedagogies, children’s engagements with and as nature are “endlessly diverse... always alive, never the same twice” (Kahn & Weiss, 2017, p. 20). Thus, nature play experiences are holistic, leading to the development of children’s social, emotional, physical and cognitive skills. In particular, nature play enables the authentic transdisciplinary entanglement of traditionally disparate disciplines such as Maths, Science, English, History, Geography, and the Arts.

In our everyday practice nature play looks like working in the sand pit, building waterfalls, building streams, building crocodile nests and crocodile ponds, and trying not to get eaten. It's about the garden and mowing the lawn... It's about working in our sensory garden, and engaging with the water pump and watering flowers, and making our own sustainable garden. And then going on bush tucker hunts and finding out that we already have bush tucker in our own yard – we don't actually have to go out into the community to find it. Liz Smith, C & K Weipa Childcare and Kindergarten, Weipa.

The foundational philosophical and pedagogical approach most commonly shared by participating educators in this project was a child-led approach. Child-led nature play requires educators embrace their role as deep listeners and respectful observers of children's play, who watch for opportunities to support and extend children's thinking and play, without interrupting or disturbing play too frequently. It is important to be aware of the potential for adults to dominate children's play (Loizou, 2017). There exists considerable confusion around how, when and why adults should "interact and support play" (Arnott & Duncan, 2019, p. 312). As the educators in this project reflected upon and shared, educator roles and levels of adult-child interaction in play vary considerably and "can be multifaceted" (Loizou, 2017, p. 785). Embracing a child-led approach supports educators to engage in a wide variety of nature play pedagogies, because children have diverse interests, curiosities, and needs. In addition, embracing a child-led approach necessitates a sincere belief in children's competencies and capabilities, a commitment to nurturing mutual trust, and a letting go of external pressures to achieve specific outcomes – particularly those related to school readiness.

"We very much try to follow their ideas, yes. That's the part about this job that I love very much – we never know where we are going. We observe, we are with them, we play with them and... as we see interests evolving or the questions that they're asking, we try to work with them to either answer those or find solutions for them, or to take the question further... It's definitely drawing from the children's interests"– Julia Greene, Rockhampton South Kindergarten

Access to the indoors and outdoors, and opportunities to leave the centre dramatically influenced the nature play pedagogies employed in the centre. The settings involved in this project included a centre on the third floor of a high-rise building, a centre with the early learning room upstairs with limited access to the outdoors, centres with easier access to the outdoors who still accessed the outdoors at specific times, centres where children were able to move freely inside or outside throughout the day, centres where children visited adjacent bushland for half and full days, to a forest school that operated exclusively outdoors. It may be helpful to think about the opportunities to move indoors and outdoors and consider ways to implement an increase to children's independence in being able to move freely between and around the indoor and outdoor environments.

Free play is a really, really big part of our day. That they get a huge amount of free play, and to have free play children need to have a really rich environment with lots of opportunities. So, they need to have different spaces to play that are set up. They need to have nature to play in, and to be able to manipulate it. So, that agency to move things around, to create their own stories, to create their own play dramas is really deeply grounded in everyday practice. Also, we do have a very strong rhythm of our day, but the children have a lot of agency within that of deciding whether to be inside or outside. An educator might say 'hey do you want to come and do this with me?' but the child still has agency to decide who to play with, what to play with and how to play. Marion Hayes, Rainbow Valley Early Learning Centre, Gladstone.

As has been explored earlier in the framework, play, play activities and play pedagogies have been defined in various ways throughout history, and these categories and definitions continue to evolve over time. The purpose of play from a pedagogical perspective is increasingly understood and respected as a means to support children's social, emotional, physical and cognitive learning and development, with play-based learning providing the foundation for pedagogy in early childhood (Cutter-Mackenzie, et al., 2014). The Early Years Learning Framework (EYLF)(DEEWR, 2009) places specific emphasis on play-based learning, an approach and "context for learning through which children organise and make sense of their social worlds, as they engage actively with people, objects and representations" (p. 5).

In order to develop understandings around the intricacies of nature pedagogies and their impact on the learning of scientific concepts, participating early childhood educators in this project were invited to plan and undertake three nature play experiences with the children at their centres. Initially, the educators were asked to plan and implement one open-ended, one modelled and one purposefully-framed play experience (Cutter-Mackenzie, et al., 2014). However, when presented with these three play types during the face-to-face professional learning workshops, participating educators quickly asked for more freedom of choice in the play pedagogies with which they could engage. It was clear that this framing of play was deemed unhelpful and limiting for the educators, which is a key finding of the project.

Instead of focusing on open, modelled and purposefully-framed play, a diversity of pedagogies emerged organically through the nature play experiences that were planned, as well as through their broader nature play observed during centre visits and mapped by the educators in their visual diaries. Nature play pedagogies that the educators embraced included: place/Country-responsive play; non-human play; slow play; sensorial play; risky play; imaginative play; construction/creative play; discovery play; and death play. Notably, it is important to reiterate that these pedagogies are not separate approaches to be enacted individually. In any one nature play experience, multiple pedagogies are enacted simultaneously, and there is often significant overlap between them. For example, similarities and interconnectedness of place/Country-responsive play and nonhuman play are considerable, and similarly sensorial play is almost always engaged when on Country or engaging with the nonhuman.

Place/Country-responsive play

Place/Country-responsive play involves exploring the interconnectedness of people, cultures and the natural environment, specifically through spending time in and learning about local places – within and especially beyond centre grounds (Tooth & Renshaw, 2020). Although place-responsive pedagogies are growing in popularity, ‘Country-responsive’ is explicitly foregrounded to draw attention to the histories and rich living cultures of local Aboriginal clans/language groups (Langton, 2019). Place/Country-responsive play creates opportunities for children and educators to become more aware of how they impact and are impacted by place/Country.

Examples of place/Country-responsive play include: leaving the centre grounds; walking and mapping the local community; nature journaling; bushwalks and other excursions on Country; learning from and with local Aboriginal and Torres Strait Islander Elders; creek exploration; beach visits; engaging with local community organisations; caring for Country through conservation; collecting rubbish; and planting habitat.

Building genuine, reciprocal relationships with local First Nations Elders, community members, families and organisations is crucial to providing authentic Country-responsive play opportunities. An investment of time and energy is encouraged to build respectful relationships with local Elders and community members, ensuring that First Nations peoples are appropriately financially compensated for their time.

That’s all the rubbish I picked up to bring home. Because I want to look after nature. Bobby, Nature Explorers, Pottsville.

I love every single part about playing outside. When I’m in the bush I feel real good. Andy, Clearview Early Learning Centre, Nerang.

The creek is really tied to the seasons and because we play in the creek so much, we notice everyday whether the water is rising or falling or whether it’s disappearing. We’ve been there in the floods so we’ve seen that, and we notice what the trees are doing. And this is where it’s all tied in together. At the moment the wattles are starting to flower, so that means that spring will come soon. So we’ve passed mid-winter, because the wattles don’t come before mid-winter. So, we can tell that things are changing now and we’ve moved from our winter songs into our later winter songs as soon as we notice that the wattles were coming. So, we are singing about the wattles, we have a story about the wattles, crafting fleece balls to make wattle. We’re playing a game with the wattle, so everything is revolving around the wattle. Narell Neville, Birdwings Forest School, Guanaba.



Figure 18: Place/Country responsive play at Birdwings Forest School, Guanaba

More than human play

More than human play is relating with other beings and objects other than human or more than human. In other words, how they engage with, effect and are affected by sky, sun, animals, plants, weather, water, soil and many other more than human elements. More than human play affords opportunities for children to develop awareness of their entanglement with nature – particularly the reality that “children are nature, and as such, are interconnected with and part of the natural world” (Barratt Hacking et al., 2020, p. 760). In other words, more than human play helps children to understand humans are “characters in a cast of many” and simultaneously deeply affected by “our local ecologies” (Ulmer, 2017, p. 833). More than human play shifts attention to learning with, rather than learning about, nonhuman nature in simple ways within children’s own “immediate and everyday common worlds” (Taylor & Pacini-Ketchabaw, 2015, p. 509). Through more than human play, both children and adults acknowledge the importance of recognising they share the world with other beings and things (Jackson & Mazzei, 2016), thereby shifting “the gaze of early childhood pedagogy from a preoccupation with individualized humancentric learning” (Whitty, et al., 2018, p. 4).

More than human play is similar to and is often engaged in conjunction with place/Country responsive play. Notably, both more than human play and place/Country responsive play supports educators to “steer away from perpetuating colonial ways of thinking and being with nature and place” (Pineda, 2018, p. 79), towards more relational understandings pervasive throughout Indigenous cultures for tens of thousands of years (Yunkaporta, 2019). In striving to nurture opportunities for nonhuman play, educators may ask themselves how they might “rethink our learning relationships with other species, including our ethical interspecies and intergenerational responsibilities?” (Whitty et al., 2018, p. 4).

Examples of more than human play is close relatings and deep observation of plants, trees, clouds, natural objects and more than human species. Such deep relatings can be encouraged through botanical drawings, creek exploration, noticing and mapping animal tracks, investigating/observing local animals (e.g. arachnids, insects, lizards, birds), becoming-animals, exploring lifecycles, and bringing natural materials inside for free play.

I need to spray the snail house with water to keep it moist. The snails like it moist because they like the wetness. Meg, Kurilpa Community Childcare, Brisbane.



Figure 19: More than human play – photo taken by Janet, age 4

I worked with an educator a couple of years ago. It was when we first put the veggie garden in, and we changed the position of it, and we built a new one in the yard. And... she was saying 'what are we going to do about the bugs in there? The bugs are eating all the lettuces'. And I was looking at the bugs saying 'Oh, the bugs are eating the lettuces. Let's investigate that, that's really interesting'. But she was seeing it as 'this is a vegetable garden to grow produce to then feed humans', rather than 'this is a place for learning about life cycles'. And it strikes me that there's so many resources in early childhood [that] take life cycles completely away from nature and put them in a book or a set up with plastic things representing nature. You need to be involved with real [gardens, bugs, environments]. I think it has to be real, that's probably one of my main things... It's great if something dies so then we can talk about why. 'Didn't it get enough water?', or 'it didn't get enough sun', or 'the bugs ate it'... So much happens that we learn about. Marion Hayes, Rainbow Valley Early Learning Centre, Gladstone.



Figure 20: Nonhuman play at Rockhampton South Kindergarten, Rockhampton

Slow play

Slow play enables children the freedom, space and time to engage in sustained, unhurried, uninterrupted play. Slow play aligns strongly with the 'being' aspect of the Early Years Learning Framework, which "recognises the significance of the here and now in children's lives... engaging with life's joys and complexities, and meeting challenges in everyday life" (DEEWR, 2009, p. 7). Furthermore, the EYLF emphasises the importance of seeing the early childhood years as "not solely preparation for the future but also about the present" (DEEWR, 2009, p. 7). Slow play mirrors Payne and Wattchow's (2009) slow pedagogy, which similar to place/Country-responsive play, is underpinned by a commitment to dwell in, listen to and learn from place/Country. Slow pedagogy supports learners to engage deeply with their senses, and more deeply consider "perceptions of time, space and place" in order to make meaning with/in/as/for environment and place (p. 16). Moments of pause, and opportunities to "dwell in spaces for more than a fleeting moment" enhances the meaning of place (Payne & Wattchow, 2009, p. 16). Notably, sustained time to explore and develop familiarity with resources and places can lead to deeper, focused, creative play (Arnott & Duncan, 2019).

Some examples of slow play are 'sit spots' where children sit quietly and observe their surroundings. Opportunities for sustained play might include where children can keep revisiting their play, observing seasonal changes, or child-directed free play on Country, and engaging with Art materials and activities.

Long periods of time are important – regular experiences over a long period of time, and to be able to experience seasonal relationships with nature because that's where your theories are formed when you're observing nature. To see how nature behaves differently when it's cold to when it's hot, and to see what animals are there when it's windy, and what birds will do when there's a storm coming. Unless you have seen nature in all of its cycles, you don't get a full picture... That scientific observation that children are very good at, and reflecting on – they can remember months back and the last time that birds did that weird thing they're doing now... So being able to observe... long periods of time and regular – like weekly, at least weekly. We would love to see a full day because even in a full day, children have got time to experience the moving of the sun and how they feel that day in nature, where a two hour block is you've just arrived in nature and then you have to go. Sometimes it takes two hours for children to just be there and play. Jennifer McCormack, Birdwings Forest School, Guanaba.



Figure 21: Slow play at Birdwings Forest School, Guanaba

Sensorial play

Sensorial play involves opportunities to stimulate children's senses – touch, taste, sight, sound, smell, and proprioception (awareness of the position and movement of the body). In other words, the “auditory, olfactory, tactile, taste and visual” senses (Beery & Jørgensen, 2018, p. 13). Through engaging their senses, children experience “opportunities of being and becoming and relating” with the natural world (Green, 2020, p. 880). Notably, it is important to expand understandings beyond the separate senses and recognise how “sensory perceptions are inevitably linked with one another and overlap in function” (Green, 2020, p. 892). Learning through pedagogies of sensorial play encourages noticing, paying attention, being slower, attuning, foraging, smelling, feeling, touching and deepening connection. “Noticing attunes us to worlds otherwise left as unrecognised through connecting beyond bodies into deep knowing, recognition; there is a sensing of bodies” (Malone 2019a, p.16). Sensorial play therefore supports “a child finding ways to be with nonhuman animals; plants; the weather; water; and materials through their bodies” (Malone 2019b, p.4). During sensorial play, children engage with natural materials such as sand, dirt, water, and clay, for example splashing in the water, running hands through sand, dirt and mud, and engaging in “manipulation of these materials” for various purposes including construction (Bairaktarova, et al., 2011, p. 219). Sensorial play is a powerful means to develop children's cognitive, physical and socio-emotional skills (Bairaktarova et al., 2011). Specifically relating to STEM, water play may support children's understandings around concepts such as sink/float, wet/dry, volumes/shapes/sizes, “empty/full, before/after, shallow/deep, and heavy/light in a hands-on way” (Bairaktarova et al., 2011, p. 223). Examples of sensorial play include gardening, sensorial bushwalk/ bug hunt, mud play, sand play, water play, attuning the senses through guided meditation, cooking, and clay work.

I like how those leaves were spikey and those leaves were fluffy. And I like how those were sort of other green colour and those were light green and whitey. Spiderman, Community Kids, Annerley.

I'm painting with mud here. And that's mud on my arm. I painted myself with mud because it feels nice and cool when it dries. Meg, Kurilpa Community Childcare, Brisbane.

The new C & K curriculum is really big on 'looks like, sounds like and feels like'. So, that's something I've tried to encompass when we're doing something. So 'what does it look like?', 'how does it feel?'. And then just being aware that even though we're very aware of everything that's happening around that sometimes you've just got to stop and really look at what's going on in that small space there in front of you. And I think the children are far better at it than I am, it's something I really have to be aware of. Whereas they're so in the moment in what they're doing right there that they can sort of just block out everything else that's going on beyond them... we had some really beautiful days and lots of things happening, and so we would quite often just lie down and look up at the sky, and talk about what our view was at the moment. Deanna Cini, Rockhampton South Kindergarten, Rockhampton.



Figure 22: Sensorial play at Kurilpa Community Childcare Centre, Brisbane

Risky play

Risky play involves “thrilling and exciting forms of physical play that involve uncertainty and a risk of physical injury” (Sandseter, 2010, p. 22), for example, climbing, running, swinging, rough and tumble play, riding, using tools, lighting campfires and so on. Although risky play was once considered a natural part of childhood and there is a growing awareness of the importance of risky play for children’s optimal development (Brussoni, Olsen, Pike & Sleet, 2012), opportunities for children to participate in risk play has been over years being reduced in many modern Western minority societies due to overprotective, risk-averse educators and parents in (Harper, 2017). Brussoni et al. (2020) analysing literature on risky-play, argue through evidence that risky play may lead to increased physical activity, improved motor/physical competence, higher ability to assess risks and handle risk situations in an appropriate way and positive psychological outcomes and general health (p. 2). As a sign at Kurilpa Community Childcare stated, “eliminating risk leads to a child’s inability to assess danger”.

Examples of risky play include climbing trees and other high objects, hanging upside down, balancing from a height, rope swings, navigating creeks, building campfires, using tools such as axes, saws, hammers or whittling knives, wrestling, fencing with sticks, and children exploring without adult supervision.

I was born a climber. I think that because I climbed when I was a baby... Nobody taught me how to climb [but] my mum and dad let me climb. Meg, Kurilpa Community Childcare, Brisbane.

Oh, that’s me again in the climbing tree. I’m quite high but I don’t ever get scared. Bobby, Nature Explorers, Pottsville.

I think our understanding of risk is quite different to other places. We manage the hazards. So, we’re looking around at the weather, we’re looking at the wind, we’re looking at the trees. We know when it rains some places are more slippery than others. It doesn’t mean we don’t go there – it might mean we chat about with the children first you know “better to walk in the water than on the rocks...” We discuss not running off into areas where we haven’t been together yet. So, “don’t go in the bush without everyone, let’s go there together and have a little look”. “Are the birds telling us anything? You know sometimes when the birds talk a lot or screech a lot, they’re warning us of something”. So “have a listen - does it feel right to you, does it feel safe in your body to go in here?” And “did you look in the bushes and see what’s around in there?”. Because right now it’s winter, so we’re not likely to see snakes, but it’s a good habit to keep up all year round. So, we do talk about that in terms of risk, but when we get visitors we realise that they think that everything we do is a risk and for us that’s adventure – that’s worth a risk. Jennifer McCormack, Birdwings Forest School, Guanaba.



Figure 23: Risky play at Birdwings Forest School, Guanaba

Imaginative play

Imaginative play may also be referred to as make-believe play, fantasy play, symbolic play, pretend play and dramatic play (Park, 2019). Imaginative play is generally open-ended and

child-led, and may be undertaken solo, with a friend, or a group of children. Imaginative or pretend play generally involves children “pretending a role, pretending with an object and pretending a situation” (Park, 2019, p. 1). Most often, imaginative or pretend play involves children pretending to do activities they have witnessed adults or older children undertaking or pretending to be fantasy creatures or superheroes (Lillard & Taggart, 2018). Children frequently role-play experiences or characters of interest as a way of exploring and making sense of the world. Importantly, research argues children’s opportunities for being and becoming are strengthened in nature through make-believe play (Green, 2020). However, although play and imagination are great sources of joy and discovery, other researchers question the value and prevalence of imaginative/pretend play (Lillard & Taggart, 2018).

Like Maria Montessori, Lillard & Taggart (2018) propose reality and real experiences (such as developing skills by engaging in real hands-on activities like cooking and so on) afford greater opportunities for learning and development (p. 89). Educators in this project generally strive to allow space for the children to lead their own play, which was sometimes imaginative, but also provided considerable opportunities for hands-on play grounded in reality. Notably, pretend play can enable children to face and grapple with their worries and fears in a safe and comfortable environment and may support children to build connections between their experiences, knowledge and understanding, leading to “real-life learning” (Park, 2019, p. 4).

Examples of imaginative play include dress ups, role playing (e.g., becoming-animals, becoming-explorers, becoming mums and dads, or mums and babies), pretending sticks or rocks or leaves or cardboard boxes are all kinds of objects, and educators removing all toys from the centre grounds are ways to encourage imaginative play.

The best day ever was when I went on my bike and did a double somersault into the creek and landed on my surfboard... And then I attached my bike to my surfboard... And I actually peddled on the bike to make my surfboard go, because my surfboard had a propeller on the back. Bobby, Nature Explorers, Pottsville.

Our children will pick up a stick and it becomes a million different things, or they will gather a bunch of stones and they become people, or they build a fire from the stones and then they put the sticks on top and then ‘oh, it’s caught on fire, we need the water,’ and they’re telling stories and playing along the way and it all happens so easily. Narell Neville, Birdwings Forest School, Guanaba.



Figure 24: Imaginative play at Nature Explorers, Pottsville

Creative play

Creative play involves children working with elements of their environment to create and construct – including for example natural and inorganic materials, and more traditional art supplies like paint, glue, pencils, crayons, paper and clay. When engaging in creative play in early childhood, the focus of the experience is upon the journey of creating, not the quality of ‘creations’ children might produce (Arnott & Duncan, 2019). According to Smithner (2011), creativity that grows and strengthens through play affords powerful “conscious and unconscious insights” (p. 221) therefore strengthening children’s learning capacities, adaptability, resilience and imagination. Furthermore, creative play is an imaginative, embodied and visceral process (Smithner, 2011), where for extended periods children can become deeply engaged.

Examples of creative play include loose parts play, whittling, sawing wood, building tunnels and bridges, drawing, dancing, singing, percussion, nature journaling, nature collage, weaving, drumming in the bush, singing, dancing, felting, sculpting, clay work and painting.

I like to collect seed pods and I just make things out of them, like tents and also castles. Spiderman, Community Kids, Annerley.

To make the grassy heads you put seeds and dirt inside a stocking and then you put water on them and then they'll grow. If you didn't water them, they would not grow. And then you get to cut their hair and you get to water them and then they'll grow again and again. Meg, Kurilpa Community Childcare, Brisbane.

Their other favourite activity is doing the tool work. So, there is a lot of STEM involved in that as well... actually managing to get materials to fit together – using a drill, using claws, using all of those different elements and trying to get sticks and leaves to connect. You know, we've got no glue and no sticky tape, so that takes a little bit of creativity there. But they manage to figure it out. They always find a way. Hannah Powell, Kurilpa Community Childcare, Brisbane.



Figure 25: Creative play at Clearview Early Learning Centre and Kindergarten, Nerang

Discovery play

Discovery play enables children to explore and think deeply about the world and learn about how the world works. Discovery play often involves exploration, experimentation, and investigation – to engage with the environment and develop skills in inquiry (Hamlin & Wisneski, 2012). There is a strong connection between discovery play and the learning of scientific concepts,

In the early years, children's sense of wonder, and their desire to explore the real world, are the perfect vehicles for absorbing fundamental understanding about the Earth's cycles – how plants grow, how weather/climate affect our lives, how plants/animals/humans interact, and how the living and non-living worlds are interdependent (Herbert, 2008, p. 64).

However, it is important to acknowledge the contribution of diverse play types to the development of children's scientific understandings, beyond discovery learning only. Although discovery play is often child-led, and emerges from the child's curiosities, interests and questions about the world, educators can certainly enrich opportunities for discovery play by thoughtfully considering materials which may extend play and learning; questions they might pose before, during and after children's play; and how they might further extend discovery play through related exploration opportunities (Hamlin & Wisneski, 2012). In order to facilitate authentic discovery play, educators might frequently refrain from answering children's questions directly, and instead support children to discover the answers for themselves. Discovery play often extends over days, weeks and even months, depending upon the interest levels of the children, the seasons and the changing environment. Learning about STEM through discovery play is very powerful, because it inspires children to engage deeply with their world, and become motivated, engaged, lifelong learners (Greenfield et al., 2017).

Examples of discovery play include looking at objects under a digital microscope, experimenting with natural resources (e.g. leaves from the red ash soap tree), exploring shadows and light, floating and sinking, observing the world and interacting with it (e.g., watching insect and animal behaviour).

Well, when I last went kayaking, I saw so much jellyfish, but now there's none. Maybe they only come once a year? I also do remember seeing a bird fishing underwater... They just dive down under the kayak. And I saw a big tail, which I don't know what it was. Bobby, Nature Explorers, Pottsville.

"Children are naturally really curious about the plants that they find. And they ask a lot of questions, and it gives us a really good chance to do research together. So, we've got a few reference books up there... they are really into birds. So, we do the same sort of thing. When they see a bird or hear a bird, we do research together. And we've got a bunch of bird app so that we can listen to the call. So, if a child hears a call and they can't see the bird, it's fantastic, because we can try to identify what sound we are hearing... So, there is a lot of science just sort of naturally embedded into what they are interested in, when they play" – Hannah Powell, Kurilpa Community Childcare



Figure 26: Discovery play at Nature Explorers, Pottsville

Death play

Death play is play which explores death, dying, or grief. Although death is traditionally viewed as inappropriate to explore with young children (Campbell Galman, 2020), death is a common

feature of child-led play. Importantly, death play may afford powerful opportunities to challenge the human-centred or an anthropocentric worldview, where humans are viewed as exceptional outside of natural ecosystems, by emphasising human vulnerabilities as deeply affected by the health of our planet (Nelson, 2020). While death play may often be child-initiated in response to loss of family members, pets passing or a child happening across a dead body in nature, in news stories, popular culture or picture books, death play may also be initiated or supported by educators as a means for supporting a child or children who are interested or grappling with concepts of death and grief. Examples of death play can include observing dead animals decomposing over time, role-playing death/dying and learning about lifecycles.

We see dead things from time to time, and we watched a dead kookaburra for a long, long time... We watched it decay. We saw it when it had fallen out of the tree and it was freshly dead, and we watched the ants eat it – that was really gross. It was smelly for a while, there were beetles in it, maggots and then it was just dried up skin and bones and with the feathers still attached. And then we were just starting to see bones, and then the floods came and there was no more dead kookaburra to watch. Jennifer McCormack, Birdwings Forest School, Guanaba.

The children really wanted to visit [the decaying kookaburra] every day. It was part of our space and part of what they knew to be there. And every day they would check it out and how it disintegrated as well, and they were interested in that and they were interested in what happened to it, and they were interested in telling their own stories of death. A couple of the children had pets that passed away during this time, and so for them then they could talk about that. Narell Neville, Birdwings Forest School, Guanaba.

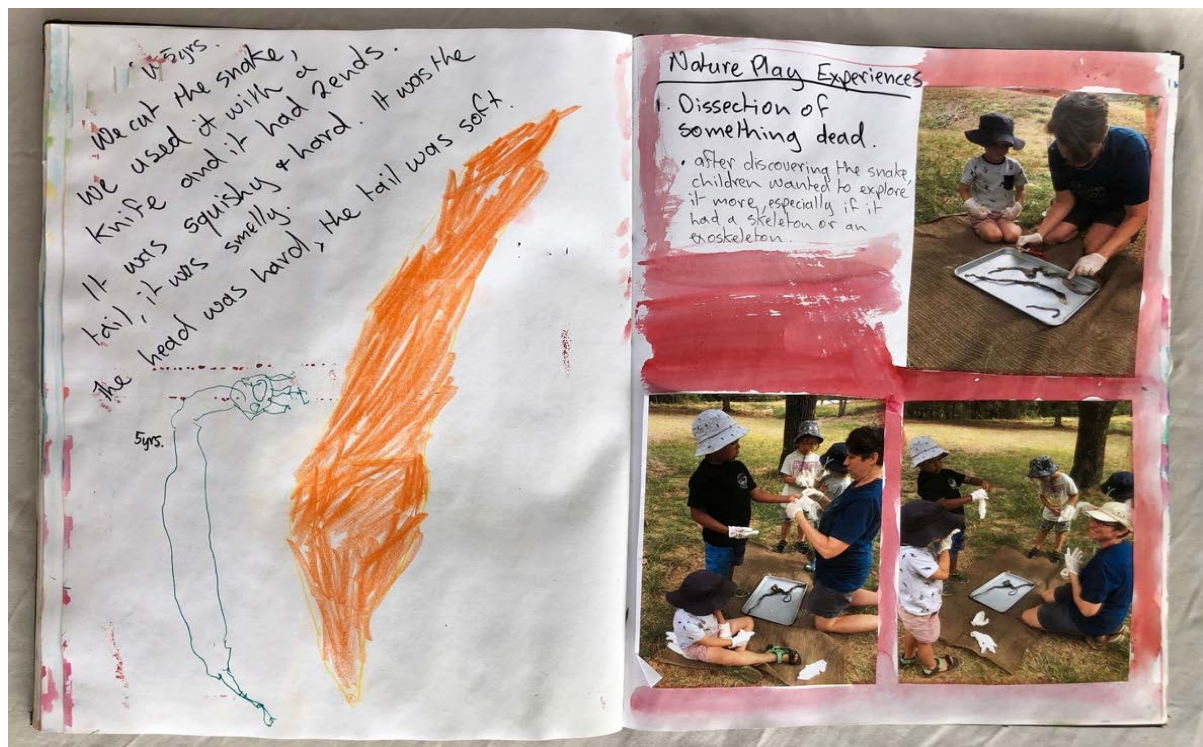


Figure 27: Pages from educator Narell Neville's visual diary, Birdwings Forest School, Guanaba



Figure 28: Death play at Birdwings Forest School, Guanaba

THE GRITTIENESS OF NATURE PLAY

During the interviews with the early childhood educator participants in this project, the researchers explained that a key outcome of the project was to write this 'Nature Play Framework' for/with educators. The researchers asked the educators: "What would be helpful for educators to include in the Nature Play Framework?". The educators were generous and forthcoming with insightful suggestions to support educators to embrace nature play in diverse settings.

In response to feedback on early drafts of the Nature Play Framework, the educators' wisdom weaves around embedding Aboriginal and Torres Strait Islander perspectives, histories and cultures, STEM and nature play and risks and barriers throughout the Nature Play Framework. However, the educators also shared rich wisdom grounded in decades of experience teaching in the early childhood sector, which is also critical to share. Thus, in this section of the framework educators' wisdom is represented regarding various ways to strengthen nature play pedagogies, and children's subsequent learning of scientific concepts (see Figure 29).

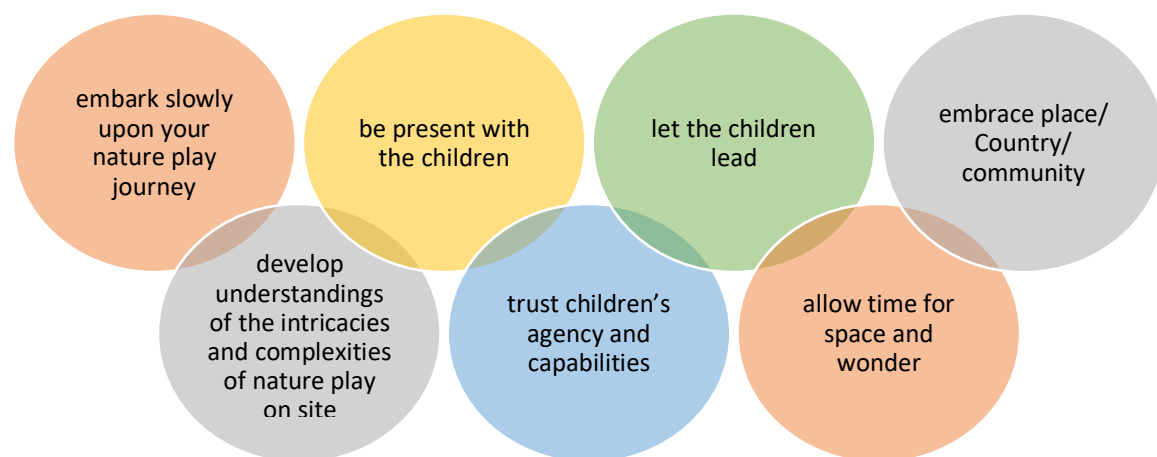


Figure 29: Strengthening nature play and scientific learning in early childhood – wisdom from educators

Strengthening nature play practice: Embark slowly upon your nature play journey

The most important thing is not to expect this to happen overnight – to start introducing things slowly, get the children used to [nature play]... I think you need to educate educators before. I think that is really key. They need to be educated first. Nettie Lester, Clearview Early Learning Centre, Nerang.



Figure 30: Birdwings Forest School, Guanaba

Strengthening nature play practice: Develop understandings of the intricacies and complexities of nature play in your centre

This has been a really big journey... because we're trying to articulate more and more in our foundation planning and documents... We had nature mentioned in our philosophy but we're actually in the middle of rewriting our philosophy. And part of the reason is we've started to embed all of these really big concepts... Marion Hayes, Rainbow Valley Early Learning Centre, Gladstone.

Really unpack your own philosophy, and the service's philosophy, and reflect on that often and change it. [Don't] be afraid to take a risk, and do lots of reading and research, and embed that into what you do. I suppose it comes down to your philosophy... The 'aha' moment is just challenging your own philosophy, to really unpack what it means for play-based learning and how that looks in nature. Cassy Reed, Pottsville Community Preschool, Pottsville.



Figure 31: Nature Explorers, Pottsville

Strengthening nature play practice: Be present with the children

I want to say to everyone – just be with children, enjoy the time, let it go... and sometimes documentation is not so important. It's more important [to engage in genuine] reflective practice than actual documentation. And if you document anything, make it relevant... don't just tick boxes and say you have 10 observations done for the sake of doing it. Sofia Machado, Nature Explorers, Pottsville.

I think a lot of people freak out thinking, 'How am I going to replicate a classroom environment in the outdoors?' And you don't have to... it's unnecessary. And I think people forget how capable children are of creating their own learning in the nature play setting... But I think it's important to remember that firstly, kids will find their own way to make it exciting for themselves, and they are really incredible at it. And also, co-learning is such a magical thing too. So, when I first started, I knew nothing. I didn't know any of the plants, and now I could name pretty much all of them. Because every time we were interested in something, we'd investigate all together. We'd go 'alright, well, let's do that, what's that plant?'... We'd just research together. And I think that's the most powerful tool that we have. Don't be scared off with a lack of knowledge, because it comes, it comes naturally. It comes with the children, and just learn alongside them. Be a learner with the kids. Because it's fun for the kids too. [It's powerful to for the children to realise] 'Oh, all the adults don't actually have all the answers, we can actually figure stuff out together, and that's okay'. Hannah Powell, Kurilpa Community Childcare, Brisbane.



Figure 32: Birdwings Forest School, Guanaba

Strengthening nature play practice: Trust children's agency and capabilities

I am often humbled by children. [They] will shock and amaze me with their capacity to find new ways to do things, or to engage with different elements of the environment. And I go 'Ahhh, that's right, this is their stomping ground', in a way. You know, nature is very natural to children. They just have this innate ability to find meaning in it. So yes, quite often I just have to remind myself to pull back and go, 'That's right, yep, they've got it. You are the one freaking out, they are actually fine'. And it's nice as an educator to be reminded all the time, 'Yes, thanks kids, you taught me again'. Hannah Powell, Kurilpa Community Childcare, Brisbane.

They are so clever. They do know a lot, they are very aware of the world that they live in, and they bring so much to their learning environment. You could [go] all day without the intentional [teaching/play] side, or you could just listen and watch, and they just like to work it out for themselves. And I guess being there as an educator to nurture those questions... and add a little language and words and descriptions. You can see their little brains just absorbing everything. Tenille Abbott, Le Smileys, Waraburra.

I really value children's competencies and capabilities in nature, and I think that kids are incredibly capable and confident in nature, even more so than they might be back in the gate at kindy... I just think... you really see children have strong leadership when they get into nature environments, and you get into the bush – it's where children really excel, they really lead. Julie McDonald, Tamborine Mountain Community Kindergarten, Tamborine Mountain.



Figure 33: Birdwings Forest School, Guanaba

Strengthening nature play practice: Let the children lead

The learning environment needs to be child directed. So, they need to have some input into what the environment looks like. Nettie Lester, Clearview Early Learning Centre, Nerang.

For me... accessibility [is crucial]. [Children] must be able to access [nature/the outdoors] when they want to. We're lucky because we can do that inside, outside play... they know that they can access it any time they need to. Gini Tangira, Blackwater Tiny Tots, Blackwater.

If you let them lead the way... if you supply the play [materials], then they takeover and lead the play where it's going to go... We make available nature experiences and excursions, then we just stand back and observe them and watch them learn through their own inquisitiveness and their own want to learn, and [we watch them] develop new skills and understandings about how they're connected to their world. Nadia Bonnell, Green Leaves Forest Springs, Kirkwood.

Our direction to ourselves was 'to notice what children notice,' and that has led our practice evermore since. Marion Hayes, Rainbow Valley Early Learning Centre, Gladstone.

[It is so important to provide] space for children's emerging learning... a space where children can revisit and then take leave of their own learning. Katrina Cupples, Rise Early Learning Centre, Gold Coast.



Figure 34: Birdwings Forest School, Guanaba

Strengthening nature play practice: Allow time and space for wonder

I think the biggest thing is spending time in nature with children. Because if you are not in there, they've got to make that connection with the natural environment that they are playing in. So, a lot of that starts by the teacher talking to the children about things that they're noticing. So, whether you notice the birds that come to visit and [say] 'I wonder what that one's called?'.... Not just saying 'I know the answer to this', [instead] saying 'I wonder why that animal is doing this', or 'I wonder how that flower smells?'. Thinking aloud with children about nature while they are playing in it. 'That sand, how does that feel today?', 'how does it feel when you are burying your feet in it?', 'that was interesting to hear the sound of the rocks as they plonked into the water there', or 'look at the splash from it.' Lots of chatting with the children while they are playing with nature, and then once you've opened up that connection with them, they are attuned to that environment that you keep playing in, it all just evolves into you just attuning your senses to them, then. And listening to them and questioning with them. It's all there, and it will come out of every child in any environment they are in, so as long as you are with them in that environment, and you're taking notice with them. Julia Greene, Rockhampton South Kindergarten, Rockhampton.

The highest priority for us is children's sense of agency, children's sense of wonder, their sense of belonging. Cassy Read, Pottsville Community Preschool, Pottsville.

[Children] deserve to play like in the old days without too much intervention, without people hovering over them. They deserve to be able to do things and see what happens when they do them... to have a rich environment full of wonder and exciting things to discover. Narell Neville, Birdwings Forest School, Guanaba.



Figure 35: Nature Explorers, Pottsville

Strengthening nature play practice: Embrace place/ Country/ community

We have an open-door policy... We still stick to our regulations and our guidelines, but it's about community teaching us about community, and supporting each other and learning from each other. And if we don't know the answer, [we ask] 'who in community can tell us?'. So, the community is raising the children of Weipa through the kindergarten. Liz Smith, C & K, Weipa.

Start by just looking at their local area... and what's in their local area and what's important to their local area? Whether it's preservation of the local creek or... start at your local community. Julie McDonald, Tamborine Mountain Community Kindergarten, Tamborine Mountain.

We're lucky here that we have access to an outdoor environment, and we also have access to lots of different parks and natural places in our town. There's a lot of free things we can do. We can go to the park and sit and have a picnic on the beautiful green grass, and we can watch the birds. We can go to different places. Jess Smith, Les Smileys, Berseker.



Figure 36: Nature Explorers, Pottsville

Strengthening nature play practice: Focus on experiences, not stuff

You don't actually need other things to play, and I think once the [children] realise that, they get more creative with how they [engage with nature]. Julia Greene, Rockhampton South Kindergarten, Rockhampton.

You don't need to take resources. And I think that's a hard concept for educators, because it's not necessary what we've trained to do. You can... follow the curriculum by using nature and only nature. You don't have to have buckets and spades and all sorts of things. And I think that's really important to reinforce, because people still coming to grips with nature play still feel like they need to take this massive load of resources that they would normally use in the classroom outside, and that's not necessary. Rebecca Burch, Nature Explorers, Pottsville.

Children need to be able to have that free play time outdoors. And you know, in settings like this, where they are here five days a week, morning til night, sometimes since they are three months old, that's even more integral in these sort of settings, is giving them that opportunity to connect with nature in a way they would have, if they were at home. So yeah, all those opportunities are very important. Hannah Powell, Kurilpa Community Childcare, Brisbane.

I believe... that if children are put in a room with manmade things, they get bored quite easily. Whereas, if they're allowed to play in nature and the resources are open-ended, they seem more connected and more in tune with themselves, and they can level their mood [more easily] and things like that. They can control and understand themselves and their thinking better than a child in a room with toys and loud music and bright stimulation... children should be more encouraged, and parents should be more encouraged, to get children outside... and let them be free to explore nature instead of wrapping them up in cotton wool. Nadia Bonnell, Green Leaves Forest Springs, Gladstone.



Figure 37: Nature Explorers, Pottsville

Strengthening nature play practice: Considering materials, resources and play sites

Use natural objects in different games instead of toys – like bingo with shells. Debbie Priest, Clearview Early Learning Centre, Nerang.

I think having real resources and not synthetic things is really important. For the sensory quality, and I guess just because they're real. Jess Smith, Les Smileys, Berseker.

Give the kids access to a variety of materials. Katrina Tantengco, Kool Kids Nerang.

D: Get away from plastic toys. N: Yeah, [provide] purposeful toys or equipment... Have more resources that are open ended. Debbie Priest & Nettie Lester, Clearview Early Learning Centre, Nerang.

Just having nature resources [is so important]. We tend to not have... or we try not to have manufactured resources a lot. We're wanting children to make their own. Julie McDonald, Tamborine Mountain Community Kindergarten, Tamborine Mountain.

We play within the bush, but obviously we have an effect on the bush. So we need to be sustainable in our play so that the environment is still there for us. If we use it too much in the one spot there's wear and tear, where the bush can't quite recover. So, we don't just play randomly, we never walk in the riparian zones, we walk on the creek bed and we try to play in nature so that we have a positive effect. And if we don't then that's why we plant trees and have a greenhouse and grow seeds and plant, so that we can give back to the land, because we know that we do have an effect on it. Narell Neville, Birdwings Forest School, Guanaba.



Figure 38: Kool Kids Early Learning Centre, Nerang

NATURE PLAY ONLINE RESOURCES

Links

Project website: www.childhoodnatureplay.com

Facebook: Nature Play Collective

Instagram: @natureplayproject

Other Nature Play Websites

Childhoodnature Collective: www.childhoodnature.com

Nature Play Australia: www.natureplay.org.au/

Nature Play QLD: www.natureplayqld.org.au/

Nature Play WA: www.natureplaywa.org.au/

Nature Play SA: www.natureplaysa.org.au/

Common Worlds Research Collective: www.commonworlds.net

Cool Australia Early Learning Curriculum materials:

https://www.coolaustralia.org/curriculum-materials/?types=k=&types=v=&year_level=k=year_level-early-learning&year_level=v=8071&ca_topic=k=&ca_topic=v=&subject=k=&subject=v=&

REFERENCES

- Arnott, L., & Duncan, P. (2019). Exploring the pedagogic culture of creative play in early childhood education. *Journal of Early Childhood Research*, 17(4), 309-328.
- Artinian, T. (2018). Engaging teachers and toddlers in science. *Voices of Practitioners*, 13(1), 62-68.
- Australian Government Department of Education Employment and Workplace Relations [DEEWR]. (2009). *Belonging, Being and Becoming: The Early Years Learning Framework for Australia*. Commonwealth of Australia.
- Bai, P., Thornton, A., Lester, L., Schipperijn, J., Trapp, G., Boruff, B., ... & Christian, H. (2020). Nature play and fundamental movement skills training programs improve childcare educator supportive physical activity behavior. *International Journal of Environmental Research and Public Health*, 17(1), 223.
- Bairaktarova, D., Evangelou, D., Bagiati, A., & Brophy, S. (2011). Early engineering in young children's exploratory play with tangible materials. *Children, Youth and Environments*, 21(2), 212-235.
- Barratt Hacking, E., Flanders Cushing, D., & Barratt, R. (2020). Exploring the significant life experiences of childhoodnature. In A. Cutter-Mackenzie, K. Malone, & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Beery, T. (2020). Exploring access to nature play in urban parks: resilience, sustainability, and early childhood. *Sustainability*, 12(12), 4894-4911.
- Beery, T., & Jørgensen, K. A. (2018). Children in nature: sensory engagement and the experience of biodiversity. *Environmental Education Research*, 24(1), 13-25. doi:10.1080/13504622.2016.1250149
- Brussoni, M., Olsen, L. L., Pike, I., & Sleet, D. A. (2012). Risky play and children's safety: balancing priorities for optimal child development. *International Journal of Environmental Research and Public Health*, 9, 3134-3148. DOI:10.3390/ijerph9093134
- Bucher, E., & Hernández, M. (2016). Beyond Bouncing the Ball: Toddlers and Teachers Investigate Physics. *YC Young Children*, 71(3), 17-24.
- Campbell Galman, S. (2020). Nicole's mother is dead: death games, unruly stories, and what matters in preschool. *Ethnography and Education* [online], 1-17. DOI:10.1080/17457823.2020.1861956To
- Colliver, Y., & Fleer, M. (2016). 'I already know what I learned': young children's perspectives on learning through play. *Early Child Development and Care*, 186(10), 1559-1570. Retrieved from <http://dx.doi.org/10.1080/03004430.2015.1111880>
- Cremin, T., Glauert, E., Craft, A., Compton, A., & Stylianidou, F. (2015). Creative Little Scientists: exploring pedagogical synergies between inquiry-based and creative approaches in Early Years science. *Education 3-13*, 43(4), 404-419. doi:10.1080/03004279.2015.1020655
- Cutcher, A., & Rousell, D. (2014). Collaborative visual mapping as performance: Visual Arts pre-service teachers' reflections on practicum. *International Journal of Education through Art*, 10(2), 247-254.
- Cutcher, A., Rousell, D., & Cutter-Mackenzie, A. (2015). Findings, windings and entwinings: cartographies of collaborative walking and encounter. *International Journal of Education through Art*, 11(3), 449-458.

- Cutter-Mackenzie, A., & Edwards, S. (2006). Environmental education as a content area in early childhood education and curriculum. *Australian Journal of Environmental Education*, 22(2), 13-19.
- Cutter-Mackenzie, A., & Edwards, S. (2013a). The next 20 years: imagining and re-imagining sustainability, environment and education in early childhood education. In S. Elliott, J. Davis, S. Edwards, & A. Cutter-Mackenzie (Eds.), *Best of Sustainability: Research, Practice and Theory* (pp. 61-67). Early Childhood Australia.
- Cutter-Mackenzie, A., & Edwards, S. (2013b). Toward a model for early childhood environmental education: foregrounding, developing, and connecting knowledge through play-based learning. *The Journal of Environmental Education*, 44(3), 195-213. <http://dx.doi.org/10.1080/00958964.2012.751892>
- Cutter-Mackenzie, A., Edwards, S., Moore, D., & Boyd, W. (2014). Young Children's Play and Environmental Education in Early Childhood Education. Springer.
- Cutter-Mackenzie, A., Edwards, S., & Widdop Quinton, H. (2015). Child-framed video research methodologies: issues, possibilities and challenges for researching with children. *Children's Geographies* 13(3), 343-356.
- Cutter-Mackenzie-Knowles, A., Lasczik, A., Wilks, J., Logan, M., Turner, A., & Boyd, W. (2019). *Touchstones for Deterritorialising Socioecological Learning: The Anthropocene, Posthumanism and Common Worlds as Creative Milieux*. Palgrave Macmillan.
- Cutter-Mackenzie-Knowles, A., Malone, K., & Barratt Hacking, E. (Eds.). (2020). *Research Handbook on Childhoodnature: Assemblages of Childhood and Nature Research*. Springer Nature.
- Davids, K. (2018). Affordances guiding Forest School practice: the application of the ecological dynamics approach. *Journal of Outdoor and Environmental Education*, 21(1), 103-115.
- Deleuze, G., & Guattari, F. (1987). *A Thousand Plateaus: Capitalism and Schizophrenia*. Continuum
- Deleuze, G., & Guattari, F. (1994). *What Is Philosophy?* Columbia University Press.
- Dodd-Nufrio, A. (2011). Reggio Emilia, Maria Montessori, and John Dewey: dispelling teachers' misconceptions and understanding theoretical foundations (Editorial). *Early Childhood Education Journal*, 39(4), 235-237.
- Dowdell, K., Gray, T., & Malone, K. (2011). Nature and its influence on children's outdoor play. *Australian Journal of Outdoor Education*, 15(2), 24-35.
- Edwards, S., & Cutter-Mackenzie, A. (2011). Environmentalising early childhood education curriculum through pedagogies of play. *Australian Journal of Early Childhood Education*, 36(1), 51-60.
- Edwards, S., & Cutter-Mackenzie, A. (2013). Next time we can be penguins': expanding the concept of 'learning play' to support learning and teaching about sustainability in early childhood education. In O. Lillemyr, S. Dockett, & B. Perry (Eds.), *Varied Perspectives on Play and Learning: Theory and Research in Early Years Education* (pp. 255-274). Information Age Press.
- Ernst, J. (2012). Early childhood nature play: a needs assessment of minnesota licensed childcare providers. *Journal of Interpretation Research*, 17(1), 7-24.
- Ernst, J. (2014). Early childhood educators' use of natural outdoor settings as learning environments: an exploratory study of beliefs, practices, and barriers. *Environmental Education Research*, 20(6), 735-752.

- Fleer, M. (2010). *Concepts in Play: A Cultural Historical View of Early Learning And Development*. Cambridge University Press.
- Green, C. (2020). Embodied Childhoodnature Experiences Through Sensory Tours. In A. Cutter-Mackenzie-Knowles, M. K., & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Greenfield, D. B., Alexander, A., & Frechette, E. (2017). Unleashing the Power of Science in Early Childhood: A Foundation for High-Quality Interactions and Learning. *Zero to Three*, 37(5), 13-21.
- Grieshaber, S. (2008). Interrupting stereotypes: teaching and the education of young children. *Early Childhood Education and Development*, 19(3), 505-518.
- Hamlin, M., & Wisneski, D. (2012). Supporting the scientific thinking and inquiry of toddlers and preschoolers through play. *YC Young Children*, 67(3), 82-88.
- Haraway, D. (2016). *Staying with the Trouble: Making Kin in the Chthulucene*. London: Duke University Press.
- Harper, N. J. (2017). Outdoor risky play and healthy child development in the shadow of the "risk society": a forest and nature school perspective. *Child & Youth Services*, 38(4), 318-334, DOI: 10.1080/0145935X.2017.1412825.
- Herbert, T. (2008). Eco-intelligent education for a sustainable future life. In I. P. Samuelsson and Y. Kaga (Eds.), *The Contribution of Early Childhood Education to a Sustainable Society*, 63–66. UNESCO.
- Hobbs, M. E., Williams, R. A., & Sherwood, E. A. (2012). Collaborating with teacher researchers to study what young children know and can do in science. *Voices of Practitioners*, 7(1), 1-11.
- Howell, E. (2017). Humans really are made of stardust, and a new study proves it. Retrieved from <https://www.space.com/35276-humans-made-of-stardust-galaxy-life-elements.html>
- Jackson, A. Y., & Mazzei, L. A. (2016). Thinking with an agentic assemblage in posthuman inquiry. In C. A. Taylor & C. Hughes (Eds.), *Posthuman Research Practices In Education* (pp. 93-107). Palgrave Macmillan.
- James, J., Bixler, R., & Vadala, C. (2010). From play in nature, to recreation then vocation: a developmental model for natural history-oriented environmental professionals. *Children, Youth and Environments*, 20(1), 231-256. Retrieved from <http://www.jstor.org/stable/10.7721/chilyoutenvi.20.1.0231>
- Kahn Jr, P. H., & Weiss, T. (2017). The importance of children interacting with big nature. *Children, Youth & Environments*, 27(2), 7-24. doi:10.7721/chilyoutenvi.27.2.0007
- Kahn Jr., P. H., Weiss, T., & Harrington, K. (2020). Child-Nature Interaction in a Forest Preschool. In A. Cutter-Mackenzie-Knowles, M. K., & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Knight, L. (2016). Playgrounds as sites of radical encounters: a mapping of material, affective, spatial, and pedagogical collisions. In N. Snaza, D. Sonu, S. E. Truman and Z. Zaliwska (Eds.), *Pedagogical Matters: New Materialisms and Curriculum Studies* (pp. 13-28). Peter Lang.
- Kuo, M., Barnes, M., & Jordan, C. (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10. doi:10.3389/fpsyg.2019.00305
- Langton, M. (2019). *Welcome to country* [youth edition]. Hardie Grant Travel.

- Lasczik Cutcher, A., & Irwin, R. L. (2017). Walkings-through paint: A c/a/r/tography of slow scholarship. *Journal of Curriculum and Pedagogy*, 14(2), 116-124. doi:10.1080/15505170.2017.1310680
- Leopold, A. (1949). *A Sand County Almanac And Sketches Here and There*. New York: Oxford University Press.
- Lenz-Taguchi, H. (2011). Investigating learning, participation and becoming in early childhood practices with a relational materialist approach. *Global Studies of Childhood*, 1(1), 36–50.
- Lillard, A. S., & Taggart, J. (2019). Pretend play and fantasy: what if Montessori was right? *Child Development Perspectives*, 13(2), 85-90.
- Loizou, E. (2017). Towards play pedagogy: supporting teacher play practices with a teacher guide about socio-dramatic and imaginative play. *European Early Childhood Education Research Journal*, 25(5), 784-795. doi:10.1080/1350293X.2017.1356574
- Louv, R. (2005). *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder*. Algonquin Books
- Louv, R. (2011). *The Nature Principle: Human Restoration and the End of Nature-Deficit Disorder*. Algonquin Books.
- Louv, R. (2016). *Vitamin N: The Essential Guide to a Nature-Rich Life: 500 Ways to Enrich Your Family's Health & Happiness*. Algonquin Books.
- Malone, K and Tranter, P. (2003a.). *Children's Environments: A study of children's environmental learning in relation to their schoolground experiences*, RMIT University, September 2003.
- Malone, K and Tranter, P. (2003b.) School Grounds as Sites for Learning: making the most of environmental opportunities, *Environmental Education Researcher*, 9, (3), 283 – 303.
- Malone, K. & Tranter, P. (2005). "Hanging out in the school ground": a reflective look at researching children's environmental learning, (special school ground edition), *Canadian Journal for Environmental Education*, 10 (1), 212 - 224.
- Malone, K. (2015). Posthumanist approaches to theorising children's human-nature relations. In K. Nairn, P. Kraftl, & T. Skelton (Eds.), *Space, Place and Environment* (Vol. 3, pp. 1-22). Springer.
- Malone, K. (2016). Reconsidering children's encounters with nature and place using posthumanism. *Australian Journal of Environmental Education*, 32(1), 1-15.
- Malone, K. (2018). *Children in the Anthropocene: Rethinking Sustainability and Child Friendliness in Cities*. Palgrave Macmillan.
- Malone, K and Moore, S.J., (2019a.). Sensing Ecologically through Kin and Stones, *International Journal of Early Childhood Environmental Education*, 7(1), p. 8-25.
- Malone, K. (2019b). Worlding with Kin: Diffracting Childfish Sensorial Ecological Encounters through Moving Image, *Video Journal of Education and Pedagogies*, 4, pp.69-80.
- Malone, K., Birrell, C., Boyle, I., & Gray, T. (2015). *Wild Nature Play: Researching Out of School Hours in the Bush*. Centre for Educational Research, University of Western Sydney.
- Malone, K., Truong, S., & Gray, T. (2016). *Reimagining Sustainability in Precarious Times*. Springer.
- Moomaw, S., & Davis, J. A. (2010). *STEM comes to preschool*. *YC Young Children*, 65(5), 12-14,16-18.
- Moyle, K. (2019). *Literature Review: Indigenous early childhood education, school readiness and transition programs into primary school*. Retrieved from

<https://research.acer.edu.au/cgi/viewcontent.cgi?article=1001&context=littlebigcuz>

- Nelson, N. (2020). Rats, Death, and Anthropocene Relations in Urban Canadian Childhoods. In A. Cutter-Mackenzie-Knowles, M. K., & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Nxumalo, F. (2020). Situating Indigenous and Black Childhoods in the Anthropocene. In A. Cutter-Mackenzie-Knowles, M. K., & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Pacini-Ketchabaw, V. (2013). Frictions in forest pedagogies: common worlds in settler colonial spaces. *Global Studies of Childhood*, 3(4), 355-365. <http://dx.doi.org/10.2304/gsch.2013.3.4.355>
- Pacini-Ketchabaw, V., & Taylor, A. (Eds.). (2015). *Unsettling the colonial places and spaces of early childhood education*. Routledge.
- Park, J. (2019). A comparison of the pretending elements between constructive play and pretend play. *The Turkish Online Journal of Educational Technology*, 18(4), 1-6.
- Payne, P. G., & Wattchow, B. (2009). Phenomenological deconstruction, slow pedagogy and the corporeal turn in wild environmental/outdoor education. *Canadian Journal of Environmental Education*, 14, 15-32.
- Platz, D., & Arellano, J. (2011). Time tested early childhood theories and practices. *Education*, 132(1), 54-63.
- Pineda, M. (2018). Mama Spider. *Journal of Childhood Studies*, 43(1), 73-80. doi:<http://dx.doi.org/10.18357/jcs.v43i1.18267>
- Pyle, A., & Danniels, E. (2017). A continuum of play-based learning: The role of the teacher in play-based pedagogy and the fear of hijacking play. *Early Education and Development*, 28(3), 274-289. <https://doi.org/10.1080/10409289.2016.1220771>
- Rousell, D., & Cutter-Mackenzie-Knowles, A. (2020). A systematic review of climate change education: Giving children and young people a 'voice' and a 'hand' in redressing climate change. *Children's Geographies*, 18(2), 191-208.
- Rousell, D., Cutter-Mackenzie, A., & Foster, J. (2017). Children of an earth to come: Speculative fiction, geophilosophy and climate change education research. *Educational Studies*, 53(6), 654-669.
- Samuelsson, I., & Carlsson, M. (2008). The playing learning child: towards a pedagogy of early childhood. *Scandinavian Journal of Educational Research*, 52(6), 623-641. Retrieved from <http://dx.doi.org/10.1080/00313830802497265>
- Sandseter, E. B. H. (2010). *Scaryfunny: A qualitative study of risky play among preschool children* [unpublished thesis]. Norwegian University of Science and Technology, pp. 1-126.
- Smithner, N. (2011). Creative play: The importance of incorporating play, liminality and ritual in teaching K-12. In S. Schonmann (Ed), *Key Concepts In Theatre/Drama Education*. Sense Publishers.
- Somerville, M., & Hickey, S. (2017). Between Indigenous and non-Indigenous: urban/nature/child pedagogies. *Environmental Education Research*, 23(10), 1427-1439. doi:10.1080/13504622.2017.1325451
- Taylor, A. (2013). *Reconfiguring the Natures of Childhood*. Routledge.
- Taylor, A., & Giugni, M. (2012). Common worlds: reconceptualising inclusion in early childhood communities. *Contemporary Issues in Early Childhood*, 13(2), 108-119.
- Thoreau, H. (1854/2014). *Walden*. USA: CreateSpace Independent Publishing Platform.

- Tooth, R., & Renshaw, P. (2020). Children Becoming Emotionally Attuned To “Nature” Through Diverse Place-Responsive Pedagogies. In A. Cutter-Mackenzie, K. Malone, & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Tranter, P. & Malone, K. (2004) Geographies of environmental learning: an exploration of children’s use of school grounds, *Children Geographies*, 2 (1), 131-156
- Tuhiwai Smith, L., Tuck, E., & Yang, K. W. (Eds.). (2018). *Indigenous and Decolonizing Studies in Education: Mapping the Long View*. Routledge.
- Ulmer, J. B. (2017). Posthumanism as research methodology: inquiry in the Anthropocene. *International Journal of Qualitative Studies in Education*, 30(9), 832-848. doi:10.1080/09518398.2017.1336806
- Wee, B. (2020). The nature of childhood in childhoodnature. In A. Cutter-Mackenzie-Knowles, M. K., & E. Barratt Hacking (Eds.), *Research Handbook on Childhoodnature*. Springer.
- Weston, A. (1994). *Back to Earth: Tomorrow's Environmentalism*. Philadelphia: Temple University Press.
- Whitehead, A. (1920). *The Concept of Nature: Tarner Lectures Delivered in Trinity College November 1919*. Cambridge: Cambridge University Press.
- Whitty, P., Hewes, J., Rose, S., Lirette, P., & Lee, M. (2018). (Re)encountering walls, tattoos, and chickadees: Disrupting discursive tenacity. *Journal of Childhood Studies*, 43(2), 1-16. doi:http://dx.doi.org/10.18357/jcs.v43i2.18574
- Whyte, K. P. (2018). Indigenous science (fiction) for the Anthropocene: Ancestral dystopias and fantasies of climate change crises. *Environment and Planning E: Nature and Space*, 1(1-2), 224-242. doi:10.1177/2514848618777621
- Williams-Siegfriedsen, J. (2017). *Understanding the Danish Forest School Approach: Early Years Education in Practice* (2nd ed.). Routledge.
- Wood, E., & Attfield, J. (2005). *Play, learning and the early childhood curriculum* (2nd ed.). London: Paul Chapman.
- Yunkaporta, T. (2019). *Sandtalk: How Indigenous thinking can save the world*. The Text Publishing Company.