

Place-responsive Pedagogies in the Anthropocene: attuning with the more-than-human

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Abstract

Drawing on New Materialist frameworks for environmental and sustainability education, we extend and deepen our understanding of contemporary place-responsive pedagogies in the light of our human-impacted geological epoch, the Anthropocene, and its allied environmental concerns. Empirically, we explore for the first time in a new and original way, the role of the more-than-human in educators' planning and enactment of place-responsive pedagogies. We show that place-responsive pedagogies are derived from ongoing attunements reciprocally made by all participants to each other – educators, learners, and the more-than-human – and between the place of learning and these participants. Findings show that these attunements emerge from socio-environmental processes and features of a place, but this article also shows the critical importance of (i) what educators and learners are able to notice and respond to, (ii) how educators choose to build upon this noticing and response-making, and (iii) how they actively incorporate the agencies of the more-than-human into teaching and learning. Wider implications for researching environmental and sustainability education are considered.

Key words: New Materialism, more-than-human, place-responsive, place-based, posthumanism

Introduction

There is an urgent need in all sectors of the education system for a clearer signposting for what educators should do to respond to stark environmental issues such as climate change, biodiversity loss and eco-social injustices. Around the world, there is call for more action on climate change from education in formal and informal settings by: intergovernmental bodies (IPCC, 2014; UNESCO, 2016; 2019), non-governmental movements (Extinction Rebellion, 2019), educational authorities (Scottish Government, 2016; Department for Conservation, 2017), in training and higher education (Tilbury, 2014; Stirling, 2012) and teacher education (Scottish Government, 2019; UNESCO, 2015).

In our current period since the nuclear fallout in 1945, humans have created unprecedented effects on the Earth, with experts suggesting we have already heralded in a new geological epoch, the Anthropocene (Crutzen, 2002). In the distant future, geologists will read of human impacts in our technological and plastic-based fossils in the record from this current period. Whilst, theoreticians have set in train valuable discussions about the need for an educational response to this (Haraway, 2016), we still lack clear understandings of what constitutes effective pedagogy as a response. More specifically, what might be the role of educators in place-responsive pedagogies with their learners and communities in the face of environmental crises driven by climate change, biodiversity loss, food insecurity, water shortages and a desire for greater energy generation?

Place-responsive Education

Place-responsive education is a pedagogy associated with education in outdoor settings (Mannion & Lynch, 2016) and related fields such as: outdoor education (Cosgriff, 2016; Wattchow & Brown, 2011; Stewart, 2020); learning for sustainability (Paulus, 2015; Tooth & Renshaw, 2009); primary geography education (Dolan, 2015); socio-ecological education (Wattchow et al., 2014); and outdoor learning (Green & Somerville, 2015). Place-responsive pedagogies hold promise for ways education can address climate change through explicitly teaching by-means-of-an-environment with the aims of understanding and improving human-environment relations (Mannion, Fenwick & Lynch, 2013; Lynch, 2018). As such, place-responsive pedagogy can be understood as part of a wider educational response to the challenges posed by environmental issues, sustainability, including for example, climate change.

Wattchow and Brown's (2011) key contribution and later chapter (Brown & Wattchow, 2016), use the term 'place-responsive', drawing on Cameron's postcolonial position on education (2003a, 2003b). John Cameron centralises the ecological perspective of place and puts forward the term 'place-responsive' to argue that we should be more than 'sensitive' to place. Our responsivity toward places is about a dynamic relationship. Wattchow and Brown offer signposts for educators of place-responsive practice:

1. Being present in and with a place.
2. The power of place-based stories and narratives.
3. Apprenticing ourselves to outdoor places.
4. The representation of place experiences.

(Wattchow & Brown, 2011; 182).

Whilst these signposts offer excellent starting points (for a discussion, see Mannion et al, 2013), there is still a need for more direction for educators based on empirical research as to how to plan and enact curricula effectively in practice.

Attunement

Whilst others have sought to apply a phenomenological frame (Wattchow and Brown 2011), in this study we look to discern when and how more-than-human elements play an important, and overlooked, role in place-responsive pedagogies. Drawing on New Materialist approaches to education, place-responsive pedagogy is seen to include the more-than-human (Mannion, 2019; Mannion & Lynch 2016; Lynch & Mannion 2016). As Coole and Frost (2010) put it, the more-than-human features of place can be thought of as co-ingredients in education in outdoor settings.

Recent place-responsive empirical work (Mannion 2019) shows place-responsive pedagogy to be a process of (re-)assembling *with* the more-than-human encountered in places. Drawing on New Materialist (Fox & Alldred, 2015) and assemblage theory (Deleuze and Parnet, 1987), Mannion (2019) challenges human exceptionalism in environmental and sustainability education – new relations, experiences and becomings with the more-than-human are required. Whilst Mannion's (2019) work is helpful in understanding some of the broad directions of place-responsive pedagogy, educators' part in this work is not well understood. This paper presents findings from a PhD study that sought to further understand how

educators harness and / or get harnessed by the more-than-human in efforts to facilitate outdoor learning.

In this paper, the concept of attunement is key to our contribution and to the further expression and extension of place-responsive pedagogy. As we will show empirically, attunement can be seen as a response-making process at work *with* the material, more-than-human and affective features of place. Such attunement calls on us to respond through our actions *with* the world. Drawing on New Materialist thought, we see attunement as a socio-material practice where matter is not inert but co-implicated in our formation (Coole & Frost, 2010). New Materialism provides us with ways we can understand our inseparability with the Earth whilst at the same time challenges a human exceptionalist view. To help operationalise some of these ideas we turn to the anthropologist Tim Ingold, and the curriculum theorist Ted Aoki.

Ingold challenges the notion that our capacities to respond to the world are innate; instead, he argues, they develop *through* our responses to the environment. In terms of education and knowledge, this means we come to know about our world through our ongoing responses within and through it. Ingold writes that any knowledge we might create “... is continually generated and regenerated within the contexts of people’s skilled, practical involvement with significant components of the environment.” (Ingold, 2004; 307). Ingold’s approach, inspired by posthumanist theory, is useful because he sees that it requires engagement *with* materials and practices (Ingold, 2013). As a result, attunement provides a theoretical basis for understanding the findings produced through the research processes and analysis of the dataset: an educational and practice-based reciprocal process involving the more-than-human features of place.

Curriculum theorist, Ted Aoki also puts forward the view of the importance of educator attunement within the practice of teaching involving both the “curriculum-as-plan” (Aoki, 2004; 203) (eg a National curriculum) and the “curriculum-as-lived” (*Ibid.*) (eg the embodied reality of classroom life). He argues that teachers as developers of curricula in the lived moment of teaching need “... a developer’s touch, a developer’s tact. A developer’s *attunement* that acknowledges in some deep sense the uniqueness of every teaching situation” (Aoki, 2004; 165, italics added). Drawing on Aoki and Ingold, we use empirical data to support our assertion that place-responsive pedagogy arises via a process of educator attunement to the uniqueness of human and more-than-human features of places.

New Materialism

There has been considerable theoretical groundwork relevant to the place-responsive education we are proposing through the use of New Materialist perspectives. Many of these sources argue theoretically for the need to work against contemporary western anthropocentrism, ‘stewardship’ perspectives, and the idea of human exceptionalism. For example, Pleasants and Stewart suggest “New materialisms are generative tools through which we might rethink our basic assumptions about the role and place of humans in the world made insecure by human existence and recognized in the affects of the Anthropocene” (2020; 14). New Materialists argue, for example, that since people, places and materials are entangled and emergent, a relational approach is required to teaching and learning.

New Materialism provides a “monological account of emergent, generative material being” (Coole & Frost, 2010; 8). In other words, ‘entities’, such as the human and more-than-human, are not bounded and separate from each other. Snaza, Sonu, Truman and Zaliwska (2016) see these ideas as part of an ‘ontological turn’ that education must respond to. This understanding

of the ontological situation impacts on how we might understand teaching and learning. For example, these views bypass individualism and break binaries such as human / non-human, and nature / culture. As Braidotti notes, this makes for the emergence of a “broader ensemble” that connects educational practice to the wider world and makes for a relational style of teaching (2019; 142). Yet, research-based contributions expressing how this is to proceed in practice are needed. Drawing on New Materialism in this study, and in an effort to address these gaps, we sought to empirically study of the role of the more-than-human in a specific context: the planning and enactment of outdoor learning by in-service school teachers in Scotland.

Within research in outdoor learning, early childhood studies, and related fields, there is a noticeable trend towards New Materialism being employed to challenge anthropocentric views of the outdoor context (Gough, 2016; Malone, 2015; Ruck & Mannion, 2019; Mikaelis & Asdfelt, 2017; Pleasants & Stewart, 2020; Somerville & Powell, 2019; Somerville, 2016, 2017; Tammi, 2019). Born out of posthumanist critiques (Andrews & Duff, 2019), New Materialism shows where the “human and non-human are no longer vertically aligned” (2019; 124). Understanding the ontological situation as non-hierarchical, or monological, situates subjectivity as something that *emerges* from multiple social, material and affective processes. Commentators argue that the application of New Materialism to education in outdoor settings requires us to consider the relations we form with the non-human, surfacing new challenges for environmental education and education for sustainability (Gough, 2016; Mcphie & Clarke, 2015).

Duhn, Malone, Tesar (2017) too argue for a consideration of outdoor environments in learning that does not separate the human from other species. Empirical work by Mikaelis and Asfeldt (2017), sought to understand what modes of relating to place emerge when we

decentre the human subject in favour of a relational entanglement. They found that new embodied relations to places emerge through outdoor skill development, place-based stories and journeying. Similarly, Jukes, Stewart and Morse (2019), re-worked empirical data collected on an outdoor education river trip with New Materialism. Challenging anthropocentrism, they found that physical materials encountered on the river trip (litter) acted with agency in how discourses and actions towards littering were generative. Whilst they see that “matter has an agential role to play in the learning occurring within OEE” (2019; 17), how such matter might be considered relevant by those planning and facilitating outdoor learning is not discussed. Jukes and Reeves (2019), suggest the role of the educator is to guide and provoke learners via the use of “more-than-human stories” (2019;15) in order to rethink human-nature relations. Whilst these studies suggest decentering the human offers new possibilities for teaching and learning outdoors, the knowledge and dispositions educators need to do this remains a moot point.

In the light of the existing research, the main research question posed purposefully sought not to specify who the actor or agent was in the processes under inquiry: “How are the more-than-human elements found in outdoor places harnessed into the planning and enactment of curricula for outdoor learning?”.

The researcher (Lynch, 2018) sought to understand when and how **educators’ plans were linked to or impacted by more-than-human agencies and what impacts were felt in the ensuing lessons** – the enactment of the lived curriculum. Drawing on Deleuzian theory, the study was sensitised by the notion that place-responsive pedagogies would be emergent, more-than-human assemblages, where what we do as educators “is always dependent on the forces and agencies of other entities” (Mannion 2019, 16). This is because “different elements in an assemblage have different capacities to act, affect and be affected” (*Ibid.*).

Mannion (*Ibid.*) calls for an open-ended, relational, processual orientation in pedagogies involving “new embodied, emergent interconnections” among learners, their communities, people, animals, and outdoor places in environmental and sustainability education (ESE) (see Mannion, 2019 for further).

As we have seen, only a few authors have used empirical data to discern what constitutes a place-responsive pedagogical response as part of wider environmental and sustainability pedagogies in outdoor settings. In much of the research on the role of place in ESE, we find a sustained struggle to break out of traditional humanistic registers. In the search for a conceptual approach, the term ‘more-than-human’ in cultural geography provided leverage for this study at an early stage of data collection (Abram, 1996; Gruenewald & Smith, 2008; Whatmore, 2002). As a concept, ‘more-than-human’ functions to address the nature-culture binary suggesting that the human and the more-than-human are relationally intertwined (Brown & Dilley, 2012; Demeritt, 2005; Gibbs, 2009; Lorimer, 2010; Panelli, 2010; Whatmore, 2006). As a result, the construct of ‘more-than-human’ was used in the context of this study on outdoor educational provision in order to challenge the privileging of the human subject and to more fully appreciate the relations we are inseparable from in the world. Whilst the term has been taken up in research in ontological considerations (Sonu & Snaza, 2015; Snaza et al., 2016; Mcphie & Clark, 2015), there has been few studies to date that have used theories of the ‘more-than-human’ as a main empirical focus in educational contexts.

Methodology

The participating in-service teachers were from primary and secondary schools in Scotland; all regularly used local outdoor places for teaching and learning. Methodologically, we sought to decentre the human subject to understand how the more-than-human aspects of

place might shape learning outdoors. Whilst focusing purposively on the educators themselves, we took a strongly relational view in both data collection, analysis and in theoretical framing. In this research, we wanted to understand the educators' experiences in a relational manner. In what way is their role still crucial, redundant, or in need of reconceptualization? What is distinctive about the role of the more-than-human when learning is facilitated outdoors?

To answer the research question, we employed Stake's (2006) multicase study methodology. Inspired by New Materialism, we worked with a case definition that was not humanist and where case boundaries were seen as relations or assemblages of human and the more-than-human. Hence, a case was defined as: **the class teacher, any planning and enactment practices of outdoor learning, and features and considerations for use of the outdoor learning site including the more-than-human.** Cases were *selected* to extend our understanding of the phenomenon (Stake, 2006). Stake notes that "a multicase study starts with recognizing what concept or idea binds the cases together" (2006; 23). From a wider sample of twelve teachers, five were chosen because they all fitted Stake's selection criteria to contribute to a rich understanding of the phenomena:

1. Is the case relevant to the quintain [research question]?
2. Do the cases provide diversity across contexts?
3. Do the cases provide good opportunities to learn about complexity and contexts?

(Stake, 2006; 23)

Two key methods (for a fuller description, see Lynch, 2020) were devised that were sensitive to the role of the more-than-human found in the planning and enactment of outdoor provisions. These were (a) walking interviews and (b) memory-box interviews. During the

walking interviews, the researcher (first author) walked with educators in the outdoor sites they used and talked about and photographed the more-than-human that was harnessed or not through their outdoor learning practice. The memory-box interviews were focused around materials that teachers collected in cardboard shoe boxes that were related to any harnessing of the more-than-human in their planning and enactment of outdoor learning. This second method was attuned to the role of materials in the coproduction of meaning and is also congruent with the New Materialist theoretical framework of the research (Barad, 2003, 2007; Braidotti, 2013; Coole & Frost, 2010).

Rhizoanalysis

In data analysis, we sought to resist linear representational logic through interpretation, and instead drew on Deleuze and Guattari's (2004) concept of the rhizome through a form of **rhizoanalysis**. St. Pierre, Jackson and Mazzei (2016) argue that New Materialist informed research works on a different plane than representational thought. In other words, the world is not separate from our experience of it. Experience is preconceptual and therefore any understanding is a process of becoming with our ideas and the unfolding world "on a plane of immanence" (2016; 103). The particular rhizoanalytical approach we used was based on Fox and Alldred's (2015) framework:

In this new materialist ontology ... both events and research processes are considered as material, relational and interacting networks comprising human and non-human components. (*Ibid.*, 2015; 1)

The rhizoanalysis was a three-stage process which resulted in the production of vignettes, or research-assemblages (Fox & Alldred, 2015). Understanding research analysis via assemblages is a way to conceptualise, and actualise, social science research that takes into account the "bodies, things and abstractions" that *include* the tools, models and researcher (Fox and Alldred, 2015; 401). For this research, this is particularly important because it means the researcher, research methods, and audience are all included in the analysis. There

is no representational position taken in this rhizoanalysis. Instead, the rhizoanalysis sought not to represent the data but to see what new thinking and conceptualising about outdoor learning can be produced when we take a fuller account of the more-than-human.

Data was used, through the process of rhizoanalysis, to produce vignettes. These were produced through the bringing together different elements from datasets of photographs, interview transcripts, and field notes. Masny's (2014) four rhizoanalysis processes were used to read the data and identify affective changes. Masny proposes four rhizomatic procedures: "Palpating", "raw tellings", "reading the data intensively and immanently", and "provoking questions" (2014; 358). In the vignettes shared here, the reader is *also* part of the ongoing performance of the research. As data are 'read', any reader will also have thoughts and ideas that are produced by the vignette which could create new meaning or new concepts. The following two vignettes are from separate cases which help to show how the findings from the study were produced.

Data and Findings

The first vignette, from a memory-box interview, is concerned with the curriculum enactment of outdoor learning. The second vignette, from a walking interview, is concerned with the curriculum planning of outdoor learning.

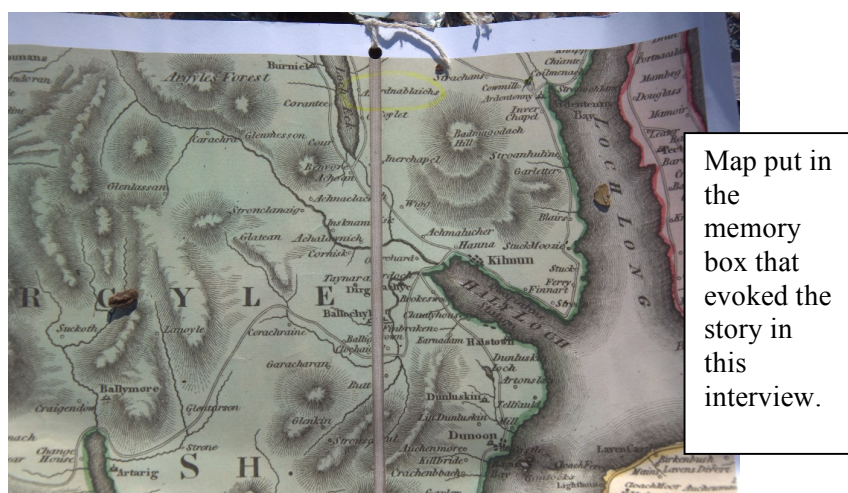
Vignette 1, Curriculum Enactment - Memory-box Interview "The Smugglers' Trail and the Shaded Forest"

This vignette provides an entry point into understanding aspects of one teacher's attunement to place and the harnessing of the more-than-human in their curriculum enactment of outdoor learning. The vignette discloses a story about a novice teacher who was being mentored by the teacher in this interview. During the memory-box interview, the map *initiated the story of*

the development of the geocache trail. It is included in this vignette because of the relations it produced. This vignette produces thinking around how the more-than-human agencies, such as the shade offered by the trees, end up being harnessed in the enactment of outdoor learning in contextualised ways developed through an attunement to place.

Vignette 1

- R Yes. Not that it costs us any transport to come here. We are lucky. I appreciate not everybody is. I was involved as a mentor with the [unclear 26/55] group in *Place name* and I got really nice feedback from them, who had done what. I was blown away with some of the ideas they came up with. There was one girl, when I first mentioned things like geocaching she was like, ‘No, that is too technical, not for me,’ **but she was open minded when she went to the site with the kids.** They are focused on the smuggling history of the area, there is a smugglers’ cave and things up there, and I had brought in some old brandy bottles that came from our house when we discovered a false wall when we were doing some renovations. So, they focused on that. **And she said when they were there on the site with the kids, you saw how the landscape made you hide, and your route varied according to not wanting to be seen, and then they ended up doing a geocaching trail that is called the smugglers’ trail. You had to keep out of sight of anybody all the time.** I think it was the ranger who offered to show her the technology side of things. Because she was on the site and saw what the site offered to the topic and how excited the kids were and then the ranger offered the expertise and the technology and the equipment to do it, it all fell into place. And that is something she would do again and again. She thoroughly enjoyed it.
- I Wow. That is a bit like here ...
- R And she was someone who hadn’t gone out very often. She was a convert.



Palpating (Masny, 2014) the data in this vignette, the changes in curriculum enactment with the more-than-human that came about through the attunement to place by the novice teacher can be sensed. The movement through the forest and the different sensations of being in shade, or out in the open, were significant aspects of attunement that seemed to influence the enactment of the ‘smugglers’ trail geocache activity. This vignette portrays how the teacher became attuned to the more-than-human aspects of the places visited through perceptual

sensation and movement: the agencies of the trees become noticeable as the shade of the site is appreciated. It also portrays how the learners' response-making to the same more-than-human features of place was something the teacher paid attention to in the enactment of the curriculum. Attunement to more-than-human agencies is achieved through the educator's own on-going engagement with places *and* through attending to learners' engagements with places.

This vignette portrays some of the processes of attunement to the more-than-human the educator drew upon to develop the smuggler geocache activity. Whilst the focus on the smuggling history is humancentric, this vignette reminds us that *all human practices* backwards and forwards in time are embedded in environments and therefore require a degree of reciprocity with the more-than-human. The difference between a smuggler and the environmental educator can be thought of an ethical one – one is about the illegal hiding of goods and the other is concerned with the education that aims to improve human-environment relations. Both practices – teaching and the past-historical practice of smuggling – are embedded in environments and require attunement to the more-than-human. This vignette discloses that for environmental educators today, it is important to consider how we assemble more-than-human and human agencies in educational practices such that improved human-environment relations can emerge. In this vignette we see an important role of the pedagogue is to be attuned to the more-than-human *and* human agencies and, then, for them to consider how they will become educational in a given ethical direction.

Vignette 2, Curriculum Planning- Walking Interview “Sphagnum Moss as Capacity”

During this walking interview, this teacher explained how the agencies of some sphagnum moss became harnessed in an exercise on capacity in the curriculum planning of outdoor learning. The relations around the sphagnum moss surfaced during the interview and have

been dominant in the production of this vignette. These relations also disclose a level of attunement to place that this teacher, and the learners, have developed over time.

Vignette 2

R. **You will see here on the ground sphagnum moss;** we did a topic on capacity and we collected quite a lot of plastic containers from the beach and took them back into the school and did a lot of work on capacity with them and how much water they could each hold. They estimated first and then ...

I The capacity of the plastic vessels.

R **But one of the things we did was collect sphagnum moss and as a problem-solving exercise we found how much water the sphagnum moss would hold and then squeezed it out and measured it.** So that was quite fun. There is all sorts of things that ... it is not just to do with the natural objects ...

R **But this is the way that we walk into the woodland so every time we walk in there will be something different to see.** There might be new flowers that we didn't notice before or it might be the trees beginning to bud, **it might be mosses**, it could be ... as I say we have used the rubbish before as a focus. It could be wildlife that we see. Birds that we see. There are eagles nesting in the cliffs up here and we sometimes see sea eagles from here. Sometimes, quite regularly actually. We see sea eagles from here. **So, what we see on the walk into the woodland can often affect how we follow, what we do next, what we follow up.**



The area with sphagnum moss

In this vignette, the teacher described the attunement to place that occurred as she walked onto the site with the children as a powerful raw telling (Masny, 2014): “**So what we see on the walk into the woodland can often affect how we follow, what we do next, what we follow up**” (Data excerpt Case 5, Vignette 9). As I consider this raw telling, I think about

how this teacher is paying attention to what she, and the children noticed, every time they entered the outdoor learning site. For this teacher, her curriculum planning was attuned to the more-than-human that can be harnessed in activities such as capacity with the sphagnum moss¹. This attunement has resulted in the harnessing of the more-than-human in contextualised ways into the place-responsive pedagogy. I also sense that this occurred as she became attuned to the more-than-human because of walking through the outdoor place with the learners. There is also a sense she was attuned to the more-than-human in this place because she knows about the moss that is there and its water-holding capacity.

Whilst this vignette portrays ways that the teacher was attuned to the moss, we can develop a richer understanding of a reciprocal responsiveness with the more-than-human through New Materialist thought. The teacher in this vignette was attuned to the water capacities of the moss. This is an example of the human responding to the more-than-human; being affected. As the more-than-human agencies do not exist outside of human agencies, we can start to tentatively appreciate a reciprocity in action where the more-than-human in turn is affected, and what pedagogical implications for place-responsiveness this produces. For example, the water the moss holds can teach us about capacity, but reciprocally we might plan outdoor learning to consider how the *moss is affected* by human actions on water cycles or by land drainage schemes. This vignette portrays an important step in place-responsive pedagogy which we see as based on the educator being attuned to more-than-human agencies. The educational activity around capacity may appear human-centric, but this vignette offers ways of appreciating the importance of attunement by the educator to more-than-human agencies in curriculum planning; that it can *remind us* of how we are ethically always interconnected

¹ It is important to acknowledge that the squeezing of the sphagnum moss as an educational activity is potentially destructive to fragile bog ecosystems.

with multiple relations on the earth. We can surmise that this environmental educator could go on to make links to the life sustaining importance of water and the role of this kind of environment in storing carbon. The analysis here shows the antecedent step needed: educator attunement to the more-than-human agencies found in places.

Analysis and Findings

These two vignettes were from a wider set of 35 [Lynch, 2018]. Taken together, these vignettes produced the following key findings:

More-than-human pedagogies are derived from ongoing attunements by human and more-than-human elements to each other over time in places.

These attunements comprise:

- i. the kinds of reciprocal response making educators are able to engage in within a given place,**
- ii. what their learners attend and respond to,**
- iii. how educators attend to learners' response-making,**
- iv. the ways in which the agencies of the more-than-human are incorporated into teaching and learning.**

Analysis

Cross-vignette analysis allowed for these findings to be divulged. These findings suggest that one key role for the educator is to develop an ongoing attunement to human and more-than-human elements over time in places. The two vignettes presented in this paper portray how attunements comprise of response-making processes *through* our actions *with* the world, and the uniqueness of the more-than-human elements found in places.

Across both vignettes, the educators attunements to the more-than-human agencies are palpable in their planning and enactment of teaching and learning in different ways. For example, vignette 1 discloses how the educators attunement to the more-than-human agencies acted as a catalyst for pedagogy around smuggling and geocaching. These are examples of how subsequent place-responsive pedagogies were derived from these attunements by human and more-than-human elements to each other over time in places opening up new ethically oriented considerations in the pedagogical practices. The first vignette portrays an example of finding (iv), where the more-than-human agencies of the shade were incorporated into the final teaching and learning activity of the smuggling geocache. This vignette also portrays finding (iii), where the teacher attended to the responses from the learners – to the shade available on the site and the connections to the social practices of smuggling in that place.

The second vignette portrays ways the educator was attuned to the more-than-human via the materials (moss) found in places and responded to what they encountered *with the learners* in any one occasion. This is an example of finding (ii), where attunement to the more-than-human by the learners was something this teacher saw as pedagogically important. What more-than-human the learners attended and responded to were included in the emergent and responsive approach this teacher took to curriculum planning. This vignette also portrays finding (i), how the teacher engages with a reciprocal response-making with the more-than-human (in this case around measurement activities with the moss). This response-making seems at least partially built upon attunement to what more-than-human agencies were present in this place. The more-than-human she and the learners encountered led to significant reciprocal response-making in that place and at that time.

In this analysis, we have shown that through attunement, educators can develop more-than human, place-responsive educational experiences in various ethically-oriented ways to improve human-environment relations. We have empirically explored how attunement to the human *and* more-than-human agencies is needed to enable the planning and development of these emergent pedagogies of the Anthropocene.

Discussion

New Materialist research can be about “finding ways to enable lines of flight that ‘produce genuinely new ways of being in the world’” (Fox & Alldred, 2015). Whilst Mannion (2019) showed that what we do as educators “is always dependent on the forces and agencies of other entities” (Mannion, 2019; 31), findings here suggest that ongoing attunement to human and more-than-human elements over time in places is another core characteristic of place-responsive pedagogies. We have shown how attunement can be thought of as a key feature of the work of the place-responsive educator arising from on-going **reciprocal** response-making process among human and more-than-human elements found in places.

We note that not all educators took the same approach with respect to the more-than-human, suggesting it can be an area for personal and professional development for in-service and pre-service teacher education. In New Materialist orientations to outdoor learning, environmental and sustainability education, the ‘human’ is not a solid category or bounded subject. If we see ourselves as not separate from the world but as relationally co-implicated, then pedagogy can be enriched, but requires certain competencies and strategies towards the design and conceptualisation of it. We see this is an ethical project too. For example, the posthuman ethics put forth by Braidotti (2013) call on us to move from an ethics based on self-interest

and individualism to one built on our interconnections between self and other; an enlarged sense of community “which includes one’s territorial or environmental inter-connections” (2013; 190). The findings of this study suggest that there are important material, relational and ethical dimensions to crafting place-responsive pedagogies. As a result, educators need to *learn* to become attuned to the social-material practices through time spent in places and working with the material dimensions of place.

The findings also suggest place-responsive pedagogies based on improved attunement can also improve human-environment relations. Thinking relationally through and with the more-than-human can encourage us to see the ecological significance of how we encounter and work with the more-than-human in education (Duhn, Malone & Tsar, 2017). We argue that appreciating any curricula as already interconnected with the world is one way to do this. Jardine et al. (1997), pose a view of curricula as that which is always integrated in an abundant world of relations. Offering a departure from discipline-centred approaches to curricula, they see any integrated curriculum as “an expression of the already existing interconnectedness of things themselves” (1997; 172). Jardine and authors note, “This is the juncture where the education can become environmental in a deep sense. It can be the place where we might slow the attention and broaden our relations with the earth” (1997; 182). We see that understanding curricula as an expression of an *already* interconnected world can encourage educators to see that the Earth will always be a necessary part of education. The findings from this study suggest the outdoors provides a distinctive context for educators to explore these interconnections. Place-responsive educators could engage in curriculum making with their learners as a process of assembling *and attunement* with the more-than-human elements of an already integrated and intertwined world.

Conclusion

In this study, we have shown that attunement in place-responsive pedagogy is a material, practice-based reciprocal process with the more-than-human features of place. In terms of the role of the educator, if we accept that we cannot be separate from the world and our knowledge of it, we have no choice but to work with the materials of the world in ways we cannot be removed from. As a result, place-responsive pedagogy is about working with the ontological situation that is available to us. In terms of the educator's role, to accommodate these features in pedagogy will require different approaches to curriculum planning. For example, planning curricula in outdoor learning may require educators to work less with predefined learning outcomes and more on hunches, ideas, suggestions or hints to where rich more-than-human encounters may exist outdoors and how to develop their abilities to be attuned to them.

Whilst we suggest that attunement can be realised through engagement with the material and through practice, we also argue that any attunement is not an ambivalent process without intent. In other words, we see that place-responsive educators can or will have explicit intentions for more-than-human agencies in their teaching and learning. This relational view of learning (whether inside or outdoors) may not be easily reconcilable with the prescribed curriculum, yet is perhaps more than ever necessary in the Anthropocene.

In this article, we have discussed how ESE research is responding to challenges presented by theorists around representational logic and concerns of anthropocentric paradigms.

Additionally, we have shown how the trend towards a concern for place as a focus for pedagogy and research has linked with New Materialist arguments that challenge human exceptionalism. Whilst New Materialism presents exciting ways to think about outdoor

learning, decentring the human and drawing our attention to the more-than-human, how we practically plan and enact place-responsive pedagogies needed to be more fully understood. In this research, we sought to address that gap through research based on walking with and interviewing outdoor pedagogues. The findings show that place-responsive pedagogical attunement in educational practice is a skilled and material process linked to human and more-than-human relations developed over time – time spent in places. The findings of this research point to a new goal for educator development (pre- and in-service): the place-responsive pedagogue can and should develop their attunements to the more-than-human as a core concern. Nurturing this disposition in ethical ways that more forthrightly addresses the goal of the *improvement* of human-environment relations in the future seems set to be a key concern for ESE.

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