



Stewardship and beyond? Young people's lived experience of conservation activities in school grounds

Andy Ruck^{a,b}  and Greg Mannion^a 

^aFaculty of Social Sciences, Division of Education, University of Stirling, Stirling, UK; ^bDepartment of Ecology, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden

ABSTRACT

This article provides ethnographic insight into the more-than-human relationships enacted through young people's participation in school grounds conservation activities. As a response to the escalating biodiversity crisis, conservation appears well-placed to facilitate young people's development of an environmental ethic of care, and a capacity to work towards addressing environmental issues. Proponents of posthuman pedagogies, however, argue that the 'stewardship' perspective underlying these activities fails to achieve the radical shift in human-environment relations required in response to the Anthropocene, given its apparent reinforcement of a perceived human/nature binary, and narrow 'solutions'-based approach. Considering these critiques, this article demonstrates that where there is openness to unplanned more-than-human encounters and the enactment of young people's own 'lived curricula', conservation activities can nonetheless enable forms of 'collective thinking with the more-than-human world' that transcend any underlying 'stewardship' perspective. We therefore point to the potential role of conservation activities within posthuman responses to the Anthropocene, provided such openness is maintained.

ARTICLE HISTORY

Received 8 January 2021
Accepted 2 August 2021



KEYWORDS

Conservation;
anthropocene;
more-than-human;
stewardship;
school grounds;
posthuman

Introduction: conservation, stewardship and posthumanism

In October 2019, the International Union for Conservation of Nature (IUCN) issued an urgent call for action to address the "unprecedented, unsustainable and growing impacts on wild species from human activities" (IUCN 2019, 1), highlighting an accelerating biodiversity crisis often referred to as the Earth's "sixth mass extinction" (Cole and Malone 2019). People across the world, the IUCN (2019, 1) states, "must accept responsibility for this emergency and act now to ensure we pass on a rich natural heritage to future generations". This article provides ethnographic insight into young people's lived experience of the Polli:Nation project – a UK-wide, school-linked conservation initiative that engaged them in a direct response to this call for action.

Young people's participation in conservation activities, particularly in formal education contexts, has seen relatively little coverage in academic literature. "Conservation" here refers to the transformation of a particular site in order to have positive impacts on biodiversity. Students need not travel to celebrated or protected landscapes to participate in conservation activities.

CONTACT Andy Ruck  andrew.ruck@slu.se  Faculty of Social Sciences, Division of Education, University of Stirling, Stirling, UK.

© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Instead, school grounds and local environs can be readily transformed for the improvement of biodiversity.

The *potential* of conservation activities in school grounds from a biodiversity perspective is highlighted in a recent article by Harvey, Gange, and Harvey (2020), yet to our knowledge, there are few or no studies focusing specifically on young people's *participation* in, or *experience* of, such activities, particularly in curricular contexts. Up to now, studies in this area have in large part focused on those taking part in conservation activities on a voluntary basis, the vast majority of whom are adults (Hine, Peacock, and Pretty 2008) who already display strong pro-environmental values (Halpenny and Caissie 2003; Guiney and Oberhauser 2009). When applied to young people, studies have focused on their participation in similar activities in curricular settings - such as food growth in school grounds (Green 2014), and citizen science (Karrow and Fazio 2010; Ballard, Dixon, and Harris 2017) - but these activities lack a specific focus on enhancement of biodiversity linked to wider environmental issues. With regard to their engagement with conservation specifically, attention has been paid mostly to learning *about* conservation rather than physically taking part in it, through visits to nature reserves, national parks and specialist education centres (Zint et al. 2002; Kruse and Card 2004; Burnett et al. 2016). Literature from related fields, however, indirectly points to the potential of conservation activities as a vehicle for environmental education, both for encouraging young people's development of an "ethic of care" towards the environment (Christie and Higgins 2012), and for increasing their capacity to work towards viable responses to critical environmental issues.

Regarding the first of these, two overarching findings from research in the fields of outdoor and environmental education point to a potential link between conservation activities and the development of an environmental ethic of care. These are, firstly, the importance of hands-on, 'direct' experience of an environment, which is highlighted in numerous studies using 'before and after' survey measures to gauge the effects of a given programme on young people's environmental attitudes and behaviours. 'Direct' experience here refers to, for example, experiencing wildlife in its natural habitat, rather than learning about it in a zoo or wildlife centre (Palmberg and Kuru 2000; Duerden and Witt 2010; Schonfelder and Bogner 2018). The second overarching finding from this field is the importance of long-term and regular engagement with a particular place, in order to develop a 'connection' to it - a premise that underpins 'place-based' approaches to outdoor learning (Woodhouse and Knapp 2000; Wattchow and Brown 2011). Sobel (2004) contends that such regular engagement with a place has the potential to foster a deep emotional attachment to that place which, he argues, is crucial to the adoption of pro-environmental behaviours in later life. Christie and Higgins (2012, 4) likewise conclude that "attitude and ultimately behaviour change stems from a connection to a place".

Young people's increased capacity to work towards the resolution of environmental issues through participation in conservation activities is most clearly indicated in the related field of civic ecology (Krasny and Tidball 2015). Krasny and Tidball (2012, 267) define civic ecology practices as those that "generally begin as small, self-organized efforts", usually involving the physical restoration of a certain locale following sudden or longer-term economic or environmental disruptions. These authors draw upon extreme examples such as the restoration of areas of New Orleans following Hurricane Katrina in 2005, yet parallels can be drawn with conservation activities in that these represent direct, localised responses to longer-term landscape changes such as habitat loss. In one of the few studies in this area focused specifically on young people, Smith, DuBois, and Krasny (2016, 451-452) argue that participation in civic ecology practices shifts the emphasis from the negative impacts of environmental decline or disaster towards a "solutions-based framing", thus instilling in young people a sense of empowerment with regard to the part they can play in its resolution.

With these considerations in mind, engaging young people in conservation activities appears to represent a suitable response to the IUCN's call for action. These activities directly engage young people in addressing a given environmental issue, while facilitating both a long-term

connection with a given place, and direct, hands-on experience of the habitats that comprise it. Critiques of the 'stewardship' perspective underlying much of environmental education, however, raise important questions regarding this suitability. Prominent among these critics is Affrica Taylor (2017), who defines "stewardship pedagogies" as those operating from the premise that "humans have exceptional capacities, not only to alter, damage or destroy, but also to manage, protect and save an exteriorized (non-social) environment" (1453). From such a perspective, the environment is positioned both as "the passive object of human knowledge" and as "needing human care and protection" (1452). Taylor sees such pedagogies as insufficient, perhaps even counterproductive, for achieving what she argues is a necessary paradigmatic shift in human-environment relations.

Taylor's (2017) criticism of stewardship pedagogies relates principally to the notion of the Anthropocene - a term given to a new geological epoch characterised by "human entanglement in the fate of the planet" (Somerville and Powell 2019, 14; Cole and Malone 2019). For Taylor (2017, 1449), accepting this inextricable entanglement calls for a radical re-thinking of our relationship with the environment and the other species comprising it, to try to de-centre ourselves in our thinking, and see ourselves as co-existent with other species rather than having any degree of mastery over them. Taylor's overarching critique, then, is that stewardship pedagogies fail to bring about this necessary paradigm shift, and can in fact reinforce the perceived separation of humans and environment. That is, in positioning humans as having the capacities to manage and protect a passive and exteriorized environment (as well as damage and destroy them), stewardship pedagogies "unwittingly rehearse the division of cultural and natural worlds, not their inseparability" (2017, 1453).

In response to the Anthropocene, and the related shortcomings of stewardship pedagogies, Taylor and Giugni (2012) propose "common world pedagogies" as an alternative (see also Taylor 2013; Nxumalo and Pacini-Ketchabaw 2017; Somerville and Powell 2019). Following Latour (2004), their use of the term "common world" describes the unique sets of "enmeshed relations with others in their worlds" through which young children experience their environments (Taylor 2013, 121). Common world pedagogies can be situated within a wider body of literature emphasising 'posthuman' approaches to environmental education (Rautio 2013; Clarke and McPhie 2016; Sonu and Snaza 2015), with which they share the following inter-related orientations. Firstly, these pedagogies emphasise eschewing the dualism between humans and a passive 'environment' to instead emphasise our co-existence and entanglements with other species. In common world pedagogies, this can be seen in the emphasis on encouraging, or at least not interfering with, affective and non-cognitive learning processes that are "nothing like the rational quest to know about the world from a distance that characterises western epistemologies" (Taylor 2017, 1456). Secondly, rather than rushing to find or promote solutions or quick fixes to environmental issues, these pedagogies emphasise "slowing down" and seeking new relationships with other species. The common world literature often draws on Haraway (2016), who advocates slowing down our responses to issues such as climate change, and instead "staying with the trouble". Perhaps because this strand of research is in its early stages, the agenda of converting the desire to "stay with the trouble" into pedagogical practice orientations is still emerging. In part, there is a sustained concern to allow children the freedom to play and explore with and alongside other species, without any necessary pre-defined agenda to 'protect' them on the basis of human agency alone.

When viewed in light of these posthuman orientations, engaging young people in conservation activities appears problematic. In particular, the argument against rushing to promote human-centred solutions to environmental issues stands in marked contrast to the IUCN's (2019, 1) call to "act now" in response to the escalating biodiversity crisis. In more general terms, positioning humans as the sole or main agents of change, planning and carrying out work that will 'protect' other species, appears to have considerable potential to reinforce the problematic stewardship perspective, and associated human/nature dualist thinking, discussed above. In fact,

Fletcher (2017, 230) suggests that the perceived physical separation of humans and nature is “most commonly expressed in the realm of biodiversity conservation”.

With these critiques in mind, this article draws on evidence to offer insight into the “more-than-human” (Whatmore 2002; Tsing 2013) relationships that were enacted through young people’s participation in the Polli:Nation project – a UK-wide, school-linked conservation initiative built around the practical transformation of school grounds into pollinator-friendly habitats. While a stewardship perspective clearly underpinned the project, this article’s key finding is that conservation activities nonetheless enabled the enactment of “lived curricula” (Aoki 1993) that were in fact considerably more complex than the simple re-production of this stewardship perspective, instead appearing to eschew – or at least shift the balance of – human/nature dualist thinking. Building upon the posthuman pedagogical theory discussed above, we point to these lived curricula as examples of what may be described as ‘collective thinking with the more-than-human world’. This term elevates ‘thinking’ to more than a purely rational, cognitive process, and takes its inspiration from the following quote from Taylor (2017, 1456):

Outside of formalised pedagogical contexts, close observations of young children’s everyday interactions with the world around them reveal that many already practice a form of thinking collectively with the more-than-human world... This is presumably because they have not yet been fully acculturated into the foundational binary traditions of western education, whereby ‘we’ (as the superior knowing human subjects) learn how to separate ourselves from the world that we learn ‘about’ (as the object of our superior knowledge systems).

This form of ‘collective thinking’, this article argues, appeared to be enacted where activities were loosely structured, allowing for unplanned and affective encounters with other species, alongside the main task comprising the activity. We therefore point to conservation activities as an effective means of facilitating such unplanned encounters, provided that practitioners retain a degree of openness to them, rather than focusing narrowly on the efficient completion of a task. We also advocate cross-curricular linking in cases where conservation activities are used in formal education contexts.

In the following sections, we first provide an introduction to the Polli:Nation project. We then outline the key methodological orientations drawn upon in this study, before providing ethnographic insights into the “lived curricula” that were enacted through young people’s engagement in the conservation activities comprising the project.

Methodology

This article draws upon a doctoral study (Ruck 2019) linked to the Polli:Nation project – a conservation initiative focused on the creation of pollinator-friendly habitats in school grounds. Polli:Nation took place in 260 schools across the United Kingdom (UK) between 2016 and 2018, primarily engaging pupils aged 9–13 (this corresponds to the upper two years of primary school, and lower two years of secondary school). Funded by the UK’s Heritage Lottery Fund (HLF), and run and managed primarily by Learning through Landscapes (LTL) – a nationwide charity promoting outdoor learning in formal education contexts – the project aimed to “create a network of knowledgeable and enthused young conservationists” (Learning through Landscapes 2014, 13) through engaging young people in directly addressing the recent severe decline in pollinator populations (Golick et al. 2018).

Typical conservation tasks within Polli:Nation included planting pollinator-friendly flowers, planting fruit trees, installing ponds, building and filling ‘planters’ made from various materials, and creating ‘bug hotels’ of various sizes and types. The project also included a nationwide survey completed by all schools at the start and end of the project, which aimed to use citizen science approaches to monitor biodiversity in the school grounds as transformations progressed. As noted, these kinds of activities are more commonly associated with informal, voluntary contexts (Halpenny and Caissie 2003; Guiney and Oberhauser 2009), and as such, the attempt

to embed them in formal, curricular educational contexts was a stand-out feature of Polli:Nation. In practice, however, activities would often be carried out on the fringes of the mainstream curriculum, and in many cases involved only small groups of young people (see below). Another striking feature of the project was its involvement of a variety of people and organisations from outside the school system. LTL staff were responsible for most of the face-to-face engagement with teachers and pupils, but the project also involved other individuals not normally associated with formal education contexts, such as parent helpers, and experts brought in to run sessions on specialist skills or topics relevant to a particular school's Polli:Nation activities. These individuals included beekeepers, members of local wildlife trusts, woodwork and landscaping experts, and at least one graffiti artist.

The associated doctoral study aimed to provide ethnographic insight into young people's lived experience of Polli:Nation, as well as to explore their own ideas as to the significant activities and features within the project. This stemmed from growing calls for environmental education researchers to focus on what participation in environmental education programmes "looks and feels like for the learners concerned", as well as/instead of the aims and outcomes of such programmes (Rickinson, Lundholm, and Hopwood 2009, 97). The lead researcher in the study (author one in this article) mainly used ethnographic methods, carrying out 30 participant-observation sessions in 12 Polli:Nation-participating schools across Scotland – 7 primary schools, and 5 secondary schools. This consisted of participating in practical tasks alongside young people, and writing fieldnotes (Emerson, Fretz, and Shaw 1995) during or as soon as possible after these activities. Later, the research questions were addressed more directly through focus groups, but this article draws entirely on the participant-observation sessions described here.

This research drew upon new materialist theories throughout data collection and analysis. Whilst somewhat resistant to brief definition, these theories are broadly characterised by an acceptance of the inseparability of humans and the material world (Jackson 2013), and studies that are oriented "towards processes and flows rather than structures and stable forms" (Fox and Alldred 2015, 407). We have written elsewhere of the challenges of adhering comprehensively to methodologies sensitive to new materialist theories when conducting empirical research (Ruck and Mannion 2020). Acknowledging these tensions, this research can be characterised as a "research assemblage" (Fox and Alldred 2015) through which qualitative research methods came to be re-oriented in a manner influenced by, and sensitive to, new materialist theories (Strom 2018). Three such orientations are relevant to the remainder of this article, and are outlined below.

The first such orientation builds upon Aoki's (1993) notion of a "curricular landscape" that is produced at the intersection of a "curriculum-as-plan", and the various "lived curricula" experienced by teachers and young people. In Aoki's work, a "lived curriculum" refers to a particular student's lived experience of a given educational process, while the "curriculum-as-plan" is the formal body of content and outcomes that is designated as 'the curriculum'. This article places a particular focus on the "lived curricula" of young people participating in activities within the Polli:Nation project, but recognises the influence of the "curriculum-as-plan" on the production of these. A key question of the PhD study on which this article draws was "how are curricula *produced* through the common activities and features within the Polli:Nation project?" The phrasing of this question follows the understanding of curriculum as a process of "curriculum *making*" that represents the "coming together" of the various elements involved in educational processes (Ross and Mannion 2012, emphasis added), rather than a static body of knowledge to be transmitted to 'learners'. This orientation had strong resonances with a new materialist focus on "processes and flows" (Fox and Alldred 2015, 407). In this study, fieldnotes written during or after participant-observation served to evidence the production or enactment of young people's lived curricula through Polli:Nation activities, as well as the ways in which these either differed from, or were influenced by, the curriculum-as-plan underlying the project.

Key to the production of lived curricula explored in this study is the second orientation - the identification of the “concepts” (Colebrook 2002) in circulation in the research setting. In new materialist theory, a concept refers to the emergence of an idea, or orientation for thought (Semetsky 2015). In keeping with Thrift’s (2008) non-representational theory, in identifying concepts, we were not seeking to *represent* a fixed ‘perspective’ already held by young people, or to locate this within an individual young person. Rather, concepts were seen as the (*re*) *emergence* of orientations for thought in a given moment, and as arising from the situation as a whole, of which young people were part. Crucially for this paper, ‘collective thinking with the more-than-human world’ was one of the key concepts identified, as was ‘environmental stewardship’. Others included ‘young people as (becoming) conservationists’, ‘scientific-technical knowledge’, and ‘young people as (becoming) active citizens’. These concepts reflected both the lived curricula identified during project activities, and the key underlying discourses– the curriculum-as-plan - identified before the project began.

The third orientation relevant to this article was the increased attunement (Lloro-Bidart 2017) to the “more-than-human” co-shaping of the curriculum making processes discussed above. “More-than-human” is a term used in geographical and anthropological research (Whatmore 2002; Tsing 2013), and later in post-human work in environmental education (Rautio and Jokinen 2016; Taylor 2017), that offers an alternative to the notion of an externalised ‘nature’, instead emphasising the inseparability of humans and the material world (Jackson 2013) that is key to new materialist theories. It is important here to acknowledge the risk of simply reproducing a human/nature dualism by distinguishing the ‘human’ from the ‘more-than-human’, or referring to interactions *between* these (James 2017; Clarke and Mcphie 2020). To be clear, we understand humans to be included *within* the term ‘more-than-human’. In this vein, we conceive of young people’s encounters with other species as “intra-actions” (Barad 2007) or “entanglements” (Gannon 2017) – terms that unlike ‘interactions’, do not presuppose a separation between two bodies. This is reflected in Lynch and Mannion’s (2021) work on “place-responsive” environmental education which, they argue, is enabled via attunements reciprocally made by *all* participants to each other – educators, learners, and the more-than-human elements found in places. In the present study, then, attunement to the more-than-human world comprised paying attention not only to young people, but also to fauna (for example, bees and other insects), flora (flowers, trees, weeds, dead leaves), and other material elements such as the specialist equipment used in conservation tasks, as well as a sustained focus on their intra-actions/entanglements.

It should be noted here that despite this more-than-human attunement, rather than necessarily evidencing the agencies of other species within more-than-human encounters, the ‘collective thinking’ demonstrated in the following section still refers primarily to *young people’s* lived experience. That is, the term ‘collective thinking’ should be interpreted as young people seeing *themselves* as part of a ‘collective’ with other species, rather than any of the ‘thinking’ being done by these other species. This, we feel, is also reflected in Taylor’s (2017) own descriptions of “more-than-human collective thinking”, which “requires *us* to let go of the certainty that humans are the only knowing subjects” (1455, emphasis added), and is evidenced by “*children’s* intimate, immediate and embodied impulses to touch and become with others” (1456-7, emphasis added). Our earlier article (Ruck and Mannion 2020) discusses the challenge in this study of interpreting the actions and “knowledgeabilities” of other species (Pacini-Ketchabaw, Taylor, and Blaise 2016, 156), particularly the worms, bees and other insects present within the Polli:Nation project. Following Petersen (2018, 11), we acknowledge that “speaking on behalf of” other species through writing and other academic practices can serve to reinforce the “performative privilege” held by humans. Thus, while fieldnotes taken during this study focused on more-than-human intra-actions, crucially, the emphasis was placed predominantly (and perhaps unavoidably) on the ways in which *young people* experienced these encounters. Significantly, however, in going beyond the purely rational and cognitive, these forms of collective thinking still demonstrate the enactment, through conservation activities,

of lived curricula that differed markedly from the stewardship perspective forming the basis of the project's curriculum-as-plan.

In the following section, then, we demonstrate by way of empirical examples how collective thinking with the more-than-human world was experienced by young people during conservation activities, and the features of the Polli:Nation project that appeared to support its emergence.

Findings – stewardship and collective thinking

This section first highlights the ways in which a stewardship perspective formed the basis of the Polli:Nation project, and was reproduced through certain elements of it. It then, however, highlights lived curricula that differed considerably from this curriculum-as-plan, as well as the key features of the project that appeared to enable the enactment of forms of collective thinking with the more-than-human world.

Curriculum-as-plan: stewardship and a utilitarian perspective

The early stages of this research involved gaining a sense of the discourses and ideas underlying the Polli:Nation project, through the Polli:Nation Activity Plan (Learning through Landscapes 2014) and website, as well as through informal conversations with project staff. Clearly, the curriculum-as-plan underlying Polli:Nation was founded on the stewardship perspective critiqued by Taylor (2017), with young people initially positioned as data collecting scientists via the biodiversity surveys, which then would steer them towards identifying changes to be made to their school grounds in order to attract more pollinators. Indeed, the Activity Plan (2014) refers to young people as “the future custodians of our natural heritage” (3), and lists “how likely (pupils) are to act in the future to conserve and protect natural heritage” (32) as a measure of the project's success.

Additionally, related to the stewardship perspective was the sense of a utilitarian view of other species in the project goals. This was most clearly expressed through the emphasis on bees and other pollinators performing an ecological function that is ‘useful’ to humans. As well as justifying the project in terms of “our” natural heritage, the Activity Plan also stresses the importance of pollinators for food production and the economy:

‘Free’ pollination by bees and other insects is worth over £400m to UK agriculture each year (UK National Ecosystem Assessment, 2011) and is crucial to the maintenance of our natural heritage (LTL 2014, 1).

Of course, alongside the evidence of young people's lived curricula (explored in the following section), there was ample evidence of how the curriculum-as-plan was reinforced and reproduced through project activities. This included explanations of the project to young people by LTL staff – for example, that bees are “doing a job for us for free... If we had to pay people to do it, it would cost Scotland £4.5 million”, and that “you're like ambassadors for pollinators, doing this work” (Fieldnotes, Primary School 1). Our analysis suggests the stewardship perspective was also re-produced simply through the premise that many activities were about humans helping other species. This is demonstrated in particular in the fieldnote extract below, which refers to the common activity of constructing a ‘bug hotel’:

Key ideas here include giving a ‘home’ to woodlice, other bugs, bees, etc. This always seems to be an activity that young people really get into, perhaps because of the relatability of giving something a ‘house’ or ‘home’. An obvious way in which we, as humans, can ‘help’ these other species.

(Fieldnotes, Secondary School 3)

Other moments, however, highlighted lived curricula that were markedly different from this curriculum-as-plan. These are explored below.

Lived curricula: collective thinking

This sub-section now provides examples of more-than-human encounters that were enabled by young people's participation in conservation activities, and which demonstrate the enactment of lived curricula that differed considerably from the curriculum-as-plan outlined above. For the purposes of presentation, the examples are initially labelled using everyday terms that occurred repeatedly in fieldnotes: 'excitement', 'fascination', and 'empathy'. Theoretically, however, and following Taylor (2017), we can characterise these descriptions as signs of the emergence of 'collective thinking with the more-than-human world'. This is expanded upon later in this section.

Before exploring these more-than-human encounters, it is firstly important to highlight the features of the Polli:Nation project that appeared most clearly to enable and enhance pupils' experience of them. Of course, simply being outdoors and participating in conservation tasks was the feature that most obviously facilitated these encounters. A feature pertaining more specifically to Polli:Nation, however, was the tendency for activities to be carried out in small groups, often outside of the core subject-based curriculum. While not the original intention of the project, it quickly became clear that this feature in fact considerably enhanced the experience of the young people who *were* regularly involved in the project, in that it enabled the replication of a degree of informality in activities more commonly associated with informal learning contexts. In fieldnotes taken during and shortly after Polli:Nation activities, author one had described this as a "relaxed atmosphere". Principally, this term referred to the loosely structured nature of many of the tasks in which pupils were engaged, and the significant amounts of time that pupils appeared to spend engaged in free play and exploration, either alongside or in-between these 'official' tasks. The encounters discussed here were most commonly unplanned moments that occurred during such free play and loosely structured tasks.

Excitement

The first three examples below are separate fieldnote extracts taken during the same day of participant-observation, during which a group of upper primary school-aged pupils are preparing to carry out the survey that formed part of the Polli:Nation project. The results gathered would help them to decide on the conservation work to be carried out in their school grounds:

"Ladybird!"; a few of the pupils exclaimed, as one of them found one, and held out his hand as it crawled over it. The others gathered round to peer in fascination.

(Fieldnotes, Primary School 2)

Another off-script moment as a bee landed on one of the purple clover flowers. "That's cool!", exclaimed one of the pupils. Most of them stood and watched it for a few minutes.

(Fieldnotes, Primary School 2)

At the corner of the site closest to the school building is a sort of 'greenhouse' building. Its structure is made out of bamboo canes, and old plastic bottles make up the walls. On the wall of the "greenhouse". Alisa found a green spider. It was one of those impromptu moments I'd come to expect. This was while a couple of the pupils were measuring out the survey area with the trundle wheel. Alisa was keen to show as many people as possible. Several of them peered closely at it. "It's looking after its baby!", she said.

(Fieldnotes, Primary School 1)

The above examples, we felt, demonstrated a palpable excitement among pupils in response to these unplanned encounters – one that appeared to transcend their perceptions of themselves as 'responsible stewards' of the environment. The encounters appeared 'affective', in a new materialist sense - with 'affect' representing a "force" that is present within an assemblage, potentially giving rise to strong emotions (Semetsky 2015). Such moments resonate with Gannon's (2017) exploration of "animal and human entanglement" during an environmental education

project, in which the author reports “unplanned and unpredictable encounters that generated affective force and mobilised learning in ways that could not have been predicted” (97). They also bring to mind the “wildlife-inspired awe” recently discussed by Hicks and Stewart (2020).

The two further examples below occurred in a different school, but also involve upper primary-aged pupils. These examples demonstrate the remaining affective force generated by *memories* of such encounters. In the first, pupils are walking around their school grounds helping to plan the conservation tasks that will take place, while in the second, pupils are digging out a new pond as part of a day involving a variety of tasks:

Then there's another of those spontaneous, off-script moments as a dragonfly hovers around us, then lands on my face. "Wow! What is it" This seems to get a few of them started talking about their own recent experiences with other species. A boy with a smiling, enthusiastic face talks excitedly about encountering a large bumble bee: "It was that big! My Mum thought it was a Queen!"

(Fieldnotes, Primary School 4)

In the same school, in the extract below, pupils are digging out a new pond as part of a day involving many different tasks, carried out by several different classes:

For Sophia, this seemed to provoke vivid memories of previous inter-species encounters in these school grounds. As we moved the neglected old pond, she talked about her strong memories of finding tadpoles there in (her first year at school) – that would have been about five years ago. She said at one point, “oh this brings back loads of memories!”

(Fieldnotes, Primary School 4)

Fascination

The examples below relate strongly to the excitement shown in the encounters described above, but might more aptly be described as a quietly expressed ‘fascination’. Both examples are taken from Polli:Nation activities run in secondary schools, in both cases involving small groups of pupils (aged around 12-13) identified as having “additional support needs”. In the first, pupils are lining wooden pallets with weed-proof fabric and filling them with soil in preparation for planting flowers in them. In the second, they are engaged in the construction of small ‘bug hotels’ from natural materials:

Sean (LTL staff member) saw a bee going into what must have been a nest, among some moss-covered small logs. It was just around the back of the polytunnel, on the side nearest the railway, in amongst some small logs that were totally embedded, grown over with thick moss... Melanie and Darren, and later Liam, all moved slowly towards the nest, peering carefully. Darren was a particular surprise there, as he normally seems totally disinterested, with a ‘too cool for this’ vibe about him.

(Fieldnotes, Secondary School 3)

Ben became fixated on a bug that was already going into his ‘hotel’. It was an eye-catching insect, about the size of an ant, or even smaller, mostly black but with red and white patterning on the back. He stayed fixated on it for quite a while, checking whether it was going into the different bits he was stuffing with bamboo cane... We spent a while with me trying to get a close-up photo of it, the insect being too tiny for the camera to focus on it.

(Fieldnotes, Secondary School 2)

Empathy:

In both of the examples below, pupils are engaged in loosely structured tasks. In the first, a group of secondary school pupils (aged around 12-13) have been sent to gather materials such as sticks, moss and leaves to place in the large ‘bug hotel’ they are building from wooden pallets. Here, a small woodland area within their school grounds affords pupils moments of free play and exploration out of sight of their teacher.

While gathering dry leaves from the ground, Liam finds a large woodlouse, and lets it crawl over his hand. He comes and shows it to me... At this point, one of the other boys, Brian, quickly takes the woodlouse off him and throws it towards one of the girls, who is scared of insects. She screams and runs away. Liam waits until the commotion dies down, then goes and finds the woodlouse, and places it carefully at the side of the path, among the leaves.

(Fieldnotes, Secondary School 3)

The following example is taken during a similarly loosely structured task, where a larger group of upper primary-aged pupils are planting flowers and vegetables in an area of large wooden planters in their school grounds:

We found loads of worms in the soil, and several of the girls kept singing that song that starts off "there's a worm at the bottom of my garden...". Talking about the trowel digging into the soil, one of them said "imagine if you were one of those worms, and you just saw this thing coming out of the sky like that!"

(Fieldnotes, Primary School 5)

Both of the above examples, we felt, were notable for the empathy with other species that pupils appear to show. The examples resonated with Karrow and Fazio's (2010) description of the "primordial capacities of care" (198) displayed by children when allowed to participate in "non-technical forms of engagement" (210) with other species. Elsewhere, Lloro-Bidart (2017) describes her attunement, during an ethnographic study of human/animal encounters, to "embodied, emotional, and affective ways of knowing that allow humans to see nonhumans as persons" (113). This description resonates particularly with the second example above, in which pupils ascribe a certain level of consciousness, and 'feeling', to worms. While we recognise that seeing nonhumans as persons is a form of anthropomorphism, we are persuaded by Bennett's (2010, 120) argument that anthropomorphism "oddly enough, works against anthropocentrism: a chord is struck between person and thing, and I am no longer above or outside a non-human 'environment'". For Affifi (2020, 1445), this applies only with an "engaged" form of anthropomorphism that assumes a degree of difference with the other being. He distinguishes this from a "naïve" form, which in assuming too high a level of similarity with other species, "shuts off our capacity to acknowledge and respect their differences" (1445). Our example is perhaps too fleeting to enable a close examination of the type of anthropomorphism on display. Despite retaining a degree of anthropocentrism, however, it was our sense that the empathy shown by pupils towards other species, as with the excitement discussed previously, was independent of any perception of the other species as ecologically 'useful'. Instead, we felt, it was indicative of the 'collective thinking' explored below.

Collective thinking with the more-than-human world

The examples above have been variously described as demonstrating 'excitement', 'fascination' and 'empathy' displayed by pupils during more-than-human encounters – commonplace themes that tended to resonate with the events explored here. Taken together, we understand these to be signs of the emergence of what, following Taylor (2017), we labelled 'collective thinking with the more-than-human world'. As discussed in the Methodology, we understand this as a *concept* – the emergence of an idea, or orientation for thought, that in this case was key to young people's lived curricula during Polli:Nation activities. Importantly, although our focus remained predominantly on *human* experience (as discussed in the Methodology), the 'collective thinking' discussed here encourages an interpretation of 'thinking' as being more than a purely rational, cognitive process. Instead, from the analysis presented here, we can say that this form of thinking is about coming to know in embodied, non-rational ways within a physical setting comprising more-than-human elements. In these settings, importantly, there are *shifts* in more-than-human relations, with *new* ways of knowing emerging through these new relations. That is, as humans, coming to know other species – acknowledging their presence, and their significance – changes also how we see ourselves.

It is important to note that the lived curricula presented here cannot be entirely separated from the curriculum-as-plan that underlay the project. Both were in circulation during Polli:Nation activities, both influencing the ways in which young people engaged with the project. It is likely, for example, that young people's palpable excitement at their encounters with other species was influenced in part by the prior learning that had already taken place around the ecological importance of pollinators, and the positioning of young people, in introductory presentations, as "ambassadors for pollinators". Nonetheless, the examples presented in this article, as with Taylor's (2017) observations, demonstrate the enactment of relations beyond those based on a perceived separation between humans and the more-than-human world, suggesting instead a form of 'collective thinking'. This, our analysis suggests, was enabled by the tendency for tasks within the Polli:Nation project to be loosely structured and to allow for periods of free play and exploration. This, in turn, enabled pupils to respond in their own ways to (usually unplanned) encounters with more-than-human elements. The significance and practical implications of this key finding are discussed in the final section below.

Discussion and implications

The examples given in the previous section have demonstrated that although the curriculum-as-plan underlying the Polli:Nation project reflected stewardship pedagogies and a somewhat utilitarian view of other species, activities within the project nonetheless allowed for the enactment of lived curricula that differed significantly from this. Following Taylor (2017), we have characterised these lived curricula as the enactment of forms of 'collective thinking with the more-than-human world' – embodied, non-rational ways of knowing that transcended young people's perceptions of themselves as responsible stewards of the environment, and of other species as ecologically 'useful'. The examples also suggest that the enactment of such lived curricula was enabled by activities that were open to contingent moments such as unplanned encounters with other species. With a 'relaxed atmosphere' that enabled such contingent moments, conservation activities within the Polli:Nation project appeared to give pupils opportunities to respond in their own terms and in novel ways to the setting, and to more-than-human elements. Put another way, these activities clearly enabled the production of lived curricula that were more complex and varied than the simple re-production of an underlying curriculum-as-plan, or the narrowing of forms of knowledge production merely to the arena of cognition or scientific rationality.

Importantly, rather than simply reflecting the overarching stewardship perspective on which the Polli:Nation project was based, the lived curricula demonstrated in these examples are in fact reflective of the posthuman pedagogical orientations discussed in the Introduction. As highlighted there, these proposed approaches emphasise a lack of interference with young people's enactment and development of relationships that eschew perceived human/nature binaries, and "slowing down" pedagogies to avoid rushing to promote immediate solutions to environmental issues. Accordingly, this paper has demonstrated that while Polli:Nation as a whole was framed as a 'solution' to a particular environmental issue, there tended not to be a narrow focus on the efficient completion of a particular task, with young people instead given the time and space to enact the 'collective thinking' highlighted in the examples above. At this point, it should be noted that despite having identified moments where such collective thinking is expressed, it is challenging to point to any degree of causation with regard to the Polli:Nation project. That is, we would not wish to claim that Polli:Nation linearly *produced* these effects. Given the key orientations proposed by posthuman pedagogical theorists, however, it is significant that conservation tasks made it possible for the re-assembling of humans and environments (Mannion 2020) to allow for their emergence.

With the above insights in mind, it is our contention that despite the legitimate critique of the stewardship perspective underlying them, conservation activities can nonetheless be

compatible with posthuman responses to the Anthropocene, provided that an openness to unplanned more-than-human encounters, and the enactment of young people's own lived curricula, is maintained. As well as the insights from this article, this contention also stems from the considerable challenges associated with comprehensively implementing the posthuman pedagogical approaches outlined in the Introduction, which reflect fundamental shifts in the discourses underlying environmental education. The body of work on common world pedagogies (Taylor and Giugni 2012; Taylor 2013, 2017) focuses on young children in the 'early years' age range, and consequently, the implication is perhaps that forms of collective thinking emerge purely through unstructured play and exploration. With the 9-13-year-old pupils that are the focus of this article, however, it would be impractical to adopt an approach where there are no overarching tasks or desired outcomes at all, given the prevalence in formal education contexts of overarching curricula-as-plan and associated desired outcomes. Our suggestion, then, is that given the prevalence and need for programmatic and structured educational facilitation when working with school-aged young people, conservation activities can act as an effective means of facilitating such unplanned encounters and the enactment of collective thinking with the more-than-human world.

We do, however, argue for two key reorientations of these activities, based on the key features of the Polli:Nation project highlighted in this article. Firstly, in line with Mannon, Fenwick, and Lynch's (2013) orientations for "place-responsive" pedagogies, which include the use of "pupil-directed, fun, less time-limited, open-ended, *yet purposeful* tasks" (803, emphasis added), our evidence points to the importance of not taking too prescriptive an approach - for example, by having an overarching task with which to frame the session/s, but not placing too much emphasis on its quick and efficient completion. 'Slower' pedagogies (Taylor and Giugni 2012; Haraway 2016) will instead maximise the potential for the unplanned moments highlighted in this article, and subsequently, for the enactment of lived curricula that amount to more than the simple re-production of an anthropocentric stewardship perspective. Secondly, we suggest that when used in formal education contexts, conservation tasks should be tied in with multiple areas of the curriculum. This builds upon Karrow and Fazio's (2010, 203) study of a citizen science project built entirely around what they call "scientific-technical knowledge", which was then expanded to enable young people to "vocaliz(e) wonder, awe, or amazement" when "given license to consider nontechnical ways of being" with other species (198). We suggest similar extensions of practical conservation activities to also encompass such "non-technical" more-than-human relations - for example, by linking them not only to the science curriculum, but to curricular areas that emphasise creative activities such as writing and drawing.

In summary, this article adds significantly to the literature on young people's participation in conservation activities which, as highlighted in the Introduction, has tended to focus on informal contexts, and learning *about* conservation rather than the effects of actively taking part in it. It also extends arguments made by Taylor (2017), Rautio (2013) and others beyond the 'early years' contexts in which their work is situated. Since this study involved mostly pupils in the upper years of primary school and lower years of secondary school, it is significant that we were still able to observe the enactment of lived curricula that, as Taylor (2017, 1456) describes, went beyond "the rational quest to know about the world from a distance that characterises western epistemologies".

Acknowledgements

We would like to thank all those involved with the Polli:Nation project for helping to make this research possible - staff from Learning through Landscapes for facilitating access to schools, teachers for keeping us informed of relevant activities, and young people for providing the valuable insights that form the basis of this paper.

Disclosure statement

No potential conflicts of interest are reported by the authors.

Funding statement

This work was jointly funded by the Heritage Lottery Fund and the University of Stirling.

Ethics declaration

This study was granted approval by the Faculty of Social Sciences Research Ethics Committee at the University of Stirling. All participants provided appropriate written and informed consent.

Notes on contributors

Andy Ruck's PhD research, carried out at the University of Stirling, explored young people's lived experience of the Polli:Nation project – a UK-wide environmental initiative centred around conservation activities in school grounds. Through this research, he provided ethnographic insight into the 'curriculum making' processes that took place through these activities, as well as young people's own perspectives as to the project's most significant features. He is now a postdoctoral researcher at the Swedish University of Agricultural Sciences (SLU). Here, he explores farmers' attitudes towards biodiversity-friendly farming as part of the EU Horizon 2020-funded SHOWCASE project.

Greg Mannion works as a senior lecturer in the Faculty of Social Sciences (Education) at University of Stirling, Scotland. His approach to educational research brings together theory and empirical perspectives on participation and rights based education, intergenerational education, person-place relations, nature and culture. Much of his research looks at the way in which places can be important in participation and learning for children and young people alongside adults and communities. In recent projects, his research considers local and global connectivity in education, place-responsive pedagogies, and the role of place and intergenerational dialogue in pupil participation in education.

ORCID

Andy Ruck  <http://orcid.org/0000-0003-1892-8205>

Greg Mannion  <http://orcid.org/0000-0003-2233-9278>

References

- Affifi, R. 2020. "Anthropocentrism's Fluid Binary." *Environmental Education Research* 26 (9–10): 1435–1452. doi:10.1080/13504622.2019.1707484.
- Aoki, T. T. 1993. "Legitimizing Lived Curriculum: Towards a Curricular Landscape of Multiplicity." *Journal of Curriculum and Supervision* 8 (3): 255–268.
- Ballard, H. L., C. G. Dixon, and E. M. Harris. 2017. "Youth-Focused Citizen Science: Examining the Role of Environmental Science Learning and Agency for Conservation." *Biological Conservation* 208: 65–75. doi:10.1016/j.biocon.2016.05.024.
- Barad, K. 2007. *Meeting the Universe Half Way: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press.
- Bennett, J. 2010. *Vibrant Matter: A Political Ecology of Things*. London: Duke University Press.
- Burnett, E., E. Sills, M. N. Peterson, and C. DePerno. 2016. "Impacts of the Conservation Education Program in Serra Malagueta Natural Park." *Environmental Education Research* 22 (4): 538–550. doi:10.1080/13504622.2015.1015497.
- Christie, B., and P. Higgins. 2012. *The Impact of Outdoor Learning Experiences on Attitudes to Sustainability: A Brief Review of Literature*. Edinburgh: Field Studies Council/University of Edinburgh.

- Clarke, D. A. G., and J. Mcphie. 2016. "From Places to Paths: Learning for Sustainability." *Environmental Education Research* 22 (7): 1002–1024. doi:10.1080/13504622.2015.1057554.
- Clarke, D. A. G., and J. Mcphie. 2020. "New Materialisms and Environmental Education: Editorial." *Environmental Education Research* 26 (9–10): 1255–1265. doi:10.1080/13504622.2020.1828290.
- Cole, D. R., and K. Malone. 2019. "Environmental Education and Philosophy in the Anthropocene." *Australian Journal of Environmental Education* 35 (3): 157–162. doi:10.1017/ae.2020.5.
- Colebrook, C. 2002. *Understanding Deleuze*. Abingdon, UK: Routledge.
- Duerden, M. D., and P. A. Witt. 2010. "The Impact of Direct and Indirect Experiences on the Development of Environmental Knowledge, Attitudes, and Behavior." *Journal of Environmental Psychology* 30 (4): 379–392. doi:10.1016/j.jenvp.2010.03.007.
- Emerson, R. M., R. I. Fretz, and L. L. Shaw. 1995. *Writing Ethnographic Fieldnotes*. Chicago: University of Chicago Press.
- Fletcher, R. 2017. "Connection with Nature is an Oxymoron: A Political Ecology of "Nature-Deficit Disorder." *The Journal of Environmental Education* 48 (4): 226–233. doi:10.1080/00958964.2016.1139534.
- Fox, N. J., and P. Alldred. 2015. "New Materialist Social Inquiry: Designs, Methods and the Research-Assemblage." *International Journal of Social Research Methodology* 18 (4): 399–414. doi:10.1080/13645579.2014.921458.
- Gannon, S. 2017. "Saving Squawk? Animal and Human Entanglement at the Edge of the Lagoon." *Environmental Education Research* 23 (1): 91–110. doi:10.1080/13504622.2015.1101752.
- Golick, D., J. Dauer, L. Lynch, and E. Ingram. 2018. "A Framework for Pollination Systems Thinking and Conservation." *Environmental Education Research* 24 (8): 1143–1158. doi:10.1080/13504622.2017.1349878.
- Green, M. 2014. "Transformational Design Literacies: Children as Active Place-Makers." *Children's Geographies* 12 (2): 189–204. doi:10.1080/14733285.2013.812305.
- Guiney, M. S., and K. S. Oberhauser. 2009. "Conservation Volunteers' Connection to Nature." *Ecopscychology* 1 (4): 187–197. doi:10.1089/eco.2009.0030.
- Halpenny, E. A., and L. T. Caisie. 2003. "Volunteering on Nature Conservation Projects: Volunteer Experience, Attitudes and Values." *Tourism Recreation Research* 28 (3): 25–33. doi:10.1080/02508281.2003.11081414.
- Haraway, D. 2016. *Staying with the Trouble: Making Kin in the Chtulucene*. Durham, NC: Duke University Press.
- Harvey, D. J., A. C. Gange, and H. Harvey. 2020. "The Unrealised Potential of School Grounds in Britain to Monitor and Improve Biodiversity." *The Journal of Environmental Education* 51 (4): 306–316. doi:10.1080/00958964.2019.1693330.
- Hine, R., J. Peacock, and J. Pretty. 2008. *Evaluating the Impact of Environmental Volunteering on Behaviours and Attitudes to the Environment: Report for the British Trust of Conservation Volunteers*. Cardiff: BTCV Cymru.
- Hicks, J. R. and Stewart, W. P. 2020. "Learning from Wildlife-Inspired Awe." *The Journal of Environmental Education* 51(1): 44-54.
- International Union for Conservation of Nature. 2019. "The Abu Dhabi Call for Global Species Conservation Action." Accessed 27 May 2020. https://www.iucn.org/sites/dev/files/content/documents/the_abu_dhabi_call_for_global_species_conservation_action_adopted_20191122.pdf.
- Jackson, A. Y. 2013. "Posthumanist Ethnography of Mangling Practices." *International Journal of Qualitative Studies in Education* 26 (6): 741–748. doi:10.1080/09518398.2013.788762.
- James, P. 2017. "Alternative Paradigms for Sustainability: Decentering the Human without Becoming Posthuman." In *Reimagining Sustainability in Precarious Times*, edited by K. Malone, S. Truong, and T. Gray, 29–44. Singapore: Springer. doi:doi:10.1007/978-981-10-2550-1_3.
- Karrow, D., and X. Fazio. 2010. "Educating-Within-Place: Care, Citizen Science, and Ecojustice." In *Cultural Studies and Environmentalism: The Confluence of EcoJustice, Place-Based (Science) Education, and Indigenous Knowledge Systems*, edited by D. J. Tippins, M. P. Mueller, M. van Eijck, and J. D. Adams, 193–214. Dordrecht: Springer Netherlands.
- Krasny, M. E., and K. G. Tidball. 2012. "Civic Ecology: A Pathway for Earth Stewardship in Cities." *Frontiers in Ecology and the Environment* 10 (5): 267–273. doi:10.1890/110230.
- Krasny, M. E., and K. G. Tidball. 2015. *Civic Ecology: Adaptation and Transformation from the Ground up*. Cambridge, MA: MIT Press.
- Kruse, C. K., and J. A. Card. 2004. "Effects of a Conservation Education Camp Program on Campers' Self-Reported Knowledge, Attitude, and Behavior." *The Journal of Environmental Education* 35 (4): 33–45. doi:10.3200/JOEE.35.4.33-45.
- Latour, B. 2004. *The Politics of Nature: How to Bring Science into Democracy*. Cambridge, MA: Harvard University Press.
- Learning through Landscapes. 2014. *Polli: Nation Activity Plan 2015 - 18*. Winchester, UK.
- Lloro-Bidart, T. 2017. "A Feminist Posthumanist Political Ecology of Education for Theorizing Human-Animal Relations/ Relationships." *Environmental Education Research* 23 (1): 111–130. doi:10.1080/13504622.2015.1135419.
- Lynch, J., and G. Mannion. 2021. "Place-Responsive Pedagogies in the Anthropocene: Attuning with the More-than-Human." *Environmental Education Research* 27 (6): 864–878. doi:10.1080/13504622.2020.1867710.

- Mannion, G. 2020. "Re-Assembling Environmental and Sustainability Education: Orientations from New Materialism." *Environmental Education Research* 26 (9–10): 1353–1372. doi:10.1080/13504622.2018.1536926.
- Mannion, G., A. Fenwick, and J. Lynch. 2013. "Place-Responsive Pedagogy: Learning from Teachers' Experiences of Excursions in." *Environmental Education Research* 19 (6): 792–809. doi:10.1080/13504622.2012.749980.
- Nxumalo, F., and V. Pacini-Ketchabaw. 2017. "Staying with the Trouble' in Child-Insect-Educator Common Worlds." *Environmental Education Research* 23 (10): 1414–1426. doi:10.1080/13504622.2017.1325447.
- Pacini-Ketchabaw, V., A. Taylor, and M. Blaise. 2016. "Decentering the Human in Multispecies Ethnographies." In *Posthuman Research Practices in Education*, edited by C. Taylor and C. Hughes, 149–167. London: Palgrave Macmillan.
- Palmberg, I. E., and J. Kuru. 2000. "Outdoor Activities as a Basis for Environmental Responsibility." *The Journal of Environmental Education* 31 (4): 32–36. doi:10.1080/00958960009598649.
- Petersen, E. B. 2018. "Data Found Us': A Critique of Some New Materialist Tropes in Educational Research." *Research in Education* 101 (1): 5–16. doi:10.1177/0034523718792161.
- Rautio, P. 2013. "Being Nature: Interspecies Articulation as a Species-Specific Practice of Relating to Environment." *Environmental Education Research* 19 (4): 445–457. doi:10.1080/13504622.2012.700698.
- Rautio, P., and P. Jokinen. 2016. "Children's Relations to the More-than-Human World beyond Developmental Views." In *Play and Recreation, Health and Wellbeing*, edited by B. Evans, J. Horton, and T. Skelton, 35–49. New York: Springer.
- Rickinson, M., C. Lundholm, and N. Hopwood. 2009. *Environmental Learning: Insights from Research into the Student Experience*. Berlin, Germany: Springer.
- Ross, H., and G. Mannion. 2012. "Curriculum Making as the Enactment of Dwelling in Places." *Studies in Philosophy and Education* 31 (3): 303–313. doi:10.1007/s11217012-9295-6.
- Ruck, A., and G. Mannion. 2020. "Fieldnotes and Situational Analysis in Environmental Education Research: Experiments in New Materialisms." *Environmental Education Research* 26 (9–10): 1373–1390. doi:10.1080/13504622.2019.1594172.
- Ruck, A. 2019. "Co-producing Curricula: Young People's Lived Experience of School-linked Practical Conservation and Citizen Science." PhD diss., University of Stirling.
- Schönfelder, M. L., and F. X. Bogner. 2018. "How to Sustainably Increase Students' Willingness to Protect Pollinators." *Environmental Education Research* 24 (3): 461–473. doi:10.1080/13504622.2017.1283486.
- Semetsky, I. 2015. "Deleuze's Philosophy for Education." In *Encyclopedia of Educational Philosophy and Theory*, edited by M. Peters, 1373. Singapore: Springer.
- Smith, J. G., B. DuBois, and M. E. Krasny. 2016. "Framing for Resilience through Social Learning: Impacts of Environmental Stewardship on Youth in Post-Disturbance Communities." *Sustainability Science* 11 (3): 441–453. doi:10.1007/s11625-015-0348-y.
- Sobel, D. 2004. *Place-Based Education: Connecting Classrooms and Communities*. Great Barrington, MA: The Orion Society.
- Somerville, M., and S. Powell. 2019. "Researching with Children of the Anthropocene: A New Paradigm?" In *International Research in the Age of Anthropocene*, edited by V. Reyes, J. Charteris, A. Nye, and S. Mavropoulou, 14–35. Hershey, PA : IGI Global.
- Sonu, D., and N. Snaza. 2015. "The Fragility of Ecological Pedagogy: Elementary Social Studies Standards and Possibilities of New Materialism." *Journal of Curriculum and Pedagogy* 12 (3): 258–277. doi:10.1080/15505170.2015.1103671.
- Strom, K. J. 2018. "That's Not Very Deleuzian': Thoughts on Interrupting the Exclusionary Nature of 'High Theory.'" *Educational Philosophy and Theory* 50 (1): 104–113. doi:10.1080/00131857.2017.1339340.
- Taylor, A. 2013. *Reconfiguring the Natures of Childhood*. Abingdon: Routledge.
- Taylor, A. 2017. "Beyond Stewardship: Common World Pedagogies for the Anthropocene." *Environmental Education Research* 23 (10): 1448–1461. doi:10.1080/13504622.2017.1325452.
- Taylor, A., and M. Giugni. 2012. "Common Worlds: Reconceptualising Inclusion in Early Childhood Communities." *Contemporary Issues in Early Childhood* 13 (2): 108–119. doi:10.2304/ciec.2012.13.2.108.
- Thrift, N. 2008. *Non-Representational Theory: Space, Politics, Affect*. Abingdon, UK: Routledge.
- Tsing, A. 2013. "More-than-Human Sociality." In *Anthropology and Nature*, edited by K. Hastrup, 37–52. New York: Routledge.
- Wattchow, B., and M. Brown. 2011. *A Pedagogy of Place: Outdoor Education for a Changing World*. Clayton, VIC: Monash University Publishing.
- Whatmore, S. 2002. *Hybrid Geographies: Natures Cultures Spaces*. Thousand Oaks, CA: Sage.
- Woodhouse, J., and C. Knapp. 2000. *Place-Based Curriculum and Instruction*. Charleston, WV: ERIC Digest.
- Zint, M., A. Kraemer, H. Northway, and M. Lim. 2002. "Evaluation of the Chesapeake Bay Foundation's Conservation Education Programs." *Conservation Biology* 16 (3): 641–649. doi:10.1046/j.1523-1739.2002.00546.x.