

ARTICLE

Becoming~Belonging with Land: Entangled Stories of Science Education and Decolonial Pedagogical Transformation

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Abstract

Our work brings together three educators – a doctoral student and sessional instructor, a middle years teacher and master’s student, and a university professor – who come to this project from divergent positionalities, ancestries and educational geographies. Across the span of one summer, we engaged in critically reflexive dialogue, sharing field texts including teaching artefacts (syllabi, assignments, lesson plans) and personal writings that map our entangled pedagogical transformations. These stories are not linear narratives of improvement, but rather messy, layered accounts of yearning, grief, contradiction and co-becoming in entangled relational worlds. As we story our experiences, we ask: What does it mean to teach science in ways that resist colonial erasures? How might we reimagine science education as a site of ethical response-ability, rooted in Land, story and ancestral relation? Our inquiry is situated in the Canadian education system, but it resists nationalistic framing by foregrounding Indigenous sovereignties, spiritual geographies and the deep affective currents of learning in stolen land. With the reminder that locating ourselves – through ancestry, land, language and community – is an act of relational accountability; we delve into situated, plural stories that trouble the singularity of “Science” itself.

Keywords: Anti-colonial education; collaborative autoethnography; decolonial pedagogy; science education

Introduction

We are three women, feminist, anti-colonial scholars, and this is our story of pedagogical transformations in our teaching:

And then it just doesn’t become this big scary thing anymore. It’s just like, this is what we’re doing. We have someone in our classroom today. This is a part of, like, our protocol and our responsibilities to make sure people feel taken care of when they’re here. (Loay, meeting 1, excerpt 107)

You just start from it, and you keep bringing it back. So, in a way, it’s normalizing it. So that very idea that, you know, there’s just the one science, even if the students can’t really connect at the same level with the reading and with the ideas . . . It’s not about everybody changing their identities, a way of thinking. But it’s about just making that room, making that space, right? And making it so that it’s equally valid. (Pozzer, meeting 1, excerpts 87–89)

Starting kind of, you know, looking at what the norm has been for so long, and starting to move the pieces around and centering a different part, and having the reading and the chapter even be the stemming point of a science lesson, to me, I think that does wonders! (Ragoub, meeting 1, excerpt 110)

The three quotes above from our dialogical, reflexive encounters over the summer of 2025 speak to our continuously evolving pedagogies as we grapple with decolonizing our practices and opening up possibilities for our students and ourselves to re-story our relationships with each other, and the Land. The conversation centred around Loay's decision to read from Robin Wall Kimmerer's *Braiding Sweetgrass* (2013) to her grade 8 science class and to start some of the units in the science curriculum for the year by reading selected passages of the youth's version of this book (Kimmerer & Smith, 2022), weaving Western, hegemonic science knowledge with Indigenous perspectives and ways of being and knowing. Loay also invited Elders and Knowledge Keepers and intently ensured that their presence in the school was announced at the start of the day to the entire school.

The use of the term Indigenous in this study is intended to highlight the presence of all Indigenous cultural groups (First Nations, Inuit and Métis) as distinct from non-Indigenous groups in Canada. We acknowledge that Indigenous peoples of Canada refer to themselves with different terms, more specific to their civilizations and cultures (Battiste, 2013). As Wilson (2008) writes, the term Indigenous is meant to be "inclusive of all first peoples – unique in our own cultures – but common in our experiences of colonialism and our understanding of the world" (pp. 15–16). We use the terms Western Science and Indigenous Science not to create false dichotomies, but to name and legitimize Indigenous perspectives in mainstream Canadian school science contexts that have historically marginalized the contributions of Indigenous communities to science (Aikenhead & Michell, 2011).

In a predominantly White, Christian community, the act of meaningfully incorporating Indigenous knowledges in a science class is transgressive and potentially transformative. Though provincial Manitoba Indigenous Education policy frameworks (Manitoba Education and Early Childhood Learning, 2022) and renewed pilot science curriculum documents with greater attention to Indigenous Sciences (Manitoba Education and Early Childhood Learning, 2024) have been released in recent years, embedding Indigenous perspectives in schools is not yet mainstream and continues to face resistance in Loay's teaching context. As Pozzer and Ragoub commented in the quotes above, relating to science in different ways can disrupt hegemonic knowledge systems, discourses and practices and open space for normalizing and validating different ways of thinking, knowing, being and doing, which are more attuned to kinship, reciprocity and ethical relationality of humans and more-than-humans in this world.

Given that environmental education is not formally recognized as a distinct discipline in Manitoba schools, our conversations sought to (re)position science education as a fertile space for nurturing ecological consciousness, reciprocity and relational accountability. As described by Poelina *et al.* (2023), Indigenous wisdom as environmental education is the oldest form of education, and "working towards the regeneration of Indigenous wisdom is one of the most important education tasks of our day" (p. 269). In this collective autoethnography, we engaged in a dialogical process of reflection and co-analysis, drawing on our lived experiences as science educators committed to reimagining environmental education within and beyond the confines of the formal science curriculum. Through a series of recorded meetings, written reflections and iterative exchanges, we examined our pedagogical choices, moments of discomfort and emerging understandings as we attempted to braid Indigenous and Western ways of knowing in authentic, respectful ways. Our collective inquiry became both method and practice, a relational act of learning with and from one another that blurred the boundaries between research and pedagogy, theory and practice. Sutton *et al.* (2023) have similarly explored their relationships to place through collaborative exploration and storytelling as they unsettle their complicities in colonization.

Methodology

Drawing from Karalis Noel *et al.*'s (2023) methodological approach for collective autoethnography, we co-constructed narratives that reflect focused conversations we conducted in summer 2025, which constitute the data corpus for this self-study. We met over Zoom (three meetings) and in person, during walks through a park (two meetings), recording our conversations. The meetings' transcripts were then analyzed for emerging themes, which we collaboratively brought to light through personal narratives.

Our conversations surfaced three interrelated themes that reflect our collective journey of becoming-with one another, with science and with the Land. These themes – *Positionality and Self-Transformation*; *(Re)centering Indigenous Sciences and Relationships*; and *Honouring the Path Forward* – emerged through dialogic exchanges that foregrounded vulnerability, reflexivity and the ongoing process of restoring relationality. In what follows, we present these themes in dialogic form, interweaving our voices with the theoretical threads from relevant literature.

We intentionally make space for dialogue, reciprocity and relationality in the way in which we present our “findings” in this article, as a way to disrupt dominant research practices in academia and authentically represent the emerging, dynamic and constantly in flux nature of learning, which is also an aspect of our methodology. That is, the insights from our conversations and analyses are not static final products, but rather continuous threads of thoughts and practices that are constantly being re-woven as we continue to teach, reflect and live these experiences. In this sense, our “findings” are not conclusions but living conversations, dynamic sites of becoming that resist closure.

Through this ongoing process of collective reflection, we seek not to fix or resolve meaning but to dwell within the generative tensions of teaching science differently, in ways that honour relationality, reciprocity and Land. Our dialogic and storied approach embodies Robin Wall Kimmerer's (2013) invitation to re-story the world through acts of gratitude and care; Jo Chrona's (2022) call to “understand how we move through the world in relation to each other” (p. 8); Donna Haraway's (2016) notions of an ecology of practice and response-ability, and Gloria Anzaldúa's (1987) insistence that transformation begins in the borderlands – those in-between spaces where identities, disciplines and worldviews meet, collide and remake one another.

Positionalities/self-transformation

Sarah: My positionality is an ongoing process of learning, reflection and change. It is a continual act of locating myself, mapping (Martin & Kamberelis, 2013) how my identity, stories and the places that shape me inform how I teach and learn with others. Robin Wall Kimmerer's (2024) invitation to view knowledge as grounded in abundance and reciprocity helps reshape my approach to pedagogy as a practice of ethical relation – with students, educators, knowledge systems and opening myself up to the more-than-human world. As a doctoral student and sessional instructor, this stance calls me to examine how my experiences, shaped by settler-colonial education and moments of dis~placement, both enable and limit my intent to enact anti-colonial approaches to science education. I continue to learn and teach within institutions and classrooms marked by colonial histories that privilege colonial scientific epistemologies, where I sometimes feel entangled in places I do not fully belong. In my master's thesis, a discourse analysis of the affordances and constraints for developing culturally responsive science-literate identities in the Manitoba grade 9 science curriculum, I pointed to the overwhelming presence of Eurocentric discourses in the mandated documents. In science education, these hegemonic views may become barriers to belonging and developing science-literate identities that do not necessarily conform to dominant normative science (Ragoub, 2024).

Being born and residing in colonized Indigenous lands prompts me to position myself as an uninvited guest (Koleszar-Green, 2019), who aims to keep Indigenous traditions, languages and

cultures as the inextricable foundation and centre of conversations about diversity and inclusion in Canadian contexts. Jo Chrona's (2022) framing of reconciliation as ethical praxis reaffirms that locating myself is not a neutral act but one of accountability. As an Algerian Canadian woman, my roles as a student, teacher, instructor and mother overlap and inform one another. My ongoing struggle to belong – whether as an Algerian who mostly lived outside Algeria or a Canadian who is rarely perceived as one – continues to challenge assumptions I encounter about identity, knowledge systems and inclusion. Although various aspects of my identity influence my experiences with/in education, wearing a hijab and thus being visibly identified by others as a Muslim woman continues to contribute to unexpected experiences that further contest my sense of belonging.

My pedagogical foundations were built within systems that separate knowledge from *Land* – capitalized here, to follow Tuck and Yang (2012), referring to *Land* as a living, relational presence rather than as object or property – and learning from relation. As I recognize being embedded in the systems I grew to question, unlearning these patterns is challenging. An ongoing reflection on my role in the inadvertent reproduction of hierarchies I seek to unsettle requires humility and the acceptance of discomfort. This “in-between” space, the borderlands (Anzaldúa, 1987), is both disorienting and generative, with imaginative possibilities of re-visioning science education as a shared act of co-becoming with learners, educators, communities and the more-than-human.

In this collective autoethnography with Peiki and Lilian, whom I got to know during my master's degree, I write as both witness and participant, offering, listening and responding to stories that hold tension. Discomfort can be a difficult ethical response, messy and enmeshed with intentions and actions. Thus, by recognizing my positionality as a multitude of living and changing stories entangled in a rhizomatic act of accountability and becoming, I aim to contribute to inclusive, responsive and relational learning environments that invite wonder, accountability and dialogue.

Peiki: Framed by the Honourable Justice Murray Sinclair's guiding questions, the Mamāhtawisiwin policy document for Indigenous Education (Manitoba Education and Early Childhood Learning, 2022) stresses the importance of learners knowing who they are and where they come from. As educators and scholars, our learning must also be grounded through knowing our histories and understanding our “sense of belonging through connectedness” (p. 17) with people and places. Jo Chrona (2022) similarly invites educators to consider how personal stories shape our interactions and relationships. And so, I begin this conversation by situating myself with/in the stories of who I am as a science educator and what brought me to this work of reimagining science education through lenses that resist and disrupt dominant colonial narratives.

For the past decade, I have been a middle school homeroom and science teacher in a small city, part of a rural school division. Due to Eurocentric K-12 formative school science experiences in predominantly White communities, my teaching was primarily rooted in colonial knowledges. Working with a research team during my undergraduate science studies also strongly influenced my teaching. This experience allowed me to develop a deeper understanding of the nature of (hegemonic) science (Bartholomew *et al.*, 2004), which led me to value collaborative and creative inquiry-based practices. From leading science outreach programming, I began to imagine the possibilities of science education as a space not only for personal growth, but also socially just transformations through connection and relationship between diverse learners.

My scholarship focuses on the spaces where social justice, science teaching and diverse stories converge. As I have previously reflected, “[m]y post-secondary science research experiences were influential in helping me become the Western Science teacher that I envisioned myself to be, but my education graduate coursework has been equally influential in my reimagining of the science teacher that I desire to become now” (Loay, 2025, p. 3). Encounters with Indigenous ways of knowing, doing and being through coursework, growing community connections and personal learning have profoundly changed my worldview and pedagogies. I am deeply committed to reconciliation and decolonization through and beyond science education as I work to dismantle

my colonial lens as a racially marginalized settler grappling with what it truly means to become a better steward of and guest on the lands of Indigenous peoples (Koleszar-Green, 2019, Phung, 2011).

Once, surrounded by glass windows and standing a hundred metres above the ground, I was invited to gaze upon and turn towards this place differently. Could I learn from its trees and birds? Rivers and rocks? Peoples and histories? What would it mean to understand the Land as “identity . . . the source of all that sustained us . . . our responsibility . . . a gift” (Kimmerer, 2013, p. 17)? How I belong to these prairies remains an ongoing project of introspection and revision that requires “resisting the desire to smooth over the internal contradictions, gaps and fractures that this learning manifests” (Sutton *et al.*, 2023, p. 372). Continually caught between multiple interfaces of geographies and cultures (Anzaldúa, 1987), my multi-hyphenated identity as a diasporic Chinese-Canadian, child of Hoa refugee-seekers from Vietnam and treaty person still viewed by dominant cultural group members as perpetually foreign leaves me wondering about my place(lessness) in this world.

While grappling with these fraught ideas and processes, I continue working to unravel the ways in which science education can perpetuate or ameliorate inequalities. Through my teaching and advocacy work, I continue walking alongside students and fellow educators as we collectively (re)centre the voices of historically marginalized communities for a more just world. Through relationships, I continue leveraging my privilege as an educator and scholar to dialogue with friends and family. My story as a science educator, advocate and human being interconnected with/in the people, places and more-than-human beings around us is still evolving. Our stories are still being written.

Lilian: Donna Haraway (2016), invoking ethnographer Marilyn Strathern, reminds us that “it matters what stories we tell to tell other stories with” (p. 12). The story I tell here is woven together with Sarah’s and Peiki’s and it is one of belonging, dis~placement and disruption, emerging through our entangled journeys as science educators negotiating the boundaries of what counts as knowledge, pedagogy and self. My story begins with my former role as their advisor in the Master of Education programme, a position that initially located me within the conventions of expertise and mentorship. Yet, as I witnessed their transformation and learned alongside Sarah and Peiki, our relationship began to unsettle those hierarchies. Through our shared questioning, I found myself implicated in the very processes we sought to deconstruct, which sustain the Eurocentric, masculine, White, colonial hegemonic worldview that continues to define science and science education to a great extent in the Manitoba curriculum standard documents and classrooms. In engaging with their critical reflections, I was invited into a transformative process of unlearning and re-learning; an epistemic and ethical reorientation that demanded I confront my own complicity in reproducing dominant narratives of science as universal, neutral and detached.

This process of reinvention is neither linear nor complete; rather, it is ongoing and profoundly relational. It requires me to reimagine what it means to teach and learn science from a place of humility, relational accountability and situatedness, recognizing that I live and work as a settler, a woman and an “other” on Indigenous lands. To honour the Land as teacher, rather than merely the site of teaching, demands a reconfiguration of my scientific identity: from one grounded in mastery and explanation to one oriented towards reciprocity, responsibility and reverence. Interrogating who we are as educators becomes entangled with ideological, political and ethical questions of being, becoming and belonging, as we navigate multiple versions of ourselves in shifting historico-geographical and relational spaces. As Gloria Anzaldúa (1987) writes, the *nepantla* (the in-between space) is both a condition of disorientation and a site of transformation. It is where we learn to inhabit contradictions, to speak in hybrid tongues and to make meaning across and through difference. As a Brazilian-Canadian, I continually inhabit the hyphen that both separates and connects. It marks the borderlands of my identity, where I am always crossing, linguistically, culturally and epistemologically. In different yet resonant ways, Sarah and Peiki too, inhabit the tensions of being “from” Canada while feeling the pull of unbelonging in spaces that

privilege certain kinds of knowing and being. What does it mean to be *from here* when “here” is defined through colonial narratives that have long excluded certain bodies, histories and epistemologies?

In attempting to reinvent myself within this tension, I am reminded that to unsettle expertise is not to erase it but to reconfigure it towards a form of knowing that listens, attends and responds. Placing myself as mentor, I turned a mirror onto my own practice, and the reflection was not always comfortable. It revealed the traces of colonial logic embedded in my pedagogical habits, the authority in my voice that once went unquestioned and the silences I had failed to notice. This reflexive discomfort is, I now understand, part of the work of decolonizing: the necessary unmaking of certainty to make space for other ways of knowing and being. To what extent can such repositioning unsettle my expertise, rewrite my history and reconstitute my relationships with students, with science, with Land? These questions are invitations to dwell in the *nepantla*, to remain open to transformation, to live the tension between worlds as both wound and possibility.

Re-centering Indigenous sciences and relationships: disrupting colonial science/our stories

Sarah: As we shared stories of our interactions with more-than-human worlds, whether as educators or in our personal lives, I reflected on my complex relationship with the outdoors. I realized that I have no clear childhood memories of large trees or vast green spaces. Instead, my memories are filled with stories of buildings and streets named after revolutionary Algerian martyrs, embedded in post-colonial narratives of independence. My sense of place was therefore not rooted in gardens and trees but instead in stories of resistance and reclamation passed down through generations. These memories, though urban and historical, are nonetheless stories of the Land – of entanglements shaped by colonial histories. I continue to question how to cultivate a sense of place beyond Algerian stories of revolution and reclamation, how to belong within lands that carry Indigenous histories and sovereignties that precede my own. Reflecting beyond our conversations in the park, I recognized that I have not yet fully developed a sense of place in the lands where I now live.

Indigenous frameworks remind us that the process of learning is as significant as the knowledge itself, emphasizing learning as a reciprocal act grounded in relationship and gratitude rather than extraction (Kimmerer, 2013; Sutherland & Henning, 2009). Recognizing Land as teacher within my educational practice is an ongoing and intricate process, one that requires decentring myself and acknowledging the agency of beings who have long preceded my presence (Chrona, 2022). During a graduate course, I was invited to express gratitude to a tree, a practice that unsettled my assumptions about connection. My thoughts raced with uncertainty: Do I thank the tree using English words? Do I touch the tree? Do I even understand what it means to thank the tree? I also remember feeling uncomfortable, challenged and perhaps out of place. As an educator who strives to spend more time outside with her learners, I asked myself: Why do I want to be outside? Is it solely disrupting the cold and isolating science laboratory experiences I had to endure? Will we enjoy exploring and being with/in the Land? Will the discomfort prompt conversations and questioning of other ways of doing science? In this uncertainty, I return to Donna Haraway’s (2016) invitation to “make kin in lines of inventive connection” (p. 2) and to resist the desire for resolution or certainty, reminding us that “we require each other in unexpected collaborations and combinations” and that “we become-with each other or not at all” (p. 4).

Thus, to learn is to remain within tension, to “stay with the trouble” of our positionalities and our partial understandings. Within education, such tension may become a site of transformation, a space where gratitude, questioning and humility can disrupt our ingrained, overwhelmingly colonial learning and teaching of science. Richard Wagamese (2019) refers to humility as “the

binding agent that holds all things together – the glue, if you will” (p. 64). The author further illustrates this metaphor with examples about Mother Earth embodying the ultimate form of humility, granting and offering for all: “humility in action” (p. 64). Although I remember most of my conversations with Peiki and Lilian, I have a vivid recollection of our walks, punctuated by the sounds of birds, the smell of what I imagined to be lavender and our exchange about insects, snakes and spiders not being a scientific means to an end. This may have been a way, perhaps, to develop a relationship with colleagues and the more-than-human simultaneously, with gratitude being expressed in an academic article.

Peiki: I am intentional about centring Indigenous Science perspectives in my teaching practice through a Two-Eyed Seeing lens (Bartlett *et al.*, 2012; Hatcher *et al.*, 2009), which means “learning to see from one eye with the strengths of Indigenous ways of knowing and from the other eye with the strengths of Western ways of knowing and to use both of these eyes together” (Hatcher *et al.*, 2009, p. 146). Coming to know science differently while unlearning my Western Science training has been fraught with tensions (e.g., experiencing both joyful and negative emotions, needing to navigate resistance and institutional constraints relating to protocols and finances) (Loay, 2025). But fruits also grew from those tensions. Examples documented in my master’s thesis (Loay, 2025) and shared during our conversations included explicitly naming science as cultural in course learning goals, lessons on the heart that wove continuously between Indigenous and Western Sciences, introducing concepts through *Braiding Sweetgrass for Young Adults* (Kimmerer & Smith, 2022) and embedding language learning opportunities despite finding ourselves in unfamiliar and hybrid linguistic spaces (Anzaldúa, 1987). As Lilian noted, these steps bring us closer to normalizing diverse science perspectives in the science classroom.

In approaching the renewed Manitoba science curriculum pilot document, which will be formally implemented in fall 2026 (Manitoba Education and Early Childhood Learning, 2024), I see opportunities for exploration, experimentation and playing with ideas through an evolving science lens. Driving to school past pigeons on the highway with Donna Haraway’s (2016) *Staying with the Trouble* playing in the background, I wondered how we might become with places and more-than-human beings differently through centring forests, prairies and water systems found in this place. As I began the process of planning a forest unit, I realized how much I still needed to learn – not just about conifers, deer and other more-than-human beings, but how to relate differently with/in forests themselves. This seemed particularly relevant in the context of a summer plagued by wildfires and smoke leading to the displacement of our communities.

I wonder how I might support learners (and myself) in becoming more holistically attuned (Chrona, 2022; Kimmerer, 2013) and symbiotically related (Haraway, 2016) to/with our more-than-human kin. Our Western views of humans as separate from nature leave us disconnected. As Gloria Anzaldúa (1987) writes, “[i]n trying to become ‘objective,’ Western culture made ‘objects’ of things and people when it distanced itself from them, thereby losing ‘touch’ with them. This dichotomy is the root of all violence” (p. 37). Despite often taking learners outside to observe plants, animals, rocks and weather patterns, thoughts of blood thirsty insects, muddy fields and behaviour management challenges leave me simultaneously unenthused. And yet, as I joyfully recount huddling with my class – necks craned, ears sharpened – amongst clusters of towering sandbar willows swarmed by bee clouds, I think of how relating with places through positive interactions and relationships may mitigate this discomfort. Am I not, after all, enjoying this brisk scholarly conversation on the Land with my fellow science educators?

As this research unfolded, I was also reading about imaginative ecological education for developing understandings of place through walking outdoors (Judson, 2018), which further reinforced my existing misconceptions and primed me to associate environmental education with being outside. Thus, I was particularly struck by our conversation that, while complementary, environmental education might be less about being outside, and more about re-thinking how we relate with the world around us. Being outside does not automatically equate to ethical

response-ability. To continue disrupting my Western Science lens, I must expand my understanding of concepts and frameworks relating to this research. I ask how opening our minds and hearts to diverse ways of knowing science and Land might disrupt the epistemic injustices (Gonzales, 2022) robbing us all of the gifts that historically subjugated knowledges have to offer.

Lilian: I see decolonizing more as “tearing down than rebuilding . . . breaking the perception that this is it and it cannot be different” (Pozzer, meeting 1, excerpt 376). My journey to decolonize my pedagogy is intricately intertwined with my re-storying of my own identity as Latina and resonates with Sarah and Peiki’s stories, as they too resisted and then leaned on their ancestral roots to re-signify who they are and how they can (be)come in anti-colonial and decolonial practices in education. Identifying as Latina already remarks my position as settler, since my ancestors (most of them, anyways; although not sure, I highly suspect that my maternal grandfather had Indigenous ancestors) were European immigrants who settled in unceded lands of Tupi-Guarani in the south of Brazil. Thus, being Latina means this association to colonizers, to Spanish and Portuguese who fought over lands that did not belong to them and to Italian immigrants who came to these violently misappropriated lands. Teaching how to teach science in Canada, particularly in the context of environmental education, colludes with this entanglement of identity, belonging and dis~placement, as I – (new)comer to Canada – attempt to disrupt settler colonialism structures and promote imaginings of different ecologies.

The Métis scientist Max Liboiron (2021) reminds us that “colonial land relations . . . assum[e] access by settler and colonial projects to Indigenous lands for settler and colonial goals” (p. 5), and “the transformation of Land into Resource is achieved not only through the arrangement of space but also through the arrangement of time. The temporality of Resource is anticipatory – it makes and even aims to guarantee colonial futures” (pp. 64–65). This certainly includes scientific endeavours but also, and most importantly for us in this article, it includes education and educational systems. What settler colonial futures am I guaranteeing through my pedagogical practices in my courses? What assumptions about access to Indigenous lands am I making when teaching about land relations and ecologies?

My personal struggle to decolonize my practices reflects the evolving understanding that in educational contexts, “the easy absorption, adoption and transposing of decolonization is yet another form of settler appropriation,” which “problematically attempt[s] to reconcile settler guilt and complicity, and rescue settler futurity” (Tuck & Yang, 2012, p. 3). If not a metaphor, which becomes a panacea for all things socio-ecologically just, then decolonizing must be disrupting, uncomfortable and about “tearing down” as I expressed in my conversations with Sarah and Peiki. Decolonizing, in this sense, means removing the colonial and recognizing sovereignty, and the very concrete and disruptive implications of it.

Max Liboiron (2021) offers the option of anti-colonial sciences, which “are characterized by *how* they do not reproduce settler and colonial entitlement to Land and Indigenous cultures, concepts, knowledges, and life” (p. 132), proposed as “knowledge systems” that may be explicitly against the dominant ones. In *The Serviceberry*, Robin Wall Kimmerer (2024) helps us envision a gift economy that is different from and in many ways against the neoliberal, capitalist economy, built and perpetuated by imperialist and colonial systems. In this sense, much of what I have been attempting with my students is anti-colonial education, but the decolonial undercurrent is also there, with an invitation to dismantle and “tear down” colonialisms. As Chrona (2022) mentions,

This process is not about directing blame or assigning guilt. It is not about holding each other responsible for the past; it is about holding ourselves, and each other, responsible for what we do *now*. Being in this kind of emotional place is challenging because it requires a level of vulnerability. But it is in the spaces where we wrestle with unfamiliar ideas and thinking that challenges our preconceptions and assumptions that we can grow the most. (p. 16; emphasis added)

Honouring the path forward

Lilian: Teaching from a relational stance is both deeply personal and politically charged. It requires confronting the colonial separations that divide humans from nature, teachers from learners, mentors from mentees, science from stories, the environment from our place and positionality in it. Honouring the path forward means restorying these relationships and reimagining our classrooms as places of kinship and care, a pedagogy of belonging that honours the agency of the living world. For instance, this may include challenging future science teachers' conceptions of being as individuals when I share with them Donna Haraway's (2016) discussion of sympoiesis and symbiogenesis, or challenge them to reconceptualize ecological relations from the point of view of the peoples and entities other than humans.

Transforming science and environmental education depends not on new content, but on new relationships: with self, others, Land and knowledge itself. Enacting relational and decolonial or anti-colonial approaches requires negotiating the boundaries of curriculum, policy and institutional expectations – the small, sustained acts of alignment and mis-alignment that collectively shift the discourse away from the dominant, colonial, individualistic and erasing truths and dispositions that are hegemonic to our ways of educating and schooling.

As we continue to navigate the tensions between aspirations and limitations, theory and practice, action becomes possible when it is rooted in relationships and grounded on stories. As I mentioned during our conversations,

the point is not to convince everyone to change; the point is to try to understand that there are different ways of knowing and being and relating... because clearly the Western "superior" way of being is ending this planet, you know, so then maybe there are different ways than ours to try to think of how we can relate, how we can do things... [which] for a lot of us it is unimaginable, but it's time to start to imagine and see that, well, actually other people do this. (Pozzer, meeting 5, lines 421 to 428)

In this sense, imagining otherwise becomes both pedagogical and ethical work, where new possibilities for thinking, teaching, learning, communicating, being and relating can begin to take root.

Peiki: It gives me pause when learners inquire why I have not yet embedded science perspectives from my own ethnoracial heritage into our learning and know it is because of my own limited understandings. I wonder often who I would have become as a science learner and educator in the absence of hegemonic structures and powers. If borders "define the places that are safe and unsafe, to distinguish us from *them*" (Anzaldúa, 1987, p. 3), what possibilities emerge when we disrupt those borders to recognize diverse ways of relating with/in the natural world?

I wonder about turning from outdoor and environmental education approaches towards an ecopedagogy that is less human-centric, more relational and more critical to interrogate the sociopolitical and historical contexts that science education is situated within (Hung, 2025). More specifically, I wonder about leaning into my own positionality to learn about traditional understandings of harmony between human and more-than-human worlds, ideas that form the foundations of a Chinese ecopedagogy (Hung, 2019). Already, I can see how it shares similarities (e.g., cyclical, relational, fluidity) (Hung, 2019) with the nature of science from Indigenous perspectives (Chrona, 2022; Williams & Snively, 2016).

Moved by conversation and introspection; supported by curricula and policies; I cobble new lessons in attempts to foster learners' interconnections with/in nature. We reflect on our science identities through Sinclair's guiding questions (who am I, where do I come from, why am I here and where am I going) (Manitoba Education and Early Childhood Learning, 2022) – just as we have done for this study. In class, we discuss what it means to belong to a place and examine images of our school and community. We observe spiders and slugs outside with/in nature and collaboratively write territorial acknowledgements recognizing the animals, plants, water and

rocks of this Land. We listen to Indigenous teachings embedded within stories of pecan trees in ecologically coordinated forests (Kimmerer & Smith, 2022) alongside investigating tree microbiomes outside with agar and sterile swabs in hand.

Though not entirely without resistance, we are slowly restorying science education. In coming to know science and places differently, we must resist picking our scabs and exercise patience as we dwell in necessarily painful places (Anzaldúa, 1987). As we have come to realize, this life-long journey can be uncomfortable because, with new knowledge and understanding, we are no longer the science educators we used to be (Anzaldúa, 1987). Like water, we must continue moving and growing to avoid stagnancy. To engage in science teaching as a form of resistance is a deeply political act – one requiring reflection, recommitment and relationality.

Sarah: I resonate with Peiki's reflections on decentring humans in educational spaces and connecting with the more-than-human world in ways that do not prioritize human benefit. Rather than focusing on what we – humans – can gain, I am drawn to exploring the imaginative possibilities of what we can offer. I once reshaped my identity as “a science person” by incorporating students' languages into the classroom and embracing drawings that were not neat or angular, but flowy, colourful and expressive. I now reflect back on this as my attempt to disrupt the pervasive rigidity of colonial scientific norms, keeping in mind that the exerted effects of science are not neutral, with scientific practices being rooted in cultural, social and political norms (Bourdieu, 1991; Latour, 1987; Valladares, 2021).

With teacher candidates, we may examine our own positionalities and discuss how we came to know (Aikenhead & Elliott, 2010) science: what are the unspoken norms and rules? How are we contributing to the predominance of one knowledge system over others? How can we, collectively, cultivate spaces that honour multiple ways of knowing? Anzaldúa (1987) reminds us that there is no clean separation between knowledge, identity and worldviews, suggesting that educational spaces may embrace hybridity and “border culture” rather than enforcing singular norms, where no one knowledge system dominates over others.

As I focus on being accountable, and response-able, I am aware of the vulnerability that staying with the trouble necessitates (Haraway, 2016). I look back at syllabus outlines I carefully created that could have included affordances to intentionally be with~in more-than-human worlds instead of instructing to write and comment on, imagery to ponder instead of long articles to read and fragment and a deeper understanding of what stories we tell and their origins. Riley *et al.* (2024) advocate for slow, situated and accountable educational practices, while remaining attentive “to *what* systems and structures we are seeking to belong to” (p. 103). Donna Haraway (2016) invites us to consider the entanglements with human and more-than-human and to remain attentive to the stories we tell and are told, as “it matters what stories make worlds, what worlds make stories” (p. 12). As I re-vision my role as a science educator, “the more the students stories are centred or welcomed, and I know we talked about possible logistics and how things could happen, but just that, like knowing that they could share their relationship with something or their wonderings” (Ragoub, meeting 5, excerpt 658) reminds me that this is not a simplistic task, but one that requires “passion and action, holding still and moving, anchoring and launching” (Haraway, 2016, p. 10). By engaging with these questions, we hope to reclaim space for science and environmental education that is imaginative, relational and responsive to ongoing inequities in the world, while nurturing care and curiosity.

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Peiki Loay is a sessional instructor in the Faculty of Education at the University of Manitoba, where she completed her MEd. She is also a science educator in the Manitoba public school system. Her research interests include justice-oriented science pedagogies, Indigenous Science perspectives, the role of science educators in reconciliation, queering science through wonder, anti-racism and (re)centring marginalized voices through (counter)storytelling. As a teacher and scholar, Peiki walks alongside educators locally and provincially in the areas of treaty and critical social justice to foster courageous, accountable spaces of belonging for all learners.

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