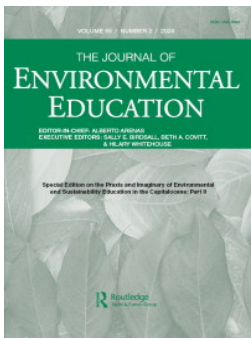

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RESEARCH ARTICLE

Prompts for eco-social transformation: What environmental education can learn from transformative design

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ABSTRACT

This paper seeks to bring together two seemingly disparate conversations, design and environmental education, with the intent to offer an interesting, new, useful approach to developing educational responses to the climate and ecological crises engendered by the Capitalocene. Beginning with observations on the relevance of design to the creation of alternative futures, we outline results from a six-person year-long research project that led us to identify six principles for guiding eco-social-cultural change: all my relations, abundant time, mystery/unknowability, embeddedness/integration, ancient futures, and (re) creative dissonance. We situate this work within transformative orientations to design, which are shown to parallel critical threads in the environmental education literature. We then extend, rework, and reimagine the six principles by suggesting how they can serve as prompts to assist environmental educators to reexamine and move beyond problematic norms of the Capitalocene in their thinking and practice.

KEYWORDS

eco-social-cultural change; transformative design; environmental education; educational change

Introduction: Using education and design to undo key premises of the Capitalocene

The relationship of human beings with land, and with the rest of the web of life, is a defining element of the Capitalocene (Moore, 2017). Both a dichotomous understanding of "nature" and "culture" (or "society"), and an unremittingly instrumentalist view of that alienated "nature", are essential to capitalism both as project and as process. Value in a capitalist metric is produced by the conversion of nature into culture, the "stuff" of the world into raw materials and thence into economic goods. In order to generate profit, this pathway has to run uphill, from low value to high. As Moore (2017) makes clear, this has consequences for human-human relations as well: the alienation of nature is closely tied to the alienation of labor and the offloading of many of the risks, burdens and harms of capitalist production and consumption to the sites and processes of extraction and disposal, and the people who work and live there.

Design thinking plays a key role in this capitalist value hierarchy. It represents the growing edge of the capitalist imaginary—the extension of production and consumption, of products and services, into new realms such as health, government, and education. As such, one might see it as situated a long way away from "nature"—and, indeed, most design thinking focuses narrowly on meeting the needs and wants of other consuming humans, reinscribing nature as backdrop or resource or ignorable externality, in keeping with the logic of the Capitalocene (Moore, 2017). Yet some recent strands of design thinking have begun to recognize the field's problematic social and ecological assumptions and to explore its potential to help transform experiences, organizations, social systems, and even designers themselves in the service of other, less consumptive and destructive, possible futures.

During a year-long research project into "educating for living within the Earth's carrying capacity," funded by Canada's Social Sciences and Humanities Research Council (SSHRC), we were struck by the

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relevance of this more expansive and critical orientation of design to the educational challenges posed by the Capitalocene. We are referring here to a conception of the Capitalocene as a "boundary event" rather than an epoch (Haraway, 2016)—a geohistorical period spanning no more than a few hundred years and marking a radical discontinuity between the Holocene and whatever comes next. Our job, as Haraway says, is to make the transition "as short/thin as possible and to cultivate with each other in every way imaginable epochs to come" (2016, p. 160). This is an educational undertaking that differs from any in the past, suggesting that we should be drawing on theoretical and practical knowledge from many different fields. Our interest is in educational approaches that move beyond anthropocentrism, human-as-capitalist-consumer and nature-as-resource, to include the more-than-human world as co-knower and co-teacher (Blenkinsop & Beeman, 2010; Simpson, 2014; Styres, 2011), thereby undoing, reframing, and reimagining foundational premises of the Capitalocene. Transformative design, we believe, can help to delineate and realize this transition, involving our more-than-human kin not only as co-educators but as co-designers, co-creators and co-citizens.

Environmental education, or at least the strands of greatest relevance to this project of eco-social-cultural change in response to the climate and ecological crises, has a long track record in facilitating people into possibly transformative experiences through deep connection with the natural world. From our reading of the literature, we see this as a important contribution to the design conversation; conversely, we see design offering creative, experimental, hopeful, imaginings and enactments of desirable potential futures that can push environmental educators to expand and enliven their thinking and practice. Our focus in this article is on the latter: we seek to introduce the readers of JEE to some of the more transformative orientations to design and consider how they might be helpful to environmental educators trying to move beyond Capitalocene norms. We make the discussion more specific by focusing on a handful of design principles, or prompts, that emerged in the course of our research project and that resonate with themes in the environmental education literature. Such a purposeful, designerly approach, we argue, may help environmental education contribute more effectively to the transition out of the Capitalocene.

Genesis: Research method as transformative design

The work that gave rise to this paper was supported by a SSHRC Knowledge Synthesis grant that required a team of researchers to put together a "state-of-the-art" report, a kind of expanded literature review, on some aspect of a given "wicked problem"—in our case, "living within the Earth's carrying capacity." Out of 27 projects tackling this particular "future challenge" across the social sciences and humanities, ours was the only one to focus on education. Our starting premise was that mainstream, formal education is directly implicated in the alienation of the wealthy societies of the Global North from the living world and hence in those societies' insensitivity and unresponsiveness to ecological constraints. That is, we approached the problem from a systemic perspective, rather than framing it simply in terms of the "content" of what gets taught and learned in schools and universities. We saw the challenge as one of fundamentally altering many of our standard ways of thinking about and doing education: a project combining philosophical critique, inquiry into transformative educational practices, and bringing systems thinking to bear on the difficult task of changing institutional habits and mindsets.

The two lead investigators assembled a group of four doctoral and post-doctoral researchers whose expertise encompassed outdoor, experiential, nature-based and environmental education, intercultural and multilingual education, imaginative education, pre-service and in-service teacher education, existential and hermeneutic educational philosophy, Indigenous and decolonial studies, counseling and community psychology, social innovation, and organizational change. This diversity of backgrounds and perspectives would, we hoped, support the development of new insights into existing and prospective educational responses to the ecological crisis and, in particular, help us think outside the tacit assumptions of the Capitalocene that have shaped our current predicament.

When this work began, only one of us was familiar with the literature on social innovation, systemic design, and transformative praxis. Despite this, our ways of working reflected some of the key processes and practices developed in these fields (Fazey et al., 2020; Goodchild, 2021; Kivell et al., 2023; Manzini,

2015; Ryan, 2014). We placed a great deal of value on working relationally, with the idea that all six of us should find value in what we chose to focus on and explore. We trusted in our own multi-dimensionality, bringing in theory, practice and experience from many different aspects of our lives; to a considerable extent, the process was user-centered with us as practitioner- and research-oriented users (cf. "research for design" in Manzini, 2015, pp. 38–39, and "a systemic design mindset" in Ryan, 2014, pp. 6–7). Team meetings, interviews, reflective projects and activities took place online each week for the best part of a year (the first year of the Covid-19 pandemic), with occasional breaks. We chose to "go slow to go fast," spending lots of time exploring different ways of understanding the problem we were trying to solve. Team members brought their own literatures, read further, and nominated and interviewed participants with expertise relevant to the project with a particular focus on educational and community-based projects, innovative social change organizations and projects, and Indigenous innovators and educators. The team discussed these interviews, shared readings around specific research questions as they arose, built out a bibliography, and gradually developed a set of "shared values, visions, and critical problem frames"—the key components of what Kivell et al. call "transformative process" (Kivell *et al.* 2023, pp. 1674–76).

Throughout this work, we were aware of the inherent risks of "early closure"—letting our own limitations and biases determine what counted as relevant. After half a year of amassing data and ideas, our sense was that our imagining of possible futures might still be overly constrained and conventional; we needed a way of loosening up our minds and language. This led to an intriguing and unexpected arts-based research practice inspired by Afro- and Indigenous futurisms (Brown & Imarisha, 2013). Independently, team members wrote short works of speculative fiction inspired by our work to date and our hopes and fears for the future. We then read each other's pieces and worked together to identify common principles that could be used to frame and bring the surface latent transformative themes across the range of readings and interviews. Out of the dozen or so such principles we first identified, we came to focus on a set of six that seemed most generative, not only in light of our research conversations, but in the context of our own diverse encounters and relationships with the more-than-human world.

The second half of this paper is one example of us working through the range of meanings embedded in the principles: all my relations, abundant time, mystery/unknowability, embeddedness/integration, ancient futures, and (re)creative dissonance. This work began during the Knowledge Synthesis project and continues in various forms and contexts—our interpretations here are simply one set of possibilities arising in the generative space between environmental education and transformative design. That particular framing of the principles led us to think of them as "design prompts"—reminders to think and imagine beyond the constraints and problematics of the Capitalocene, and nudges toward an educational praxis oriented toward eco-social transformation. We see this as an illustration of the potential for design thinking to open up new perspectives and challenge old habits in the field of education (environmental and otherwise); at the same time, we hope it will encourage educators to bring more of their perspective and expertise to the conversations around systemic and transformative design, which to date have shown little awareness of education as a vital dimension of cultural change.

Seeking educational relevance: Designing for eco-social transformation

Because educators are typically unfamiliar with design literature and practice, we offer here a brief introduction to the field, with a particular emphasis on recent critical and transformative work. As noted above, the field of design as a whole has tended to reinscribe the assumptions of extraction, exploitation and human superiority that are built into our current systems of industrial production and consumption. Yet the activity of design—what Buchanan calls "conceiving, planning and making products that serve human beings in the accomplishment of their individual and collective purposes" (2001, p. 9)—is not necessarily restricted to capitalist and consumerist ends. Little by little, designers have expanded the scope of their work, from an early focus on "symbols and things" (the defining concerns of graphic and industrial design) to encompassing "experiences or activities or services" and "environments and systems"

(what Buchanan terms the third and fourth orders of design: 2001, pp. 10–12). This has opened the door to addressing larger design-related questions, such as the wellbeing of employees, the purposes of an organization, the social impact of an innovation, and the needs of communities. Some practitioners of service design, in particular, have come to consider services "less as design objects and more as means for societal transformation" (Sangiorgi, 2011, p. 29).

As Sangiorgi notes, this approach to service design poses challenges to designers who lead these processes: although the "design literature is generally characterised by a highly positive rhetoric on the role and impact of design in society… a more critical approach is becoming increasingly necessary" (p. 37). She suggests that "transformative design" needs to address questions of agency—having recipients of services play an active role in their design—and scale—"community" being an especially key organizational level. Relationship- and capacity-building, the redistribution of power, the creation of equitable organizational structures and platforms, the cultivation of imagination and hope or "collective efficacy," and the reflexive assessment of long-term impacts are other key aspects of this approach to design, which clearly begins to intersect with justice-oriented approaches to environmental education (e.g. Casas et al., 2021). Others have argued that, given the embeddedness of design in "neoliberal capitalist, colonial structures," there is a need for "a more nuanced understanding of power dynamics—the complexities, tensions and pluralities of power that underlie design practices and that may reproduce systemic oppression" (Goodwill et al., 2021, p. 46). Describing reflective prompts and practices for designers to understand and engage differently with their own power and that of others, such work could be enriched by specific pedagogical strategies proposed by environmental educators for similar purposes (e.g. Poeck & Ostman, 2018; Räthzel & Uzzell, 2009).

Irwin (2015) argues that service design tends to operate on relatively short time scales and within existing power structures, and frames more transformative approaches as "design for social innovation… where projects are usually situated within social and community contexts, engagements are ideally longer, and solutions begin to challenge existing socioeconomic and political paradigms" (p. 231). Yet she wishes to push still farther "along the continuum," to what she terms "transition design" leading to "radical, positive social and environmental change." Transition design approaches "have their origins in long-term thinking, are lifestyle-oriented and place-based, and always acknowledge the natural world as the greater context for all design solutions" (Irwin, 2015, pp. 231–2). Here we start to see the convergence of design thinking with more radical themes within the environmental education conversation. Slow pedagogy, for instance, explicitly asks the field to extend the time scale it is considering, both *in* learning and *as* learning (Payne & Wattchow, 2008), while C.A. Bowers (2008) argues for the importance of "community memory" and "sustainable traditions of community self-sufficiency" in place-based education. The distinctive emphasis of transition design on "everyday life… as a potentially powerful, transformative space" (Irwin et al., 2022) is an orientation shared not only with the "practice theory" approach to social change (e.g. Shove et al., 2012; Spaargaren et al., 2016), but also with critical place-based research (e.g. McInerney et al., 2011).

In the influential design typology proposed by Jones (2014), transition design would be considered an instance of Social Transformation Design, a level 4 "stage" or "domain" of design thinking and practice that draws on but transcends earlier stages or domains. In this emerging field, Jones posits a need for "a broad crossover of principles between systems and design theory" in order to "enable new forms of design, planning, and deliberative conversation for coordinated action" (2014, p. 104). Drawing on a rich systems thinking literature (for an overview see Meadows, 2008), Jones lists the following "systemic design principles" as a starting point for such conversations: Idealization; Appreciating complexity; Purpose finding; Boundary framing; Requisite variety; Feedback coordination; System ordering; Generative emergence; Continuous adaptation; and Self-organizing. In short, "creative methods and mindsets" are needed, "bringing deep technical knowledge, aesthetic skill, and creative implementation to the most abstract programmes of collective action" (Jones & Kijima, 2018, p. ix). To our knowledge, while similarly integrative, meta-level thinking can be found in the fields of transformative learning (Nicolaides et al., 2022) and holistic education (Miller, 2019), environmental education has not tended to frame itself in such systemic terms (though see Jickling et al., 2019, for a recent proposal).

Echoing the previously cited work on power dynamics in design processes, some researchers have warned of the potential entrenchment of "a design culture of nowhere and nobody" that marginalizes

and supplants "what design means and how it's practiced in and by 'peripheral' locations, cultures and people" (Akama et al., 2019, pp. 62–64). Barcham (2023) reminds us, again paralleling critical work in environmental education (e.g. Berryman & Sauvé, 2016; Root, 2010), that "design methods are political" and that design practices are often pro-capital and neo-colonial, particularly when working on social and organizational systems, structures, and processes. As one recent manifesto states: "It is not sufficient for design institutions to simply include a greater diversity of actors or perspectives. …[T]here is little point to diversifying institutions, practices and processes that ultimately sustain colonial imperatives" (Abdulla et al., 2019). In response to such concerns, Escobar (2015) formulates a call for "pluriversal ontological design… aimed at enabling the ecological, social, and technological conditions where multiple worlds and knowledges, involving humans and non-humans, can flourish in mutually enhancing ways" (p. 15). This rethinking of social transformation design as decolonization rooted in people, places, and community resonates strongly with the work of critical environmental educators, dating at least from Cronon's Cronon (1995) critique of romantic Western assumptions about "wilderness", and furthered in many directions by eco-justice (Martusewicz et al., 2015), deep ecology (Drengson & Inoue, 1995), and critical race and Indigenous theorists and researchers (Tuck et al., 2014; Nxumalo & Ross, 2019).

This brief survey of a few transformative orientations to design and suggestive parallels in environmental education is intended as preparation for the following discussion of the six "design prompts" for eco-social transformation. We hope this introduction will help readers understand what we mean by "designerly ways" of working with these principles in environmental educational practice. The idea is to draw forward the educator's designerly role, looking at activities, curricula, and programs through the lens of the possibilities they offer for systemic shifts in our assumptions, values, habits, relationships, and even our identities as educators and persons. In the limited space available, we have not been able to spell out all of the implications; our hope is that readers who see promise in this way of working will delve more deeply into the design approaches that resonate with their positioning and practice.

All My relations: Sitting amidst the gossamer webs of generations of spiders

The phrase "all my relations" (LaDuke, 1999) originated with Plains Indigenous cultures (Lakota, Cree, Métis). It contains both an ontological and an ethical premise: the world is *fundamentally* relational, and its flourishing demands that we *work relationally with all beings*. As Ojibwe writer Richard Wagamese (2013) puts it, "There is nothing that matters less than anything else. By virtue of its being, all things are vital, necessary and a part of the grand whole, because unity cannot exist where exclusion is allowed to happen. This is the great teaching of this statement." And Cree scholar Shawn Wilson (2008) has drawn the epistemological corollary: ""Knowledge cannot be owned or discovered but is merely a set of relationships that may be given a visible form" (p. 127).

Educating in relational ways requires a series of commitments and changes. For instance, reciprocity, one of the "4 R's" of Indigenous education, emerged as important in many of our interviews, along with a commitment to enacting and expressing gratitude as concomitant to being in relation with myriad Others. Such reciprocity is based not in a capitalist economic model (i.e. human teachers providing a paid-for-service, knowledge as being extractive, or students as consumers in an educational transaction), but rather on the exchange of gifts within a web of relation. So this design principle challenges environmental educators to consider reciprocity in the educational encounter and in life itself, and seek ways to enact and model it not only within their human relationships but with more-than-human kin.

Here, then, are some thoughts on how environmental educators might work with "all my relations" in designerly ways:

- By putting equity and decolonization right at the center of practice, from beginning to end. As noted earlier, this goes beyond simply *involving* diverse actors and perspectives; it means engaging all participants in considering how intersectionality, positionality, and privilege shape their actions, choices, perspectives, and imaginings (including nature as an object of colonization: Blenkinsop et al., 2017), and building their capacity to think and choose *otherwise* (e.g. Menakem, 2017; Saad, 2020).

- By seeking to co-design everything with the more-than-human. This includes understanding all-our-relations to be participants, decision-makers, stakeholders, and co-teachers in whatever learning is sought, and to take time to listen to what they have to say (Blenkinsop & Beeman, 2010; Jickling et al., 2019).
- By cultivating supportive networks of experimentation and learning, rooting the work in gratitude, reciprocity, community and communities of practice. This gives sustenance to all involved and nourishment to the transformative nature of much of this learning work, while undermining the capitalistic assumptions of education and the transactional nature of encounters with the Other. Design here goes beyond educational practice itself: it implies that relationships, collaborations and gifting networks need to be shaping our lifeways as environmental educators.
- By engaging in "self-in-the-system" reflective practices (Scharmer, 2018; see also https://www.u-school.org/) and asking questions like: Who am I? What is my work? What am I being called to contribute? What are the gifts I am offering and receiving? This challenges us as educators to see ourselves as part of a larger whole, as having something (but not everything) to contribute and receive within larger networks of relationship.

Abundant time: Floating down a lazy river on a sunny summer day

The ecological crisis, and the ongoing violence of colonial and capitalist systems, tend to promote a sense of urgency, of there being *not enough time*. In fact, assumptions of scarcity are a major driver of the Capitalocene (Lane, 2019). Yet our research convinced us that this understanding of time is deeply problematic—indeed, an integral part of the very mindset that has brought those crises into being (Nanni, 2017; Ogle, 2015). The same, essentially colonial notion of time as a scarce resource now permeates modern culture, with far-reaching consequences for the organization of work, parenting, leisure and other key dimensions of human existence, including education (Southerton, 2020).

In response, philosopher Roman Krznaric (2020) argues that modern society is "colonizing the future" by treating it as a dumping ground for its toxic legacies. Living within the Earth's carrying capacity requires us to become, in his terms, "time rebels." In another critical intervention, Black artist and theologian Tricia Hersey, founder of the Nap Ministry, offers paradigms and practices to resist grind culture and capitalism through acts of rest as radical resistance and refusal (Hersey 2022). WIthin education, hermeneutic scholar David Jardine pushes back on "regimes of scarcity" in schools by situating "curriculum in abundance" (Jardine et al., 2006). These are just a few of the threads supporting the key point in all this: that our understandings and practices of time can be sites of possibility, of joy, of freedom, of nonlinearity, and of calm attention/attunement to the present—but realizing this potential is a matter of intention and design.

Here are some thoughts on how environmental educators might work with "abundant time" in designerly ways:

- By allowing for more "unprogrammed", free educational space, and for situations where questions can float un/under-answered in their complexity. This suggests rethinking what we understand as "activity" and "outcome" and allowing room for spontaneity and emergence, as well as for "nothing" to happen.
- By facilitating in ways that allow room for joy, possibility, and peace to arise in unlooked-for forms and contexts. This suggests that we consider affordances: what is being made accessible, what is being hindered, and what expectations, tacit or explicit, are shaping interactions? How can the constraints be loosened?
- By holding space for abundant time and not jumping quickly to a solution—the immediate answer or the easy activity. Instead, beginning with not knowing: with curiosity, exploration and lots of questions. This suggests that, in designing a program, we build in ongoing iterative cycles of paying attention, gathering information, reflecting and wondering, and resting with awe and wonder: what could we be doing differently? How could we be doing *less*?

- By adopting ideas, tools and activities from such examples of "design facilitation" as Open Space Technology (Owen, 2008; see also https://openspaceworld.org/) and The Long Time Project (2020; see also https://www.thelongtimeproject.org/).

Mystery/unknowability: Standing surrounded by the coastal winter evening's shades of grey

Another persistent theme arising from our work was the question of "ethical space" (Ermine, 2007)—in essence, how to engage with diverse Others in ways that do not erase difference. While comments in interviews and literature tended to focus on human Others, these concerns are readily extended to more-than-human alterity, whether in terms of Western phenomenology (Castrillón, 2014) or Indigenous epistemologies and cosmologies (Simpson, 2017). As Maori scholar Carl Mika (2017) points out, the necessity of reverence and respect for unknowability can be seen as a corollary of the world's interrelatedness; if "one thing is never alone, and all things construct and compose it," then "I am no more familiar with any one thing than if I had never encountered it. Indeed, I experience an aspect of the worlded thing and its mystery when I meet the limits of my ability to say much about it, or when I realise that I cannot fully know it" (2017, p. 5).

The ubiquity of mystery implies that knowledge should be understood as always incomplete (Graeber, 2015), and indeed best practiced as a shared endeavor betwixt and between myriad and diverse knowers (Ahenakew, 2016, 2017). Wonder and imagination are more central to these modes of meaning-making than certainty and control (Egan et al., 2014; Fettes, 2013; Sheridan & Longboat, 2006). This also challenges environmental educators to decenter themselves as human, as expert knowers, as teachers, in order to make space for other teachers and voices, including those of the more-than-human world.

Here are some thoughts on how environmental educators might work with "mystery/unknowability" in designerly ways:

- By asking open-ended and well-framed questions that deliberately exclude the notion of learning experiences having to be efficient, cost-effective, measurable, or conforming in other ways to our expectations of education in the Capitalocene. Instead, the goal would be to stretch individual and collective thinking into wilder, less linear, more systemic, creative possibilities. In our research, this was the purpose of our experiment with speculative fiction; it suggests that artistic and creative process might be more intentionally embedded within the practice of environmental education.
- By approaching program and activity design through cycles of small experiments involving prototypes. Designers use this approach to test, learn, and iterate their way into something that they couldn't imagine or think of before beginning. For environmental educators, this suggests developing new practices through many tiny steps (and honored mis-steps), treating each program offering as a step in a journey toward eco-social-cultural transformation—a step that is reflected upon, reworked, and moved beyond.
- By modeling comfort with and in these spaces of incomplete knowing and mystery and by making those spaces available, important, and interesting for learners. While novices and others new to a particular space may feel they have little to contribute, in fact their spontaneous responses and fresh eyes on a problem can be sources of innovation and transformative learning. Equally, instructors can be frank about the limitations of their understanding, not just as individuals but as participants in a culture and a worldview.

Embeddedness/integration: Nurse log lying in the full glory of sun shining through the canopy

The importance of belonging came through in many of our interviews and discussions—experiencing oneself as part of a larger whole. As with other themes, we understood this one to be fundamentally ontological, about what it means to *be* and how to realize that *being* more fully. While the question of

"living within the Earth's carrying capacity" naturally directed our attention to being in relation with the planet as a whole, what struck us was that our interviewees spontaneously located themselves within smaller-scale forms of belonging: community, place, land. Given the difficulty of experiencing, or working at the level of, Earth as a whole, perhaps there is a fundamental human need to orient ourselves through integration in landscapes large enough to be self-sustaining and self-renewing, but small enough to invite intimacy—a sense of belonging, connection, and responsibility, often infused with a sense of the sacred.

This theme echoes Indigenous concepts of "land as first teacher" (Simpson, 2014; Styres, 2011, 2017). Land teaches us, holds us, not simply by offering a place to live, or the food and material resources necessary for survival, but more fundamentally by showing us and letting us experience, continually and in myriad ways, what living relationships look like and feel like and how they weave together to make greater, more complex, self-sustaining and adaptive wholes. In Indigenous creation stories, humans are typically the late arrivals, the youngest member of the family, the last to be created, arriving on a scene where action and intelligence are already in full swing, and where our main task is to learn by observing and participating in the webs of relationship that carry both doing and thinking.

Here are some thoughts on how environmental educators might work with "embeddedness/integration" in designerly ways:

- By seeking out and coming to an understanding of the Indigenous stories and knowledges embedded in the lands we are on, while avoiding appropriation and acknowledging the contemporary keepers of these knowledges. Styres (2018) calls this "a conscious choosing to live in intimate, sacred, and storied relationships with those lands… not the least of which is an acknowledgment of the ways one is implicated in the networks and relations of power that comprise the tangled colonial history of the lands one is upon" (p. 29).
- By actively mapping, resisting, and/or restorying the systems in which we work and teach. This includes being actively critical of narratives that sustain and further the Capitalocene, including diverse, often taken-for-granted forms of extreme individualism and alienation. The aim is to come up with new maps and stories that allow for, or are even centered on, the shapes and voices of the communities (human and more-than-human) that you want to connect with, preserve or restore.
- By recognizing that stories can be teachers of wholeness, communities, and relationships, and thus choosing stories to listen to and to tell that are informed by land, the very land holding us at this moment, as teacher and gifter. This also implies developing and teaching the skills of listening for connection, of hearing relationship, and being engaged with the land directly, or by human voices in dialogue with the land.
- By looking at the relationships between the immediate challenges that we are working on and the broader systems of the Capitalocene—cities, food, families, money, classrooms, cars, etc—within which they/we are situated. Such systems thinking can be fostered through pedagogies developed in the field of social innovation and design (e.g. Omidyar Group, 2017; see also https://acumenacademy.org/course/systems-practice), which in turn can lead to looking for ways to exercise collective agency so that the larger system levels can learn and grow as well. A guiding premise is that the stuck or the generative patterns within a student may be replicated at the scale of teacher, classroom, school, and society; thus, it is worth asking what kinds of interventions might catalyze transformation at one or more levels (Brown, 2017).

Ancient futures: Resting in a glacial valley with our feet on a huge erratic

Many of the communities, groups and organizations we encountered in the research had deep roots in what might be thought of as sustaining philosophies, or even cosmologies: long-established worldviews that were different from/in opposition to those that sustain modernity and the Capitalocene. This was most apparent, for obvious reasons, with Indigenous groups, but it also appeared in other settings as well. These traditions, metaphysics, ways of being, histories, ceremonies, and axiological forms anchored people in sets of beliefs and a sense of purpose and allowed them to respond to challenges, threats, and problems in dynamic, and ethically acceptable, ways. There was a self-renewing quality, even a wildness,

to these ecologies of practice, within which the past was experienced as an inexhaustible resource for encountering and shaping the future.

Future-oriented discourse on education is typified by the claim that "today's challenges cannot be solved by old thinking," and so "we need to support learners to become innovators, capable of leveraging their own imagination and creativity to realize new outcomes for society" (Moravec, 2019, p. 258). Yet our research suggests this easy and generic dismissal of the past is embedded in Capitalocene thinking. Imagination and creativity are wiser and wilder when they are shaped within what Indigenous scholars have termed "grounded normativity… a series of complex, interconnected cycling processes that make up a non-linear, overlapping emergent and responsive network of relationships of deep reciprocity, intimate and global interconnection and interdependence, that spirals across time and space" (Simpson, 2017, pp. 23–24). To envision *this* kind of educational future, the question that needs to be asked is, what will honor the understandings and the needs of old and young alike, including the ancestors who have passed on and the generations yet unborn, the land and all our relations as they used to be and as they are becoming?

Here are some thoughts on how environmental educators might work with "ancient futures" in designerly ways:

- By challenging ourselves to include within our empathetic knowing past/present/future generations of humans and more-than-humans, while at the same blurring the boundaries between and amongst them. Writerly accounts of Elder teachings can be valuable sources of insight and inspiration, whether ethnographic (Cruikshank, 2007), essayistic (Gumbs, 2020; Lopez, 2001), or autobiographical (Paul et al., 2014). Indeed, the seeking out of such elder wisdom might become a kind of designerly and environmental educational practice. The emerging methodology of ecoportraiture is also relevant here (Blenkinsop et al., 2022).
- By building empathy, understanding, and rich descriptions of the experiences of the "users"/learners who come new to these ancient teachings. This can be called different things in design language—user research, action research, thick data collection, ethnographic research—but it's about getting to a place where the learners are welcomed and engaged in all of their complexity and diversity, and the educational process is reponsive to their emerging understanding of and relationship with the world and its myriad beings, in a dialogue with older/Other ways of knowing.
- By deliberately engaging in "enviro-futuristic" visioning—actively imagining other possibilities, for ourselves and the future, that draw on imaginaries and wordviews outside the assumptions of the Capitalocene. In particular, the aim would be to disrupt our habitual, linear conceptions of time to highlight the intermingling of processes that are continuous, cyclical, intermittent and emergent. In this way, present experiences and dilemmas can be reimagined in a vaster temporal context, as part of a much longer history of being and belonging and becoming that resists enclosure and foreclosure. In this way, the possibilities of ecological justice can be located not in a distant time but in present shared encounters and visions that are concrete, instructive, hopeful, and possibly transformational.

(Re)creative dissonance: Listening to the pine siskins chatter in their invisibility, held by a Mountain hemlock

The ecological crisis—along with all the other systemic pathologies of the Capitalocene—is a sign of a civilization in desperate need of reshaping: of being rendered more lively, as Lewis Hyde (2010) describes the role of Trickster figures in oral tradition. That implies that our thinking and practices need to be open to difference, contradiction, paradox, and dissonance. Rather than insisting on resolution, we need to allow ourselves to recognize and be moved by what lies beyond our expectations, understanding and control. Put another way, environmental education for eco-social-cultural change is education for an era of disturbances. Understood ecologically, that is not necessarily a bad thing. As Anna Tsing (2019) writes, "disturbance is always in the middle of things: the term does not refer us to a harmonious state before disturbance.

Disturbances follow other disturbances. Thus, all landscapes are disturbed; disturbance is ordinary. … Whether a disturbance is bearable or unbearable is a question worked out through what follows it" (p. 160).

Despite the emphasis placed in the other principles discussed here on relationality, wholeness and mutual flourishing, we must accept reality's lack of deference to any desires we may have for certainty or comfort. While Indigenous scholarship and teachings, for example, tend toward optimism regarding what Earth can teach us and the restoration of balance, there are other powerful voices that posit different lessons. Brown (2021), for example, says that "Black people have been excluded from the category human," and argues that "there is real power to be found in such an untethered state—the power to destabilize the very idea of human supremacy and allow for entirely new ways to relate to each other and to the postapocalyptic ecologies, both organic and inorganic, in which we are enmeshed.… the possibility of real change on a vast inhuman scale" (p. 7). Inviting such voices in and giving them space is a way of embracing dissonance as a generative force.

Here are some thoughts on how environmental educators might work with "(re)creative dissonance" in designerly ways:

- By incorporating practices of dissonance in the way we hold space for learning and being together. To invite in and make intentional room for ambiguity, for not-knowing, for the incomplete and unresolved, the messy, disorienting, and disruptive takes confidence, trust in the process and learners, and a bit of Trickster energy. It also includes making careful 'micro-moves' to prevent premature closure, to create space and time for steeping and ripening, to encourage and acknowledge discomfort and uncertainty as necessary, important, and fertile zones of transformation.
- By cultivating the capacity for welcoming in and sitting with dissonance and discomfort, allowing this to enter not only the cognitive space but also the emotional and physical. For environmental educators this likely means continuing to take risks, both in their own learning and growth and in the ways learners are worked with, likely drawing on embodied, mindful, even therapeutic practices to open and hold good and healthy space for dissonance. This is truly about the art of teaching as a practice on the edge of what one knows how to do. It is also about pushing back against the myth of progress and the search for answers, for resolution, that has long been part of modern teleology and that still drives much thinking about the problems of the Capitalocene.
- By drawing on facilitation traditions like deep democracy, which actively foster highly contentious and fraught spaces where perhaps the only thing that people agree on is that something needs to change. This is education that involves working with conflict and tension as creative forces, peeling back the layers of why we think about something the way that we do, or act the ways that we do, and finding ways to move together toward something else. Here we see environmental educators as really coming into their own and having some very significant skills to offer the mainstream (Blenkinsop et al., 2017). Tools such as "voice dialogues" from Zen Buddhism can help with the work of naming different perspectives, experiences, and feelings, e.g. "what is the voice of fear saying?" and "what is the voice of confidence saying?"

Conclusion

Finding a way out of the Capitalocene is the challenge of our age. Along with many environmental educators, we believe that learning from and with the more-than-human, and from a wide diversity of human voices and positionalities, are essential parts of this process—yet we also see that environmental education practices often fall short of this transformative potential. Enriching our thinking and practice with new tools and perspectives drawn from the world of transformative design may help environmental educators play a larger role in the coming transition, messy and imperfect as it will likely be.

The six design principles outlined in this paper seem promising to us as entry points to new conceptions of what environmental education is trying to accomplish, and what pedagogical skills and dispositions it might seek to nurture and extend. Our suggestions here are illustrative more than prescriptive: invitations to experiment with practice, and encouragments to question our habits and assumptions. Responding to the climate and ecological crises demands this kind of critical inquiry into the possibilities

of transformative praxis. We hope that others will join us in exploring this wild, disturbed and challenging terrain.

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