



Article

Education Beyond Green Growth: Regenerative Inquiry for Intergenerational Responsibility

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Abstract

Despite the continued popularity of education for sustainable development (ESD) and expanded calls for educators to inspire hope in the face of the climate and nature emergency, scholars from varied disciplines and knowledge systems have pointed to the disavowed social and ecological costs of the promise that we can continue pursuing infinite economic growth on a finite planet. In this article, we offer an alternative approach to education grounded in a regenerative inquiry methodology. Regenerative inquiry can prepare people to honestly confront the limits and harms of “green growth” and support them to “grow up” by expanding their capacity to navigate complexity and uncertainty and activating a sense of intergenerational responsibility. We also offer an example of how this methodology was mobilized in the context of a year-long transdisciplinary program focused on the climate and nature emergency.

Keywords: coloniality, responsibility, regeneration, sustainable development

Introduction

It is often observed that the existing socio-economic system has allowed for unprecedented economic prosperity. While many have sought more equitable distribution of access to the benefits of this prosperity, less commonly examined is the fact that this prosperity is premised on the disavowed social and ecological costs that enable this system to function. Despite growing questions about the feasibility and desirability of making the existing system “sustainable” through sustainable development, we have seen the persistence of calls for educators to embrace “education for sustainable development” (ESD). In this article, we argue that ESD approaches education as if we could transcend the violence and unsustainability of our current system without giving anything up, and thereby fails to account for the harms produced by this system or to prepare people to confront planetary limits and ecological breakdown.

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In many contexts, ESD has become synonymous with education about climate change, biodiversity loss, and other ecological crises, thereby marginalizing or invisibilizing other educational frameworks and possibilities. Although the meaning of sustainable development is contested, the dominant narratives presume that human well-being depends on exponential economic growth (Kopnina, 2014). Furthermore, there is an assumption that Western scientific knowledge and technological innovations will help us ensure we can continue that growth without significant disruption of our existing socio-economic system (Hopwood et al., 2005). In particular, there is an assumption that these innovations will enable “green growth”: the decoupling of economic growth from carbon dioxide emissions and ecological degradation.

Particularly in light of growing eco-anxiety amongst young people (e.g., Galway & Field, 2023; Hickman et al., 2021), educators are being tasked to serve as emissaries of hope for the continuity and expansion of the existing system, as we are warned that failing to inspire this hope equates to endorsing hopelessness and climate doomism (Frumkin et al., 2022). In many ways, investing in the promise of the “status quo” vision of sustainable development is understandable (Hopwood et al., 2005). It offers comforting assurance that, even in the face of increasingly grave warnings about climate instability and mass extinction, the future offers seamless progress toward ever-greater prosperity. Yet scholars across multiple academic disciplines and knowledge systems have raised serious questions about: 1) whether it is indeed possible to decouple economic growth and consumption from carbon emissions and ecological degradation; 2) whether the climate and nature emergency should be reduced to an issue of excess carbon alone (sometimes called “carbon tunnel vision” [(Konietzko, 2021)]; and 3) who pays the invisibilized costs of efforts to pursue the continuity of “business as usual, but greener” (Baskin, 2019). In light of these questions, we suggest it is time to seriously consider the possibility that sustainable development and its promises of infinite growth and consumption on a finite planet are not only harmful and unrealistic but are accelerating the path toward irreparable ecological degradation and premature human extinction. And if this is the case, then we will need to look beyond “education for sustainable development.”

To continue investing in the same systems that have caused climate destabilization and biodiversity loss in the first place feels increasingly not only like arrogance but also negligence, grounded in collective immaturity and refusal to accept our responsibilities to those who will pay the highest price for the promise of “green growth”: Indigenous and other systemically marginalized communities, particularly in the Global South, and future generations of all species. In response, we ask what kind of education could instead prepare people to “grow up” by honestly confronting the depth, magnitude, and complexity of the challenges we face, acknowledging our complicity in these challenges, and learning to navigate the climate and nature emergency in ways that centre our responsibilities to past, current, and future generations.

We begin by critically unpacking the promises offered by education for sustainable development, in

particular the promise of green growth. Next, we consider how education might be repurposed for something different: supporting people to outgrow an immature system that is in decline but that continues to constrain our imaginations and deepen destructive patterns of knowing, being, and relating (Machado de Oliveira, 2021). We then review our methodology of regenerative inquiry, which invites people into an open-ended educational process of un/learning to grow up amid current and coming storms, guided by a compass of SMDR: emotional *stability*, relational *maturity*, intellectual *discernment*, and intergenerational *responsibility*. We offer an example of how this inquiry was mobilized in a transdisciplinary university program focused on the climate and nature emergency and conclude with an exercise that offers an entry point for collaborative regenerative inquiry: 7 Steps Forward/Back/Aside.

Education for Sustainable Development

Before reviewing the implications of education for sustainable development it is important to situate our analysis. One of the premises of ESD is that there is a universal path toward ever more inclusive and equitable collective flourishing. Wary of the risk of challenging one universal only to replace it with another, we emphasize the importance of situating ourselves and our locus of enunciation: the place from which we speak. We have been working as a collective, Gesturing Towards Decolonial Futures (GTDF), for nearly 10 years, oriented by a shared inquiry about what kind of education can invite people (including ourselves) to interrupt modern/colonial habits of being, learn from and repair the harm done by those habits, and activate more responsible possibilities for existence (Andreotti et al., 2018; 2021; Stein et al., 2020; 2022). Collectively, we were educated in multiple disciplines and knowledge systems. This article extends our previous analyses of the limits of mainstream sustainability and climate education (Stein et al., 2019; 2022; 2023; Suša et al., 2021a; 2021b).

Informed by de-/post-/anti-colonial scholarship and inspired by the insights and relational sciences and technologies of our collaborators in the Teia das 5 Curas Network of Indigenous communities in Brazil (see Teia das 5 Curas, 2023), much of GTDF's work has focused on denaturalizing the "single story" of human progress and development that organizes global social and ecological relations. This story first emerged in the 15th century with the birth of what Táíwò (2022) calls "global racial empire": Europe's colonization and enslavement of the Americas, Africa, and Asia. This story can be considered a modern/colonial story, in that it touts the benefits of modernity while invisibilizing the colonial processes that underwrite those benefits.

Although the hegemony and universalism of this single story have been resisted in myriad ways since it first emerged, it has been forcibly and coercively imposed on the majority of the world for over five centuries. This story rests on a series of imposed separations, presumed supremacies, and rationalized subjugation. It naturalizes anthropocentrism by claiming humans are separate from nature and that nature is a resource to

be exploited and dominated by humanity; capitalism by claiming that economic growth, prosperity, and accumulation are equivalent to progress; and racism by claiming that humanity is broadly divided into two groups that are unevenly developed in the path of universal progress: those (white/Western people) who are humanity's leaders and those (non-white/non-Western people) who are humanity's followers.

Overall, this story is underpinned by a Western supremacist sensibility. This sensibility is predominantly held by white people, but not exclusively, and is oriented by several structurally sanctioned presumed entitlements and exceptionalisms that can be summarized as "5As":

- 1) Presumed entitlement to universal epistemic, political, and moral *authority*
- 2) Presumed entitlement to unaccountable and unrestricted *autonomy*
- 3) Presumed entitlement to *arbitrate* truth, justice, and commonsense
- 4) Presumed entitlement to unrestrained *accumulation* and consumption (not just of things, but also of nature, people, knowledge, experiences, relationships, etc.)
- 5) Presumed entitlement to have one's wants, desires, and benevolence *affirmed*

Alongside these 5As is the presumed entitlement to enjoy the intergenerational social, political, and economic benefits derived over centuries of slavery, colonialism, imperialism, and segregation. While the wealth of Western societies is often attributed to Western scientific innovation, the exceptionalism of Western knowledge, and the inevitable march of Western-led human progress, these presumed entitlements can only be realized through ongoing processes of extraction, exploitation, and expropriation. According to many Indigenous and other decolonial thinkers, this is the root cause of our current ecological crises: the single story of progress and development grounded in the separations and supremacies enacted through anthropocentrism, capitalism, and racism, has been mobilized to sanction systemic, historical, and ongoing genocide, ecocide, and epistemicide while disavowing responsibility for this violence.

From this perspective, climate change and biodiversity loss are understood as relational and cultural problems, rather than merely technical problems. Those who are responsible for the most ecological destruction through reckless consumption have become indifferent to our responsibilities, treating the Earth as an extension of ourselves, rather than the other way around. This analysis suggests we will be unable to ethically and effectively address ecological breakdown using only the tools and technologies offered by the same story that has led to this breakdown. Yet this is precisely what is offered by the promise of education for sustainable development. Mainstream education for sustainable development implies we should desire capitalist economic development, seek to make it more sustainable, and educate more people to enact it. Below we review the promises offered by each dimension of this term, in that order.

Development

Development emerged as a discourse in the post-World War II era, as formal European colonialism came to

a close throughout much of the world. In this context, “Cold War politics demanded the construction of a strong and irreproachable West, cleansed of any suggestion of complicity in Third World ‘underdevelopment’” (Kapoor, 2014, p. 1127). Since then, numerous de-/anti-/post-colonial, post-development, Indigenous, and Global South scholars and activists have observed that the hegemonic development agenda represents a continuation of colonial and racial relations, arguing that it “naturalizes the effects of past and present colonial expropriation at work in present global architectures” (Silva, 2015, p. 37).

Mainstream development positions Western knowledge and the capitalist system as universally desirable and beneficial. It implies that non-Western peoples, knowledges, and economic systems are “backward” and must “catch up” with the West by following its prescribed pathway toward economic growth. At the same time, “catching up” is impossible within a system established by the West and rigged in its favour. As Wynter writes, through discourses of development the West told the non-West “The problem with us *wasn't* that we'd been imperially subordinated, *wasn't* that we'd been both socioculturally dominated and economically exploited, but that we were *underdeveloped*” (in Wynter & McKittrick, 2015, p. 20, emphasis in original).

These narratives of development and the practices and policies that accompany them not only pathologize non-white/Western communities for their supposed lack of development, but they also deny the historical and ongoing role of the West in creating the same problems that advocates of development purport to solve. By disavowing these colonial dynamics, mainstream development reproduces unequal, paternalistic, salvationist, and extractive relationships between systemically dominant and marginalized communities, simplistic solutions to complex problems, and ethnocentric imaginaries of justice, responsibility, and change.

Sustainability + Development

Established by the UN, the Brundtland Commission (1987) has been credited with popularizing the term “sustainable development” and its definition as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” As Hopwood and colleagues (2005) note, “there is no such thing as a single unified philosophy of sustainable development” (p. 47). However, prevailing approaches to sustainable development are grounded in the same Eurocentric story of human progress and prosperity as previous iterations of development. These approaches do not challenge the imperative of exponential economic growth, nor address the ecological limits of the planet. The Brundtland report itself “rejected the idea that there were environmental limits to growth” (Hopwood et al., 2005, p. 44). According to Kapoor (2014), to the extent ecological limits are acknowledged by

governments, business, and NGOs, they are treated, “not as a problem or limit, but as a business opportunity (i.e., ‘greenwashing’ or ‘green capitalism’)” (p. 1124).

In short, although they may dress up the growth imperative with new terms like “green” or “inclusive”, most notions of sustainable development presume economic growth must continue unfettered and thus, we must find ways of decoupling growth from its environmental impacts. Kopnina (2014) describes this as “the ‘having your cake and eating it approach’,” which elides the “problems and contradictions inherent in the sustainable development paradox” (p. 74) - that is, the paradox of seeking infinite economic growth on a finite planet.

Despite its mainstream acceptance, the promise of green growth has come under increasing scrutiny in recent scholarly assessments, and many technical and technocratic climate solutions that fall under this umbrella have been deemed “false solutions.” Following their statistical analysis of the effect of economic growth on emissions, Schröder and Storm (2020) conclude “dominant ‘green growth’ approaches remain squarely within the realm of ‘business-as-usual’ economics, proposing solutions...which are bound to extend current unsustainable production, consumption and emission patterns into the future” (pp. 167-168). They suggest continuing to believe in green growth amounts to “self-deception” (p. 168). Vogel and Hickel (2023) also find that existing rates of decoupling carbon emissions from economic growth in high-income countries “are inadequate for meeting the climate and equity commitments of the Paris Agreement and cannot legitimately be considered green” (p. e759).

Promises of green growth often co-exist with “net zero” pledges. Negative emissions technologies, like carbon capture, removal, and storage, “put the ‘net’ into ‘net zero emissions’” (Ho, 2023, p. 9). Yet as Hickel and Slamersak (2022) conclude, large-scale carbon capture and storage would require huge swaths of land with “devastating effects on biodiversity, forests, water tables, and food systems” (p. e630). Many of these climate mitigation proposals also rely on the appropriation of “land in the Global South to support, and further boost, the energy privilege of the Global North” (p. e630). Similar dynamics characterize many green or renewable energy projects that presume unfettered access to Indigenous territories, for instance, the land required for building new infrastructure (e.g., wind farms) and the metals and minerals required for batteries (e.g., that go in electric vehicles) (Whyte, 2020; Zografos & Robbins, 2020).

None of these assessments dismisses the importance of Western technological innovation in addressing the climate crisis. In fact, all emphasize that any decarbonized future will require it. But they also conclude this innovation alone is insufficient to avert catastrophic global warming, and that many innovations exacerbate existing social inequities and ecological harms.

It is not just Western scientific innovation, however, that undergirds the promise of sustainable

development and the continued naturalization and normalization of “green capitalism,” but also the notion that wealthy countries and businesses can compensate for their continued carbon emissions by paying to reduce or remove emissions elsewhere – commonly called “carbon offsetting.” Carbon emission reduction commitments made by companies and institutions in the Global North often rely on buying “carbon credits” in Indigenous territories and territories in the Global South to offset their emissions. However, a recent report by the Berkeley Carbon Trading Project (2023) concluded, “The current design of the carbon credit market is not effective at reducing deforestation and protecting people” (p. 8). Further, this market often prevents systemically marginalized governments and communities from using “the territories designated as carbon sinks for their own subsistence and development” (p. 9).

As the discussion above illustrates, focusing on green growth also tends to reduce the climate and nature emergency to an issue of carbon emissions through “carbon tunnel vision” (Konietzko, 2021). While reducing carbon and other greenhouse gas emissions is no doubt an issue of central importance, this does not capture the many other ecological dimensions of the emergency, such as those identified within discussions of Earth’s “planetary boundaries” (Richardson et al., 2023).

Focusing primarily on emissions also fails to address the social, political, economic, or psychological causes, drivers, and impacts of the climate and nature emergency. By reducing the emergency to an issue of carbon alone, its multiple other dimensions, layered complexities, and systemic root causes and drivers are invisibilized. This narrow diagnosis of the problem, in turn, means that the proposed solutions will also be narrowly defined - in this case, defined as green growth. Thus, in practice, “sustainable development” often prioritizes not the sustainability of a healthy planet and its inhabitants, but the sustainability of the existing socio-economic system.

Education + Sustainability + Development

Education was positioned as key to implementing sustainable development at the Rio Earth Summit in 1992. More than a decade later, the United Nations declared 2005-2014 the “Decade of Education for Sustainable Development,” and since the release of the UN Sustainable Development Goals (SDGs) in 2015, there has been a growing commitment to mobilize education to reach the goals across geographical contexts. Much as is the case with sustainable development, there is no one definition of ESD. However, certain definitions are more common than others, in particular, the definition that “conflates ecological sustainability with support of economic growth and neoliberal economy” (Kopnina, 2020, p. 281).

Even as this growth-centric iteration of ESD maintains its hold on the collective educational imagination of much of the world, numerous critical, de-/post-/anti-colonial, Indigenous, and Global South scholars have challenged its universalism, feasibility, and benevolence. For instance, Sumida Huaman and Walker (2023)

write that the ideas and practices of sustainable development “that remain embedded in coloniality through fixation with economy and interest in human manipulation of (so-called) natural resources” (p. 1) and pay

little attention to the following— analysis of how structural roots of poverty, unsustainability, and multidimensional violence are grounded in state power, corporate monopolies, neo-colonialism, and patriarchal institutions; the planet’s biophysical limits; and unregulated consumerism and strategies to address the global north’s disproportionate environmental contamination and waste. (p. 1)

Beyond specific critiques of sustainable development, many Indigenous scholars and activists have suggested that climate change and biodiversity loss are not technical but rather relational problems that are grounded in Western culture, its ontology of separation between humans and the Earth, and the systemic violences that this reproduces: colonialism, capitalism, and the commodification of nature. According to Chief Ninawa Inu Huni Kui, “colonialism represents a cognitive, affective, relational and neuro-biological impairment based on illusions of separation and superiority that have damaged our relationships with our own selves, with each other, with other species and with the land/planet we are part of, with deadly consequences for all involved” (as quoted in Andreotti et al., 2023, p. 73). Meanwhile, Whyte (2020) argues climate change is grounded in “violations of consent, trust, accountability, and reciprocity”, not only against Indigenous and other systemically marginalized communities but also “against relatives such as plants, rivers, animals, insects, seas, mountains, fishes, among others” (p. 3).

By socializing learners to embrace a single story of human progress and evolution premised on continuous growth and consumption, Western education has naturalized and normalized the illusions of separation, supremacy, and subjugation that rationalize racialized exploitation, expropriation, and extraction as the necessary costs of seeking efficiency, expansion, predictability, prosperity, and control. As Chief Ninawa observes, this education does not just ideologically recruit learners to invest in this story and in the 5As that it promises, it also wires our nervous systems to expect and enjoy these presumed entitlements.

In addition to its disavowed historical and ongoing dependence on colonial violence, an education that naturalizes and normalizes economic growth and consumption disavows current generations’ responsibility to future generations by imposing an intergenerational burden. Governments borrow against the promise of future prosperity, leaving coming generations responsible for repaying these debts without the same level of resources. Incoming generations also inherit a throwaway culture, where products are intentionally designed with planned obsolescence, resulting in single-use items and fast-paced consumerism that generate excessive waste. These practices further strain the already depleted and struggling ecosystems that future generations will inhabit. Young people today are increasingly skeptical of the long-standing promise that each successive generation will enjoy a better quality of life than the preceding one. In a recent survey of youth from 10 countries, 75% said they think the future is frightening and 83% said people

have failed to take care of the planet (Hickman et al., 2021).

Over 30 years ago, Orr (1991) observed Western education has played a key role in the creation of ecological degradation, and argued that “more of the same education will only compound our problems.” He noted threats to the future of climate stability, biological diversity, and planetary health are “not the work of ignorant people. [They are], rather, largely the result of work by people with BAs, BSs, LLBs, MBAs, and PhDs.” Komatsu, Rappleye and Silova (2020) also observe that, when education is reduced to formal schooling, “the world is the most ‘educated’ it has ever been and yet the nearest to environmental breakdown” (p. 298).

Education for Growing Up

Questions about the role of Western education in systemic violence and unsustainability have dovetailed with broader questions about the relevance of our existing education system in the face of “wicked problems” that are hyper-complex, multi-layered, constantly shifting, and involve many unknowns, and thus, cannot be definitively solved. More than two decades ago, Bauman (2001) wrote that our educational institutions were “meant for a different kind of reality” and thus it is “increasingly difficult [for them] to absorb, accommodate and hold the changes without a thorough revision of the conceptual frames they deploy” (p. 128).

Paired with his work on “liquid modernity” (2011), which is characterized by the simultaneous explosion of information, an unprecedented pace of social change, as well as the collapse of epistemic hegemony and consensus (e.g., about the common good), Bauman argues that our schools and universities are increasingly ill-suited for the world as it currently is, and we would add, for the worlds that are coming as we reach the limits of the planet. It is no surprise that many young people today are questioning the relevance of their education (Stein, 2024).

Alongside wider questions about the adequacy of existing educational systems and frameworks, it can be argued that education for sustainable development and green growth is not only increasingly insufficient but also irresponsible in the face of today’s social and ecological crises, particularly as this is the same education that helped create these crises (Hunt, 2022; Nxumalo et al. 2022; Orr, 1991). Within the modern educational system and the Western knowledge systems that undergird it, nature is treated as something separate from humanity, a set of resources to be exploited, managed, and mastered. By contrast, for many other knowledge communities, including many Indigenous Peoples, nature is a web of relations that humans are also part of and accountable to (Ahenakew, 2019). As Chief Ninawa Huni Kui observes,

While Western society has developed advanced engineering sciences and technologies, which are often

deployed for exploitation, extraction and expropriation, relational sciences and technologies of respect, reverence, reciprocity and responsibility have been neglected... Indigenous Peoples have developed these relational sciences and technologies to an advanced state. We are now facing mass extinction in slow motion and the colonial ways of organizing, thinking, feeling, relating, hoping, imagining and being that have got us into this situation cannot alone get us out of it. (as quoted in Andreotti et al., 2023, p. 73)

A complementary way of understanding the climate and nature crisis is that it is a product of the immaturity of Western culture and its pursuit of a single story of human progress and development. Through unrestrained consumption, those located in the West/Global North have not only created a system that is harmful to many non-Western peoples and the Earth's ecosystems, but we have also created the conditions of our own demise. Biesta (2019) has observed that, at the level of individual learners, rather than "interrupting and limiting our desires," prevailing forms of education are "focused on the multiplication of our desires so that we will desire more and therefore will buy more and more" (p. 59). If Western culture remains in a state of immaturity, these desires are likely to intensify in the context of climate destabilization, the breach of planetary limits, and increasingly scarce resources, and may become ever more reactive, compensatory, and volatile. As Bednarek (2021) writes, the ecological breakdown we are facing will be matched by an equally devastating mental health breakdown if we fail to adequately prepare to "meet the enormity of the times ahead" (p. 6).

By doubling down on education for green growth, we are infantilizing young people by inviting them to continue to treat the world as something to be consumed (Biesta, 2019) and failing to prepare them for climate complexities and uncertainties (Andreotti et al., 2022). Green growth also consigns much of the world to inhabit green sacrifice zones to subsidize white/Western futurity (Stein et al., 2023; Zografos & Robbins, 2020). In recognition of the limitations of the sustainable development paradigm, some in the West have turned toward Indigenous Peoples for "solutions" and "alternatives." Indigenous knowledges make up a vast and diverse body of wisdom that is vital for addressing climate destabilization and biodiversity loss (Hernandez et al., 2022; Sumida Huaman & Walker, 2023). However, the Western impulse to seek solutions in Indigenous knowledges tends to be grounded in the same consumptive patterns that have created the crises of colonialism and climate change in the first place. It is not the responsibility of Indigenous Peoples to provide answers for how Western culture can "grow up" – this is the responsibility of those embedded in Western culture itself (Guzman, 2018). Indigenous knowledge systems can serve as an important reminder that there are many different possible ways of knowing, being, and relating, but other possibilities will only emerge for those socialized into Western culture if we can outgrow our collective state of immaturity and activate our sense of responsibility to interrupt and heal the impacts of harmful colonial patterns.

What might be the educational antidote to this state of immaturity and the educational activation for intergenerational responsibility? Rather than amplifying and extending the appetites and entitlements of

Western and consumer capitalist cultures by promising “green growth”, what kind of education could invite people to “grow up” by reminding them of their responsibility for restraint so that future generations can survive? How can we prepare to move with the social and ecological storms coming our way, rather than be overwhelmed and swept up by them? How can we expand our individual and collective capacity and stamina to navigate the complexities, paradoxes, tensions, and conflicting demands and accountabilities that are amplified in the context of an inherently harmful and unsustainable system in decline?

These are some of the collective questions that have long oriented GTDF’s work. Rather than propose or prescribe a single answer, we approach these questions as a consistently moving problem space that we address through an ongoing practice of regenerative inquiry, which we review in the next section. We acknowledge that GTDF is not alone in its articulation of educational alternatives to ESD (see Kopnina, 2020), and emphasize that our approach is just one of many possible approaches, including other regenerative approaches to education.

Regenerative Approaches to Education

The term “regenerative” has been conceptualized as an alternative to, or “the next wave” of, sustainability (Macintyre et al., 2023). It has been used to describe more holistic, integrated, and ecologically accountable practices of agriculture, economics, and other fields of study and sectors of society, including education. According to the United Frontline Table (2020), “Rather than extract from the land and each other, [a regenerative] approach is consistent with the Rights of Nature, valuing the health and well-being of Mother Earth by producing, consuming, and redistributing...in harmony with the planet” (p. 6).

Informed by our collaborations with the Teia das 5 Curas Indigenous Network, the GTDF Collective’s approach to regenerative inquiry emphasizes the imperative to heal the wounds produced through the modern/colonial illusions of separability and supremacy. This healing is understood as necessary for addressing our collective state of planetary “dis-ease,” with its “symptoms of human greed, vanity, arrogance and indifference” that “are driving the destruction of ecosystems that are essential for our survival” (Huni Kui in Andreotti et al., 2023, p. 73).

Regenerative approaches to education are starting to emerge. For instance, van den Berg and colleagues (2022) developed the concept of “Regenerative Higher Education” (RHE), which “aims to connect university education with transition challenges in ways that are conducive to personal and planetary health, where learning is oriented towards redirecting systems that are transgressive of socioecological boundaries” (p. 2). However, the meaning of “regenerative” is contested, in education and beyond, and the concept can either be mobilized to continue business as usual but greener, or, gesture beyond it (Loring, 2022).

GTDF takes the latter approach, yet we recognize that even within this sub-category of regenerative approaches there is much diversity. For instance, Macintyre and colleagues (2023) developed a “regenerative decolonisation perspective” that seeks to interrupt the anthropocentric, extractive, and universalizing assumptions that underlie mainstream ESD. They propose “a normative direction which is informed by a particular moral compass of justice, fairness, solidarity and care” (p. 14). While we share similar concerns about the colonial nature of mainstream ESD, the GTDF approach to regenerative inquiry is an invitation to re-activate a visceral sense of responsibility that derives from our metabolic entanglement with the Earth itself, rather than from a normative prescription guided by human concepts of morality.

GTDF’s Regenerative Inquiry

The GTDF Collective approaches the violence and unsustainability of our dominant system as educational challenges that modern schools and universities have not prepared us to address, especially as these institutions have also contributed to the reproduction of harm (Stein et al., 2023). As a result, our work has focused on developing alternative educational frames and pedagogical artistic and embodied practices that can prepare people to “dig deeper” into complex issues and “relate wider” to the world around them so that we might confront social and ecological challenges in more responsible (“grown-up”) ways, and without becoming overwhelmed, immobilized, or seeking quick fixes. In this section, we outline the methodology of regenerative inquiry that we have developed over our nearly 10 years of working together, and that is deeply informed by learnings from our collaborations with the Teia das 5 Curas Network.

GTDF’s regenerative inquiry emphasizes that if we seek the possibility of a livable planet for current and future generations of all species, those of us socialized into modern institutions will need to learn to confront, interrupt, and “compost” destructive inherited desires, frames of reference, and modes of relationship that are based in separability, supremacy, and subjugation. This educational approach is grounded in a call to responsibility that originates from the Earth itself, rather than from human norms and constructs. It is through composting work that we can prepare the soil in which new possibilities for collective existence can grow in our different contexts, and those of us educated in Western societies and schools can learn to grow up and grow out of destructive patterns - without any guarantees that we will succeed in these efforts. This resonates with van den Berg et al.’s (2022) idea that “the educational task for RHE [Regenerative Higher Education] is more akin to a gardener that tends to and cares for (designs and enacts) the conditions conducive for learners to flourish” (p. 3); however, GTDF’s educational approach decentres the individual learner and centres the Earth that learners are also part of. In doing so, the inquiry emphasizes multi-species, multi-generational well-being.

One way of understanding the GTDF approach to regenerative inquiry is as an ongoing, dual process of

unlearning and learning: unlearning what we have been cognitively, affectively and relationally conditioned to think, feel, relate, hope, desire, and imagine within the modern/colonial system, including its educational institutions; and learning to expand our capacity to hold space for the multiple, moving layers of complexity, complicity, and uncertainty in ourselves, in others, and in the world, and learning to navigate those layers as much as possible in alignment with our responsibilities. This includes the responsibilities we have not only to our immediate nuclear families and to friends of our choosing, but also to past, current, and future generations of all beings, both human and other-than-human.

Diffraction for Interrupting Denial

Education focused on learning and unlearning can be described as “depth education”, in contrast to “mastery education.” Mastery education is the dominant approach to education in Western schools and is focused on accumulating standardized content and skills to maximize one’s economic value and epistemic authority and achieve narrowly defined goals (Machado de Oliveira, 2021). To support depth education, GTDF has identified a series of “depth capabilities” that can prepare people to engage in regenerative inquiry through ongoing un/learning.

One of the depth capabilities we have identified is “diffraction.” Diffraction is the ability to step outside of a narrow perspective (like carbon tunnel vision) to recognize the multiple moving layers of reality, including different layers of interpretations, emotions, structures, systems, and relationships that surround any issue of concern. This includes layers that have been flattened in the search for simple, coherent narratives and those that have been intentionally invisibilized to sustain the status quo. Zooming out to acknowledge this wider tapestry of reactions, relations, and responsibilities can remind us that human perception is inherently partial, plural, mutable, and often contradictory. We can begin to see the world and ourselves through different lenses and layers, and hold more space for complexity and complicity. By identifying these layers, we can also recognize the collective histories, social structures, and neural pathways that have led us to our present system, and ask where this system is heading if we do not interrupt our current trajectory and try to change course. We invite people to experience diffractive reasoning through the “7 Steps” exercise in the conclusion of this article.

Diffraction offers an alternative to the socialization of mastery education that teaches us to simplify things that are paradoxical, ambivalent, or painful to make them fit into a neat, predictable, “flattened”, coherent reality. By inviting people to acknowledge the existence of multiple layers of self, language, and reality, diffraction can offer a sense of relief: relief from the work of constantly repressing the presence of these layers, and from the burden of feeling the imperative to identify a single, simple, and universal solution. Nonetheless, the invitation to experiment with diffractive reasoning is often met with resistance because it

challenges the perceived entitlements and exceptionalisms (5As) many of us have been socialized to invest in.

Thus, in GTDF's analysis, it is not primarily ignorance that keeps us from confronting the violent and unsustainable underpinnings of our existing system, but rather affective investment in the continuity of that system and in our own innocence. A growing number of people have at least some intellectual understanding of the limits and harms of this system. Nonetheless, many of us continue to act as if this system can and should continue (and expand) indefinitely because we fear the implications of admitting it cannot - in particular, fear that we will lose the entitlements promised by this system. Thus, GTDF's invitation to practice diffractive reasoning entails more than just inviting people to identify multiple layers; it also invites people to develop practices of critical self-reflexivity that allow us to see how existing systems are reproduced through the consumptive intellectual, affective, and relational patterns we have internalized, so that we might then learn to identify and interrupt these patterns in ourselves and others.

These patterns are often unconscious and not grounded in a lack of knowledge or information, but rather in denial. GTDF has identified four socially sanctioned denials that organize collective common sense: 1) denial of systemic colonial violence and our complicity in harm; 2) denial of systemic unsustainability and the limits of the Earth; 3) denial of our metabolic entanglement with each other and the Earth; and 4) denial of the magnitude and complexity of the problems we will need to face together (see Machado de Oliveira, 2021; Stein et al., 2020; 2022; 2023). Ultimately, each of these denials is grounded in a denial of responsibility that is not only rooted in our investment in perceived entitlements (e.g., the 5As), but is also premised on a fantasy that humans are separate from and superior to nature and each other. Yet no matter how far we try to displace and repress the pollution, destruction, and human suffering that are required to produce the "abundance" of the existing system, these violences never really go away because we are all embedded in the same shared biophysical metabolism that is currently in "dis-ease" (Huni Kui in Andreotti et al., 2023). Thus, regenerative inquiry seeks to un-numb people to their entanglement, and thus, to their responsibility to heal this collective dis-ease. In this approach, responsibility is not treated as an intellectual choice or cost-benefit calculation made with the "head", but rather is first felt in the "gut" and then moves the "heart", only after which the "head" follows (Andreotti & Stein, 2021).

Once we have been reminded in embodied ways that we are not separate, denial is increasingly difficult to sustain, and our individual and collective responsibility for relational repair becomes more difficult to refuse. GTDF has developed several pedagogical and artistic practices that seek to mobilize this visceral sense of responsibility and invite people to attune to the wider living metabolism that they are part of. Because this responsibility can be overwhelming for those of us who have denied it for a long time, these practices also support people to hold space for what is difficult, complex, and painful. This is done, in part,

by inviting people to reactivate the capacities that have been exiled within modern/colonial habits of being. We review some of these capacities below, summarized in what we call the SMDR Compass.

SMDR Compass

Because the wicked problems we face are continually moving and developing new layers of complexity, there are no definitive solutions and the regenerative inquiry is never completed. This approach leaves space for the unknowable (mystery) and the constantly shifting nature of reality (movement), and thus seeks to navigate these challenges with humility. Recognizing that human understanding is inherently limited, regenerative inquiry emphasizes a long-term, non-linear, self-reflexive, and iterative process of trying to fulfill our intergenerational responsibilities. Approaching our inquiry in search of a final point of arrival would likely lead us to project images of the future that have been imprinted by modernity's egocentric habits and entitlements. For these reasons, GTDF's regenerative inquiry does not offer a universal map toward a different future. Instead, potential pathways and interventions in this direction are understood as inherently experimental and therefore, always partial, provisional, and contextual.

Even though there are no definitive pathways, GTDF recognized the importance of having a guiding "compass" to orient regenerative inquiry. This compass can help keep us on track – moving in a generative direction – especially when inevitable complexities, contradictions, and conflicts arise in the journey. Based on what we have been taught by our Indigenous collaborators in the Teia das 5 Curas Network, and by our nearly 10 years of collective learning, we have synthesized a set of four orienting directions that invite people to re-activate exiled capacities to move with emotional *stability*, relational *maturity*, intellectual *discernment*, and intergenerational *responsibility*. We summarize this "SMDR Compass" below:

S – emotional *stability*: The capacity to disinvest from harmful desires and compulsions to help ensure that our responses to complex "wicked problems" are not driven by affective desires and demands for comfort, certainty, and control, or perceived entitlements to the 5As (authority, autonomy, arbitration, accumulation, and affirmation);

M – relational *maturity*: The capacity to self-reflexively trace the origins and impacts of our assumptions and (re)actions, to develop relationships grounded in trust, respect, reciprocity, consent, and accountability (Whyte, 2020), and to commit to "growing up" and doing what is needed for metabolic well-being (rather than doing what we want to do, what makes us "look, feel, and be seen as doing good", or what is convenient);

D – intellectual *discernment*: The capacity to navigate multiple, complex moving layers of self, language, relationship, and reality in contexts of volatility, uncertainty, complexity, and ambiguity, and to assess possible opportunities for contextually relevant and responsible intervention and experimentation, rather than flattening these layers and complexities and imposing coherence in the search for consensus or universal solutions;

R – intergenerational *responsibility*: The capacity to prioritize the well-being of current and future generations of all species by accepting responsibility for our own learning and unlearning so that we can interrupt and enact repair for destructive inherited patterns of immaturity, irresponsibility, and indifference, learn from repeated mistakes, and heal the wounds of separability and supremacy, thereby seeking to ensure "the buck

stops here.”

It is important to note that people socialized within mastery education will tend to reduce the SMDR Compass and its capacities to concepts. There is a sense that if we can intellectually “master” and commit to an SMDR approach, that means we are already doing it. However, these are not mere concepts, they are life-long intellectual, affective, and relational practices of unlearning perceived entitlements (“un-entitling”), and learning to attune to the wisdom of the Earth and our responsibilities to it. Therefore, the un/learning process is never done, and the minute we think we are “already doing it,” we have likely lost our way. Further, because interrupting perceived entitlements is extremely difficult, failures and mistakes along the un/learning journey are inevitable – and there is much to be learned from these as well.

To illustrate how regenerative inquiry works in practice, below we review how this inquiry was mobilized in the context of a yearlong transdisciplinary program at a university.

Regenerative Inquiry in Practice: The Climate and Nature Emergency Catalyst Program

The Climate and Nature Emergency (CNE) Catalyst Program, hosted at the Peter Wall Institute for Advanced Studies at the University of British Columbia from 2022-2023, offered an opportunity to experiment with GTDF’s regenerative inquiry in a university context. The CNE Catalyst Program invited participants to go beyond technical solutions and “business as usual” responses to the CNE by approaching the CNE as a wicked problem.

The program convened six 10-person cohorts of faculty, undergraduate students, graduate students, emeriti, staff, and artists. Participants were invited to engage in an educational inquiry that asked how we can expand our individual and collective capacity to responsibly grapple with the complexity, urgency, scale, and uncertainty of the CNE. We framed the program as transdisciplinary to foster collaborations between people from different disciplines and career stages in the academy as well as knowledge holders from various communities and sectors of society (Bernstein, 2015; Mauser et al., 2013). We sought to create an environment where different knowledge systems, life experiences, and forms of expertise related to the CNE were equally valued, and where people could practice diffractive engagements with the CNE.

Oriented by the SMDR compass, the collective learning that emerged from this transdisciplinary regenerative inquiry iteratively informed our educational programming, research, and climate action projects throughout the year. The leadership team of the CNE Catalyst Program developed four guiding principles: 1) *developing ethical and reciprocal collaborations* across different disciplines, knowledge communities, generations, and sectors; 2) *practicing intellectual depth* grounded in relationally rigorous

engagement with multiple perspectives, especially critical ones, and self-reflexivity about one's own frames of reference; 3) *enacting reparative redistribution* grounded in a commitment to prioritize the communities most affected by ecological breakdown; and 4) *supporting Indigenous resurgence* grounded in a recognition of higher education's historical and ongoing complicity in colonial violence.

These four guiding principles oriented our recruitment efforts, program activities, and funding priorities. Everyone who participated in the program was invited to continually engage with these principles, but they were not compelled to intellectually or morally agree with them. The principles were instead part of the inquiry process itself, as we encouraged people to grapple with and be taught by the challenges, complexities, and dissonances that emerged from different understandings of the principles, and their varied implications for teaching, research, and relationship-building across disciplines, generations, and knowledge systems. This approach differed significantly from other inter- and trans-disciplinary spaces that are premised on prevailing approaches to problem-posing and problem-solving, including those that seek clear answers, require or impose a consensus, and seek to determine the desired outcome in advance.

Elsewhere, we have reflected on some of our collective learning from this inquiry (see Andreotti et al., 2023). Rather than review these learnings here, below we offer some further context for each guiding principle and invite readers to experience a bit of the regenerative inquiry process themselves by engaging with some of the questions we provided to program participants. These questions were intended to prompt participants to examine the assumptions of their own disciplines and knowledge systems in diffractive ways so that they could practice showing up to CNE-focused collaborations with more intellectual, emotional and relational agility, humility, resilience, and stamina. The intention of these guiding principles and the program overall was to create a "container" for a transdisciplinary and multigenerational inquiry about difficult and complex issues related to the CNE, without relationships falling apart.

1) Developing ethical and reciprocal collaborations: Participants were encouraged to recognize that it takes considerable time and commitment to build ethical collaborations across knowledge communities, including collaborations between disciplines and between academic researchers and systemically marginalized communities. We highlighted the fact that historically and today, relationships between the academy and marginalized communities have tended to be extractive and exploitative. Academia also carries a history of deficit-based and damage-centered research (Tuck, 2009) that often pathologizes and then imposes supposedly universal and benevolent "solutions" on communities in paternalistic ways that reproduce the white/Western "saviour complex." Weaving collaborations grounded in trust, respect, reciprocity, accountability, and consent can take years (Whyte, 2020), which conflicts with academic timelines and expectations. Despite these pressures, we emphasized the importance of prioritizing the

quality of the collective learning process and the integrity of relationships, rather than measurable outcomes. With these in mind, participants were invited to consider several questions, including:

- Who decides the agenda of your collaborative projects (e.g., who decides what questions are asked, where “forward” is, how collaborations unfold, and to what end)? In whose name is this agenda decided? For whose benefit? At what cost? At whose expense?
- How can we interrupt common patterns through which academic researchers are considered the only (or primary) experts, educators, and knowledge producers?
- How can we seek to ensure that collaborators with less systemic power can have their perspectives recognized and respected, including when they voice critical concerns, and when they engage with passive forms of resistance and/or active forms of refusal?

2) Practicing (self-reflexive) intellectual depth. We emphasized the importance of both intellectual and relational rigour, which requires attending to the politics of knowledge and accountabilities to multiple human and other-than-human communities. This entails challenging hierarchies of knowledge within and beyond academia premised on a single, modern/colonial story of human progress and prosperity. It also requires a willingness to self-reflexively step back from one’s own social-cultural-economic positions in order to interrupt tendencies toward universalism and ethnocentrism, and to step back from one’s scholarly discipline and self-image in order to observe how one is contributing to social and ecological harm. Intellectual depth also requires recognizing the complex, multi-layered nature of problems associated with the CNE and the socio-historical systems and structures that have led to it. Thus, participants were encouraged to consider how they might undertake regenerative forms of inquiry and experimentation that work across multiple knowledge communities in their efforts to respond to these problems, emphasizing the ethical, pedagogical, procedural, logistical, and relational challenges of this kind of coordination. The questions that program participants were invited to consider included:

- What is your theory of change? Which communities would benefit most from this change? Which communities might be negatively impacted or bear the costs?
- What might become possible if, rather than trying to arrive at definitive answers to shared questions or problems of concern, we held space for responses offered from multiple different perspectives and worked with and through dissensus?
- What are the limits and biases of the approaches to problem posing, problem solving, coordination, and accountability that have been naturalized through your education?

3) Enacting reparative redistribution. Participants were invited to consider how they might allocate program resources in ways that prioritize the communities most affected by the CNE, and support action and research about issues of the greatest urgency for these communities. This principle was premised on the fact that modern social and institutional structures are a product of centuries of extraction, exploitation, expropriation, and dispossession, which have resulted in the unequal distribution of resources, power, and vulnerabilities across different communities. Participants were encouraged to consider why colonialism, capitalism, and consumption are not commonly presented as causes and drivers of the CNE, and what is invisibilized when these are not addressed. They were also invited to engage with

analyses grounded in climate justice frameworks that draw attention to the fact that communities who contributed the least to the CNE are the most negatively affected by it, yet often have the fewest material resources and least institutional power to shape collective responses. In practice, however, participants' interpretations of justice and its role in climate education, research, and action varied greatly. The questions that participants were invited to consider included:

- In what ways does your work take into account the disproportionate impact of the CNE on systemically disadvantaged communities, and/or take into account systemically advantaged communities' disproportionate responsibility for causing the CNE?
- How can your work be more accountable to systemically marginalized communities, even if you do not work in direct collaboration with them? (e.g., How might these communities use your findings to make a case for restitution for past harms?)
- What strategies exist for enacting reparative redistribution in climate education, research, and action and what are the guiding assumptions, possibilities, and limitations of each strategy? How can we craft new strategies in this direction?

4) Supporting Indigenous resurgence. Program participants were encouraged to reflect on their responsibilities to Indigenous communities and make these responsibilities actionable by considering how their research, teaching, and community engagements could support Indigenous resurgence and sovereignty, and Indigenous-led and Indigenous-focused climate action and research. It is also necessary to undertake the parallel work of interrupting the colonial frames of reference, practices, policies, funding, and governance structures that continue to shape most responses to the CNE. The questions program participants were invited to consider included:

- How are Indigenous communities impacted by the problem or question you seek to address in your climate-related work (including teaching, research, and action)? How might Indigenous communities be impacted by your work? How might Indigenous communities approach the problem you are addressing differently?
- Does your work uphold Indigenous Peoples' rights, knowledge, sovereignty, and jurisdiction, particularly the Indigenous Peoples on whose territories you conduct your work? How might your work negatively impact Indigenous Peoples' rights, knowledge, sovereignty, and jurisdiction, and how can you minimize this risk?
- What kind of educational preparation could enable non-Indigenous people to interrupt colonial patterns of relationship building, cross-epistemic collaboration, resource distribution, and knowledge production in climate education, research, and action?

Conclusion: 7 Steps Back/Forward/Aside

In this article, we questioned a primary promise of sustainable development, namely the assumption that we can continue to pursue limitless economic growth and stay within the limits of a finite planet. The systemic drive for growth is justified through a single story of human development premised on anthropocentrism, capitalism, and racism, which in turn are fed by individual investments in the promise of entitlements to 5As: authority, autonomy, arbitration, accumulation, and affirmation. We suggested that education for sustainable development is insufficiently attentive to the true costs of economic growth and

leaves young people ill-prepared to navigate the realities of ecological breakdown, including its social and psychological impacts. It also leaves future generations with the burden of addressing the complex challenges that we ourselves have not yet been brave enough to confront, without preparing them to do so (Stein, 2024). In this way, ESD is a product of collective immaturity and irresponsibility: a failure of Western culture to “grow up”, which results in a failure to prepare future generations to grow up.

We also reviewed the GTDF Collective’s approach to regenerative inquiry as an alternative educational response to the climate and nature emergency and other wicked problems of our own making. In particular, our approach suggests that the promises made by the dominant modern/colonial system are not simply “broken” or as yet unfulfilled, as is often suggested by ESD, but rather were always premised on inherently violent and unsustainable practices that are now breaching planetary limits. This inquiry therefore invites people to disinvest from hope in the continuity of the existing system and the 5As, and to instead embrace the imperative to grow up, guided by a compass of emotional stability, relational maturity, intellectual discernment, and intergenerational responsibility (SMDR). In this way, we might be better prepared to co-develop contextually relevant coordinated responses to complex collective challenges in ways that bring together multiple communities, disciplines, sectors, and generations in generative ways.

To conclude this article, we share an abbreviated version of an exercise that offers seven invitations for people to “step back” and seven invitations to “step forward and/or aside” (GTDF, 2023). In our experience, these steps are a useful starting point in preparation for engaging in collaborative forms of regenerative inquiry. Through the invitations to “step back”, the exercise invites people into a diffractive practice of zooming out beyond one’s immediate time and space to identify the multiple layers, systems, and patterns that have led us to the present. The invitations to “step forward and/or aside” invite people to consider the capacities and dispositions that would be required to enable more generative relationship building and repair.

By closing with this exercise, we offer a final opportunity for readers to experience regenerative inquiry. Rather than expecting people to agree with each of these steps, the invitation is to self-reflexively observe the intellectual and affective reactions that emerge within oneself at each step and to trace the origins and impacts of these reactions. The “data” gathered from observing these reactions can help readers gain insight into their internal complexities, modern/colonial investments, and degree of emotional and relational maturity. It can also enable people to assess their capacity to hold space for discomfort, uncertainty, complexity, and complicity in systemic harm. This, in turn, can help inform what one’s next steps might be in the process of a life-long regenerative inquiry oriented by our boundless responsibility.

7 Steps Back

1. Step back from your self-image to decentre the ego and centre the challenges at hand.
2. Step back from your generational cohort to have a sense of how previous and incoming generations may interpret and experience the challenges differently.
3. Step back from the universalization of your social/cultural/economic parameters of normality to understand one's privilege as a loss of perspective.
4. Step back from your immediate context and time to see wider historical, structural and systemic patterns, and consider what you might still be missing.
5. Step back from normalized patterns of problem-posing, problem-solving and relationship-building to tap into possibilities that are currently unimaginable.
6. Step back from the single, Eurocentric story that elevates humanity above the rest of nature to consider our entanglement with and responsibilities to all beings.
7. Step back from the impulse to find quick fixes and expand your capacity not to be overwhelmed or immobilized by uncertainty, complicity and complexity.

7 Steps Forward/Aside

8. Step forward and/or aside with honesty and courage to see what you don't want to see.
9. Step forward and/or aside with humility to find strength in openness and vulnerability.
10. Step forward and/or aside with self-reflexivity so that you can learn to read the room and how you are being read by the room (including how your unflattering parts are read).
11. Step forward and/or aside to accept the responsibility to do your own work toward "growing up" so that you don't become work for other people.
12. Step forward and/or aside with maturity to do what is needed rather than what you want to do, even when it is difficult, uncomfortable, or inconvenient.
13. Step forward and/or aside with intellectual discernment and affective attention in the face of proliferating uncertainties, complexities, and paradoxes.
14. Step forward and/or aside with adaptability, flexibility, stamina, and resilience for the long haul, being prepared to fall, to fail, to have your plans shattered, to be stretched, to change course, and to find joy in the process rather than in an imagined prize at the end.

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