Chapter 10
Education for Sustainable Contraction as Appropriate Response to Global Heating

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Abstract Human-induced climate change is happening, opinions differing as to what window of opportunity remains to mitigate its direst effects. Responses to the climate change threat are characterized by denial and cognitive dissonance, the cultural pathology extending to those situated on the reform to transformation spectrum, including proponents of education for sustainable development. The climate crisis brings into question the usefulness and appropriateness of a lexicon of development. An alternative to sustainable development – sustainable contraction – is proposed. Nine propositions are nailed to the laboratory door to mark out what an education for sustainable contraction would entail. They call for an educational approach that: confronts denial by engendering disequilibrium in learning spaces; addresses despair, pain, grief and loss; combats consumerism and offers alternative conceptions of the "good life"; endows learning with a deep ecological paradigm; embraces intimacy and cultivates the poetic; folds marginalized "educations" such as anti-discriminatory, peace and media literacy education into sustainability learning; addresses emergency and disaster risk reduction learning; localizes and brings "denizenship" to prevailing "citizenship" discourse and practice; discards mechanistic thinking in favor of holistic and systemic ways of seeing, and acting in, the world. These propositions, it is suggested, constitute an appropriate agenda – that STEM is well-placed to help effect – for addressing the profound crisis in human ethics, values and worldview laid bare by potentially runaway climate change.

Keywords Climate change • Global heating • Climate change denial • Cognitive dissonance • Education for sustainable development • Education for sustainable contraction

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The Heating Is Happening. . .

In a summary for policy makers, the international collectivity of scientists making up the physical science working group of the UN Intergovernmental Panel on Climate Change (IPCC) asserts that: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC 2007, p. 1). Confirming the anthropogenic nature of climate change and the likelihood of some "abrupt and irreversible" impacts (Ibid, p. 13), the scientists project a rise in surface air temperature of between 1.8 and 4.0 °C during the twenty-first century relative to the pre-industrial period and a sea level rise of between 0.18 and 0.59 m, the latter projection not taking into account any future "rapid and dynamical" Arctic and Antarctic ice conversion events (Ibid, p. 7).

Future histories, each informed by a meta-analysis of scientific papers (Lynas 2007; Romm 2007), offer scenarios of a twenty-first century marked by ubiquitous environmental disaster (including a huge loss of biodiversity), ongoing and massive internal and external population displacement in consequence of sea incursions, seasonally recurring wildfire and desertification, and resultant social dislocation, hunger, starvation, internecine strife, violent conflict, tribalism, aggressively defensive localism, as well as the ever-lurking danger of genocide. Elizabeth Kolbert's empirical study, *Field Notes from a Catastrophe* (2007), forewarns of a similarly dire future.

Not that the present is short on trauma and tragedy. A report on the human impact of climate change from the Global Humanitarian Forum (2009) describes the "silent crisis" of climate change already upon us that, on yearly average, is causing over 300,000 deaths, seriously affecting 325 million people, and bringing about economic losses of $US 125 billion every year: "4 billion people are vulnerable, and 500 million people are at extreme risk," the report adds (2009, p. 1).

Scientific opinion varies as to whether we still have latitude to prevent runaway climate change. "We have a short period – a very short period – in which to prevent the planet from shaking us off," writes George Monbiot (2006a, p. 15), a view largely endorsed by the UN Intergovernmental Panel on Climate Change (IPCC 2007, p. 20). Early in 2009 world-renowned climatologist James Hansen of NASA advised incoming US President, Barack Obama that "we have only 4 years left to act on climate change" (McKie 2009, p. 44). Others are far less sanguine. "The time," says another eminent scientist "is already 5 min past midnight" (Kolbert 2007, p. 58). "Our future," writes another (Lovelock 2006, p. 6), "is like that of passengers on a small pleasure boat above Niagara Falls, not knowing that the engines are about to fail." For Joseph Romm (2007), any perceived window of opportunity to mitigate climate change is closing fast: "Climate change is coming faster and rougher than scientists have expected," he warns (p. 231). There is mounting evidence that surface temperature rise cannot be held at the 2.0 °C rise relative to pre-industrial levels that governments and the UN are taking as livable

with (Adam 2009, p. 14). For James Hansen (2009, p. 42) a 2.0° rise is nothing short of a "disaster scenario" anyway. "Business as usual" is not an option.

Denial and Cognitive Dissonance in Response to Global Heating

Arguably, the greatest hindrance to shaking off a "business as usual" mindset are responses to global heating marked by a presenting acceptance, often fulsome, of the severity of the looming crisis coupled with an ill-preparedness to follow through in terms of embracing and promoting the radical personal and societal change needed to stave off the worst effects of climate change. As such, they constitute a form of self-deceptive or furtive denial characterized by fully conscious or threshold of consciousness dissonance between perception of problem and identified acted upon (or not acted upon) remedies, with profoundly unhealthy ramifications for both the individual concerned and society at large. Responses of this kind are captured by Sandra Postel's (1992) prescient words of over 20 years ago:

> Psychology as much as science will determine the planet's fate . . .denial, among the most paralyzing of human responses, . . .can be as dangerous to society and the natural environment as an alcoholic's denial is to his or her own family. Because they fail to see the addiction as the principal threat to their well-being, alcoholics often end up by destroying their own lives. Rather than facing the truth, denial's victims choose slow suicide. In a similar way, by pursuing lifestyles and economic goals that ravage the environment, we sacrifice long-term health and well-being for immediate gratification – a trade-off that cannot yield a happy ending. (p. 4)

To Monbiot (2006a), there is an unspoken and barely acknowledged collusion of denial between citizenry and leadership, electorate and elected:

> But the thought that worries me most is this. As people in rich countries. . .begin to wake up to what science is saying, climate-change denial will look as stupid as Holocaust denial, or the insistence that AIDS can be cured with beetroot. But our response will be to demand that the government acts, while hoping that it doesn't. We will wish our governments to pretend to act. We get the moral satisfaction of saying what we know to be right, without the discomfort of doing it. My fear is that the political parties in most rich nations have already recognized this. They know that we want tough targets, but that we also want those targets to be missed. They know that we will grumble about their failure to curb climate change, but that we will not take to the streets. They know that nobody ever rioted for austerity. (pp. 41–2)

For Diarmuid O'Murchu (2004), the central feature of our "addictive trap" is "an illusion of power and control that has become progressively compulsive, acquisitive, manipulative and destructive. . . .In our addictive commitment to power, we ourselves have become quite powerless, but like all addicts we vehemently deny and disown that fact." Joanna Macy and Molly Young Brown (1998) call the source of our addiction the "Industrial Growth Society," a society that cannot last in that "it is inexorably and exponentially destroying itself" (p. 23). There is ubiquitous

evidence of systemic "runaway," they maintain, that should "rivet our attention, summon up the blood, and bond us in collective action" but the evidence before our eyes tends to have the opposite effect making us "want to pull down the blinds and busy ourselves with other things" (Ibid, p. 26). Reminding us of the etymology of the word "apathy", the Greek *apatheia*, literally the inability or refusal to experience pain, Macy and Young Brown identify a range of forms of Western cultural conditioning through which we repress deep concern about the planetary circumstance:

- *Fear of pain* – Seeing pain as dysfunctional and as evidence of an inability to cope, rather than as opportunity for re-empowerment and renewal.
- *Fear of despair* – Fearing that to admit to despair about the state of the world will undermine all we believe in and bring paralysis rather than resolve.
- *Fear of appearing morbid* – Believing that only sanguinity and optimism are culturally appropriate indicators of and keys to successfulness and that dystopia anguish is an indication of lack of confidence, even incompetence.
- *Fear of guilt* – Fearing to expose the moral pain of individual and societal complicity in the exploitation of peoples and other-than-human life forms around the globe and of the planet itself.
- *Fear of causing distress* – Believing it is compassionate not to distress others, especially the young, about the state of the world rather than seeing disclosure as a healthy connecting of people to the world.
- *Fear of being unpatriotic* – Holding that to speak things as they are will somehow harm the national fibre and interest.
- *Fear of appearing weak and emotional* – Falling for the objectivist fallacy that emotional-tinged responses are weak while impassivity is evidence of strength.
- *Belief in the separate self* – Fearing that expressing concern about the world is simply a reflection of unprocessed inner turmoil and believing that the discrete self is the only locus of empowerment and transformation.
- *Fear of powerlessness* – Believing that global threats are so huge and intractable that the individual can do nothing of significance. (After Macy and Young Brown 1998, pp. 27–32)

The consequences of such processes of repression are what Robert Gifford (2007, p. 209) calls "environmental numbness" and Robert Lifton (1967) terms "psychic numbing". We immure ourselves from the way the world is going by divorcing our personal trajectory from the global trajectory. We immure ourselves, too, through forms of displacement or self-delusion on a spectrum from quick fix hedonism to cozy reformism. "We live in a dark age," concludes O'Murchu (2004, p. 140), "but, alas, nobody wishes to entertain that notion. We are unable to befriend the darkness because our addictiveness and compulsiveness keep us firmly rooted in *denial*. The whole thing is too painful to look at, so we choose to befriend our pathology rather than befriend its deeper truth."

Denial and Cognitive Dissonance in the Field of Education for Sustainable Development

A befriending of our pathology afflicts those positioned along the reform to transformation continuum in their responses to global heating, including many proponents of education for sustainable development.

The Learning and Skills Council, a body responsible for the UK further education sector, argues in its *Strategy for Sustainable Development* (2005, p. 3) that "we are living in an unsustainable world" not least because "global temperatures are rising faster than previously recorded". Alongside this, it identifies "the maintenance of high and stable levels of economic growth and employment" as a key sustainable development objective and in language that resonates with global marketplace-speak, it continues:

> Experience shows there is a strong business case for sustainable development. Businesses, companies, colleges and learning providers that adopt environmental management systems can make significant financial savings. They can also enhance their reputation, gain access to new markets and better motivate their staff. (p. 4)

The conception of the humanity/nature relationship within the *Strategy* is one of nature as resource or "natural capital" or "ecosystem service" (Porritt 2006; Orr 2009, pp. 21–2) to be managed, and having instrumental rather than intrinsic value.

The same is the case in the pronouncements of Forum for the Future, the influential UK sustainable development charity with a significant educational arm to its work. Noting in the presumptuously titled report on its 2003 activities, *Sustainable Development – the only game in town*, that "evidence of unsustainable development kept piling up" (Forum for the Future 2004, p. 1), Forum rehearses its "Five Capitals" framework for responding to the global environmental crisis in which nature, human beings and human communities and forms of social organization are viewed as capital assets alongside financial and manufactured capital (Ibid, pp. 3, 5, 8, 9, 12). Nature is conceived of as resource – "the stock or flow of energy and material" (p. 3) – underpinning a system of capitalistic development that needs to be husbanded properly to safeguard its upward trajectory. The response to the global crisis is better care of assets for status quo maintenance. Following from this, Forum's emphasis on skills-based "sustainability literacy" in its Higher Education Partnership for Sustainability with 18 UK universities comes as no surprise:

> A sustainability literate person will be equipped with a number of intellectual and practical tools that enable them to make decisions and act in a way that is likely to contribute positively to sustainable development. They will be able to make decisions on specific matters, such as advising on financial investment, buying food or writing new policy for prisons, by applying the 'at the same time' rule – that is, taking environmental, social and economic considerations into account simultaneously, not separately. (Parkin et al. 2004, p. 9)

While recommending action, the prescription for educational change is apathetic in the sense used earlier of inability or refusal to confront and experience pain. The

concept of "sustainability literacy," much vaunted across the field of education for sustainable development (see, for instance, DfES 2003; John Foster Associates 2006; Stibbe 2009) is itself objectivist in its explicit or implicit emotion avoidance – even in skills terms, the skills and capacities for handling despair, distress, pain, guilt and grief are not addressed – and in its failure to position the transformative dispositions and capabilities of the individual within a conscious reconnecting with the flow of life.

This phenomenon is not restricted to the United Kingdom. In their report to Macquarie University and the Australian Department of the Environment and Heritage, *Change in Curricula and Graduate Skills Towards Sustainability*, Daniella Tilbury and colleagues (2004, p. 3) write: "Education for Sustainability involves students and educators in a process of active learning and futures thinking, and addresses the generic skill needs of business and industry". The skills list offered recites critical, creative and future-thinking skills, needs assessment and action-oriented skills, interpersonal and intercultural skills, the skills of dealing with uncertainty, and problem solving skills (Tilbury et al. 2004). Important as they are, they are set within a frame of the "generic skills needs of business and industry," eschewing alternative frames and dispositions crucial to a context of looming or actual civilizational threat. The emphasis on skills, as with the Learning and Skills Council and Forum for the Future, also tends to obfuscate the centrality of a values and socio-affective response to a threatened world. None of the education for sustainable development proposals reviewed here call for the curricular treatment of themes and issues that might reasonably be seen as imperative for actively addressing the deepening multiple crisis syndrome of global heating, a point to be returned to later.

A fundamental issue for proponents of education for sustainable development is the relevance of continuing to talk about development. As James Lovelock (2006) so powerfully puts it:

> (W)hen change was slow or non-existent, we might have had time to establish sustainable development, or even have continued for a while with business as usual, but now is much too late; the damage has already been done. To expect sustainable development or a trust in business as usual to be viable policies is like expecting a lung cancer victim to be cured by stopping smoking; both measures deny the existence of the Earth's disease, the fever brought on by a plague of people. (p. 3)

For Lovelock, "what we need is a sustainable retreat" (2006, p. 7). Lauding the orderly quality of the Napoleonic 1812 retreat from Moscow and exhorting a1940 Dunkirk spirit, he adds: "We need people of the world to sense the real and present danger so that they will spontaneously mobilize and unstintingly bring about an orderly and sustainable withdrawal to a world where we try to live in harmony with Gaia" (p. 150).

Preferring the softer and more ecological concept of "contraction," a concept devoid of militaristic connotations and tending to infer the systemic rather than the systematic, the organic rather than the lockstep, let me examine what "education for sustainable contraction" in the face of runaway climate change might entail.

Education for Sustainable Contraction (ESC): Nailing Nine Propositions to the Laboratory Door

On October 31, 1517, Martin Luther nailed 95 propositions to the door of the Castle Church in Wittenberg, Germany. The propositions fulminated against the widespread practice of the Catholic Church of selling indulgences, paper certificates guaranteeing relief from punishment in Purgatory, to those who had committed sins. This is regarded as the seminal moment in the Reformation of the Western Christian Church (Davies 1996, pp. 484–5). It has not gone unnoticed by climate change commentators that the hypocrisy and cognitive dissonance of the pre-Reformation period finds its echo in the thinking and practices of those accepting – but not following through on the consequences of accepting – the climate change threat. A notable example is carbon offsetting. "Just as in the fifteenth and sixteenth centuries you could sleep with your sister, kill and lie without eternal damnation," suggests Monbiot (2006a, p. 210), "today you can leave your windows open while the heating is on, drive and fly without endangering the climate, as long as you give your ducats to one of the companies selling indulgences." Inspired by this nifty connect (see also, Monbiot 2006b), I offer nine propositions for Education for Sustainable Contraction that we might nail to the doors of our STEM learning and teaching places and spaces.

But, before exploring the propositions, it is important to identify what frequently recurring features of education for sustainable development would be markedly absent from or significantly less ubiquitous within an ESC landscape:

- The uncritical or tacit embrace of the neo-liberal economic growth and global marketplace model, and of rampant consumerism.
- An instrumentalist and utilitarian view of nature, emphasizing the "desirability of sustaining those natural systems that are conducive to *human* flourishing" (Bonnett 1999, p. 315), with its correlative denial of the intrinsic value of the natural world and of human embeddedness in nature.
- A managerialist and policy orientation to sustainability in which "natural resources" and the world are looked upon as what Bonnett (Ibid, p. 317), citing Mitchum (1997), calls "a spaceship in need of an operating manual".
- Absorption with technical fixes to remedy unsustainability, with skills development of the learner prioritized and values issues left on the rhetorical shelf.
- A conception of change potential as fundamentally *individual* as against *individuated*, i.e. the person acting from a sense of being largely alone even if working in tandem with others, rather than from a sense of their orchestrated and holographic enfoldment within the social and environmental whole (O'Murchu 2004, pp. 91–3).
- An exteriority of focus (issues in the world out there) as against a dynamical interplay between interiority and exteriority (the learner's inner and outer worlds) in processes of personal and social transformation.

Uprooting features such as these, so prejudicial to transformation, would clear space for an Education for Sustainable Contraction.

ESC: Proposition 1. A concerted effort is needed in the light of looming runaway climate change to confront denial by moving learner assumptions, understandings and responses towards disequilibrium (fomenting dissipative structures).

ESC: Proposition 2. Given the likely impending severity of global heating, Education for Sustainable Contraction needs to address despair, pain, grief and loss.

Global heating is beginning to turn the world on its business-as-usual head, exposing the fragility of the normal and the vulnerability of the taken-for-granted. As Monbiot (2005) puts it:

> Everything we thought was good turns out to be bad. It is an act of kindness to travel to your cousin's wedding. Now it is also an act of cruelty. It is a good thing to light the streets at night. Climate change tells us it kills more people than it saves. (. . .) Climate change demands a reversal of our moral compass, for which we are plainly unprepared (p. 23).

STEM classrooms at various levels are marked by the comfortable equilibrium of the agitated pendulum where any movement stimulated by the learning dynamic often tends to reduce to minimal swing followed by a more or less settled state. What, asks Ilya Prigogine (1989, p. 396), if we turn the pendulum on its head? It is difficult to predict what will happen. The notion of the upturned pendulum, Prigogine avers, has been "ideologically suppressed" in that its message is inconvenient for a culture that seeks to dominate and suppress nature (Prigogine 1989, pp. 396–7). For confronting a world that threatens to make castles built of sand of our assumptions, the notion acquires huge consequence, as does Prigogine's concept of "dissipative structures" within self-organizing systems. Prigogine distinguishes between systems at equilibrium or near-equilibrium where huge disturbances would be required to effect radical change, and hence where creativity is low, and far-from-equilibrium systems. In the case of the latter, a fluctuation can induce movement to disequilibrium – dissipation – at which point the system responds by bringing to bear on a situation as wide and coherent a range of forces as is necessary to effect a new complexified condition of equilibrium. It is at the far-from-equilibrium where the potential for deep creativity lies (Capra 1996, pp. 180–3) and, within learning community dynamics, where reversals of the moral compass, held back by denial, are more likely to happen.

Science and technology curricula have tended to reinforce the myths we tell ourselves: of unending economic growth; of ever upward progress; of technological fix to preserve "business as usual"; of human separation from, and dominance over, nature. There is a storehouse of sound science, none better than the work of James Hansen (2009), that can be deployed to bring unsettling but creative far-from-equilibrium thinking to STEM classrooms.

Confronting despair, pain, grief and loss within communities of learners by giving space for both cognitive and affective response to scientific data as well as case studies and personal narratives of climate change (e.g. Kolbert 2007; Selby and Kagawa 2013) is a likely harbinger of dissipative structures. At a conference

several years ago, I found myself in a small minority arguing for a confronting of the pain of "gloom and doom" as a vital rite of passage in any transformative learning process. Most of those in the room regarded "gloom and doom" as disabling and disempowering for the learner. For me, their position smacked of denial, and also of reluctance to recognize that, from within an ecological or holistic worldview life and death are marked by dynamical unity, "the cycle of birth-death-rebirth" (O'Murchu 2004, p. 190).

Recognizing that present and future generations need hope, we have to ask what the hope is grounded in and what kind of hope it is. Is it spurious optimism, a comfortable fiction based on what we would prefer to see happen while keeping our "eyes wide shut" (Hilman et al. 2007)? Or, is it a pared down and realistically straitened optimism born of confronting the present and future earth condition? Is it cozy but inauthentic hope or a hard-edged but more authentic hope forged out of what Martin Seligman (1992, p. 292) calls "the courage to endure pessimism"? Are STEM classrooms helping students keep their "eyes wide open" as to the global climate change condition?

From within a quantum theological frame, O'Murchu writes of the importance of the "Calvary moment" (Ibid.), encapsulating the idea that transformation entails a conscious and thoroughgoing progression by groups and individuals through despair towards empowerment, healing and renewal. The "Great Turning," as Joanna Macy calls it, involves breaking through denial to confront the pain of the world, heroic holding actions to stop things getting worse, analysis of the structural causes of the damage wreaked by the Great Industrial Society allied to the nurturing of alternative institutions and, most fundamentally, a cognitive, spiritual and perceptual reawakening to the wholeness of everything (Macy and Young Brown 1998, pp. 17–22). Macy's despair and empowerment work provides a powerful canon of activities and exercises for breaking out of denial to connect with the state of the world (Macy 1983, 1991; Macy and Young Brown 1998). Such exercises would be the food and drink of education for sustainable contraction. They are recommended to STEM practitioners.

ESC: Proposition 3. Given the "powerful wave of neo-liberalism rolling over the planet" (Jickling and Wals 2008, p. 2), destructive of ecosphere and ethnosphere, climate change education needs to offer alternative conceptions of the "good life", combat consumerism, and help learners explore and experience alternatives to a growth economy.

For the peoples of the metaphorical North and elites in the South who have taken on the western worldview, it is important that an education in "voluntary simplicity" (Elgin 1981) is made available, the term connoting frugal consumption, ecological awareness, connectedness and community, and personal growth based upon evolving material and spiritual aspects of life in harmony. A countercultural idea amongst such populations, the transition to "voluntary simplicity", its originator argues, is more than made up for through the quality of revitalized experience and the cultivation of "conscious watchfulness", the ability to see the close-at-hand world through an intimate eye (pp. 149–51). STEM curricula have a key part to play in

fostering alternative conceptions of the "good life" by helping learners envision and then concretize appropriate technologies for societies and communities relearning how to live simply and frugally as they adapt to and seek to mitigate the drivers and effects of climate change.

Dovetailed with the promotion of "voluntary simplicity" among such populations should be anti-consumerism education. Defined as "consumption beyond the level of dignified sufficiency" (McIntosh 2008, p. 180), consumerism not only violates the indentured slave, the sweatshop worker and the natural environment but also enslaves the consumer herself (McGregor 2003, p. 3). Consumerism, Sue McGregor avers, "is an acceptance of consumption as a way of self-development, self-realization and self-fulfillment. In a consumer society, an individual's identity is tied to what he or she consumes" (2). Anti-consumerism education, then, has the twin goal of protecting the ecosphere and ethnosphere while liberating the individual from the thrall of consumerism for a journey of self-discovery and self-growth. It is to be distinguished from "consumer awareness education" with its subliminal agenda that consumerism can be made benign just as, given the exigencies of structural racism, "race awareness education" had to give way to "anti-racist education".

As a backcloth to this agenda item, it is vital that Education for Sustainable Contraction in STEM and other disciplines provides age-appropriate windows for engaging with ideas for transition to a global slow-growth or no-growth economy (Victor 2008), concretizing those ideas through learning-in-community experimentation and practice.

ESC: Proposition 4. The view of the human<>nature relationship needs to shift from the doministic, the instrumental and the exploitative to one of embeddedness and intrinsic valuing; from a shallow ecological to a deep ecological paradigm.

ESC: Proposition 5. The embrace of intimacy with nature calls for the cultivation of the poetic.

As has been noted, common to articulations of education for sustainable development is representation of nature as resource. This is indicative of collusion with the dominant corporate paradigm but also suggests that the precocious and headstrong infant that was ESD in the 1990s paid insufficient heed to a heritage of eco-philosophical responses to the question of humanity's relationship to the environment, each response offering its own insights on how to live ethically and responsively on the planet. Had the infant listened, in particular, to deep ecology, ESD might have thought more deeply about the human<>nature relationship and divested itself of some of its anthropocentrism, at least giving space in its debates to the biospherical egalitarian position (Selby 2006, p. 359). Key principles of deep ecology include:

- The well-being and flourishing of both human and other-than-human life have value in themselves
- Richness and diversity of life forms (and cultures) are valuable in themselves
- Human interference with the other-than-human world is excessive
- Quality of life matters more than standard of living (after Devall and Sessions 1998, p. 147).

Re-bonding with nature would be a key goal of ESC and would involve the cultivation of the poetic dimension of human awareness, thus marrying sense and sensibility (Selby 2006, p. 361). It was in the time of Galileo Galilei, says the poet T.S. Eliot that "a dissociation of sensibility" set in from which the West never recovered (cited in McIntosh 2008, p. 154). This "breaking up of the ability to feel and relate to life", according to Alastair McIntosh (p. Ibid), lies behind the "mindlessness that underlies anthropogenic climate change" (Ibid, p.112). Following from such an insight, it would seem evident that an education responsive to climate change should also help learners cultivate a sense of oneness and interconnectedness with nature through poetic and spiritual ways of knowing such as attunement, awe, celebration, enchantment, intuition, reverence, wonder and an oceanic sense of the oneness of being. Education for sustainable development has given barely any space to the poetic and the numinous in its reliance on scientific rationality. There are questions to be asked about rationality "in resolving issues as complex, subtle and multidimensional . . .as environmental concern", especially given how rationality has proved so effective a tool in the exploitation of the environment (Bonnett 1999, p. 321). There are correlative questions to be asked about the "deadening language", emphasizing "the terminology of science and policy over that of ethics and philosophy" and relying upon '"practical" utilitarian arguments', as employed by environmental educators and public awareness raisers (Goodstein 2007, p. 76). Effective political communication on climate change, writes Eban Goodstein (Ibid, p. 77), "comes from the heart, and the heart of concern about the impacts of humanity's climate destabilization is a spiritual connection to nature".

If this sounds "unscientific" then it does not have to be so. Intimacy with nature can be about walking the interface between the scientific and the numinous and thereby cultivating resistance to forces destroying cultural and natural environments. In a time of violation of flora and peoples occasioned by the English land enclosures and agrarian "modernization" of the 1820s, the laborer poet John Clare conveyed a sense of loss through finely-detailed sketches and descriptions of flower species under threat, images that in their detail and exactitude also betokened a sense of oneness between flowers and laborers as "fellow members of the great commonwealth of the fields" now sharing a common fate in their eviction (Mabey 2010, pp. 115–26). His radicalism and expansiveness were bred of nature intimacy in which were folded together science, spirituality and social justice. In a time of present and looming runaway climate change eroding environments, social relations and livelihoods, it is profoundly important to cultivate a sense of enfoldment in nature and correlative disposition to hold on to what is being lost by fostering scientific intimacy alongside poetic and spiritual ways of knowing and relating. UNESCO (2010) has identified bio-diversity loss as one of three "key action themes" for the second half of the 2005–14 Decade of Education for Sustainable Development. STEM curricula can make a signal contribution to the advance of biodiversity education by adopting an activist science approach placing due emphasis on emotional intelligence.

The cultivation of a consciously watchful intimacy with nature suggests a return to something akin to local nature study programs based on close observation of local fauna and flora through the seasons that characterized earlier educational

practice, programs long discarded as environmental educators of the 1970s immersed themselves in ecosystemic thinking and global environmental problematics. Diane Pruneau et al. (2001, p. 135) make precisely this point when they recommend "more in-depth educational work focusing on developing knowledge and appreciation of regional fauna and flora, and various seasonal weather patterns". "The idea of going outside and perceiving ambient elements creates a link with these elements," they continue. 'A reflection exercise could follow this direct contact: "Do we really want to lose the piping plover, the Clintonia borealis [sic], snow, the return of spring, and so on?"'.

ESC: Proposition 6. "Educations" that have been marginalized within education for sustainable development are of pivotal importance.

ESC: Proposition 7. With global heating under way, sustainability education and emergency/disaster risk reduction education need to fold together.

It is perhaps indicative of the "business as usual" mindset pervading the field of education for sustainable development that, while holistic and integrative in original intention (UNCED 1992), the insights of certain key social, political and moral educations are virtually ignored.

Confronted with all the societal ramifications of potential, some would say inevitable, degree-by-degree global heating, giving peace education a central place within the panoply of sustainability "educations" would seem essential. A field concerned with non-violence, conflict avoidance and conflict resolution, confronting and unpacking negative and enemy images of the "other," and processes and outcomes of direct and structural violence (Smith and Carson 1998) would have the potential to bring wisdom and insight to learners facing the looming prospect or immediacy of what is being predicted (especially massive population displacements and the tensions they will bring). For similar reasons, anti-discriminatory education, concerned with confronting all the negative and hegemonic "centrisms" that foment societal and inter-human injustice, and with dissecting inner and outwardly-manifesting processes of "othering" (Plumwood 1993, 1996; Selby 2001), needs to be brought to an ESC agenda. In helping learners confront ubiquitous social, political and media global heating denial, the "crap detecting" skills and insights of media literacy education would also be given prominence (Duncan et al. 2000).[1]

The gulf that has so far characterized the relationship between education for sustainable development and emergency and disaster risk reduction education will urgently need to be bridged as the heating happens. Emergency education, that is, education in crisis or disaster contexts occasioned by armed strife and/or environmental cataclysm, has achieved increasing prominence since the end of the Cold

[1] I am, as ever, indebted to Neil Postman and Charles Weingartner (1969) for the their delightfully incisive term, "crap detection".

War period (Kagawa 2005; Kagawa and Selby 2006). As Fumiyo Kagawa (2007) explains, with the world moving ever more inexorably into multiple crisis syndrome, the theory and practice of sustainability and emergency need to coalesce. Disaster risk reduction is the younger cousin of emergency education and is a response to the mounting incidence and severity of natural disaster globally. It has been described as involving a "combination of actions, processes and attitudes necessary for minimizing underlying factors of vulnerability, improving preparedness and building resilience" (Global Education Cluster et al. 2011, p. 2). Key focuses, then, are: understanding the science and mechanisms of natural disasters; learning and practicing safety measures and procedures; understanding social, economic and environmental risk drivers that exacerbate vulnerability and turn a hazard into a disaster; resilience building; building school and community cultures of safety and resilience (Kagawa and Selby 2012). The STEM subjects have the potential to make a huge scientific and technological contribution to this agenda. Clearly, too, there are major implications for any sustainability education agenda in that the mounting incidence of natural disaster coupled with rampant climate change presents potentially insuperable obstacles to the realization of a sustainable future (Ibid.). As events such as Hurricane Sandy illustrate, developed countries can no longer maintain an "out there but not here" attitude to emergency and disaster.

ESC: Proposition 8. Cozy assumptions about the relationship between education for sustainability and education for citizenship need unpacking and formal and informal learning programs need to offer alternative and localized conceptions of "good citizenship" (or "good denizenship").

In *Earth Democracy: Justice, Sustainability and Peace* (2005), Vandana Shiva makes a powerful case for localism in response to the global crisis of unsustainability. "Conservation of the earth's resources and creation of sustainable livelihoods," she writes (p. 10), "are most caringly, creatively, efficiently and equitably achieved at the local level. Localization of economies is a social and ecological imperative". For Shiva, localism allows for "living democracy" integrated with a "sustenance economy" within which "people can influence the decisions over the food we eat, the water we drink, and the health care and education we have" (Shiva 2005).

There has been an all-too-cozy connection between education for sustainable development, on the one hand, and citizenship education (including what is called "global citizenship education") and education for democracy, on the other. The respective "educations" are, more often than not, assumed to enjoy a dovetailed relationship (see, for instance, Bourne 2005; National Assembly of Wales 2005; QCAA Wales 2002). A thorny, but largely untouched, problem concerns how representative democracy drawing upon an electorate immured in and, on that account, not readily teased from, a pervasive consumerist ethic can be squared with an environmental narrative predicated on the finiteness of the Earth. If we

embrace the notion of finiteness and the ecological imperatives deriving from it, "certain policies are proscribed," writes Michael Bonnett (1999, p. 315). He elaborates:

> They are in effect not only removed from the area of democratic debate, but set the parameters within which democratic debate can be allowed to function. . . .Insofar as such enframing is broad in scope, it is tantamount to defining a conception of the good life to which citizens need to be brought to conform and thus both runs counter to the assumption of democracy of valuing diversity of view and holds the danger of peripheralising democracy as a contingent value, instrumental to achieving the public acceptance of these imperatives. (Bonnett 1999)

Shiva's "living democracy" provides a means of negotiating this seeming impasse. While it is almost certainly the case that citizenship education focused upon (consumerism-fuelled) representative democracy will never sit easily with the sustained and draconian intervention by government regarded as essential by such as Romm (2007) if the worst global heating scenarios are to avoided, "living democracy" offers the potential for a reinvented citizenship ethic and education. For Shiva, "it is essential to dispel the notion that globalization is natural and inevitable" (2005, p. 106) and that we see it as a political and profiteering process that continues to encroach on the commons, i.e. that held to be common property or of shared accessibility, through appropriation, privatization, exclusion and "the enclosure of minds and imagination" whereby the global market is portrayed by its adherents as the only way forward (2005, p. 20). The alternative path Shiva advocates is the actual lived experience of two-thirds of humankind, in "which humans produce in balance with nature and reproduce society through partnerships, mutuality, and reciprocity" (2005, p. 17). Turning globalization on its head, Shiva envisages a future in which the "most intense relationships are at the local level and the thinnest interactions at the international level" with decisions being taken "at the level closest to where the impact is felt" (2005, p. 64). Localization would not only offer a more fertile arena for participatory democracy to flourish but, based on a keener, immediately lived, appreciation of the "interdependence between nature and culture, humans and other species" (Ibid, p. 82), would open the way for a more biocentric and less consumerist and exploitative democracy. Following the principle of subsidiarity, the centralized draconian approach to preventing perilous levels of global heating would stand in negative correlation with "living democracy", that is, like a thermostat, only being triggered if the climate change determinations of localities fell short.

In educational terms, subsidiarity would also apply to curriculum, with thinnest input into curriculum framing emanating from the national level. Learning would involve a rebalancing of the mind<>hand interface through local craft learning and craft apprenticeships. Generally within localized living democracies and sustenance economies, there would be a move away from learning as expert induction to a livelihood, communitarian orientation fostering new "tools of conviviality" (Illich 1973).

Within such a scenario, the weighting within citizenship education would shift towards local participatory democracy with commensurately reduced emphasis on national citizenship. In treating the global level, education would be responsive to

the need to globalize "compassion, not greed" (Shiva 2005, p. 115). The notion of "citizenship" might give way to that of "denizenship," a denizen being an inhabitant or occupant of a particular place, the term connoting primacy of immediate context while also neatly sidestepping the built-in anthropocentrism of citizenship in that a denizen can be either human or other-than-human.

What would STEM curricula look like if set within a localized "living democracy" frame of reference with an accent on "denizenship"?

ESC: Proposition 9. Everyone has to understand and come to terms with the fact that we are threatening our own existence. To confront this requires a Copernican revolution in our view of the world and in the aims, structures and processes of education and, perhaps, in the loci of learning.

While some sustainability educators have emphasized that social transformation towards sustainability calls for a relinquishing of the pervasive mechanistic and reductionist way of seeing the world and a radical shift to holistic and systemic perception (Selby 2006; Sterling 2007), the field of education for sustainable development remains by and large wedded to mechanism (Selby 2007), an argument that has been implicitly and explicitly present throughout this chapter. It will not be further elaborated here. As the heating happens, institutional and in-community learning cannot afford the self-indulgence of being other than holistic and systemic.

If habituation to mechanism/reductionism and a "business as usual" mindset afflict those embracing change, as suggested here, how much more so is that the case within schools and universities. Mechanism, writes Robin Richardson (1990, p. 54), is "institutionalized in all sorts of structures and career patterns". It is certain that, as the heating happens, learning programs and educational institutions as we presently know them will be faced with deep challenge and disruption and, if unresponsive to the need for transformation, will disintegrate as people go to find other, more relevant, loci for learning what they have to learn.

I leave the last word to George Monbiot:

> For the campaign against climate change is an odd one. Unlike almost all other public protests which have preceded it, it is a campaign not for abundance but for austerity. It is a campaign not for more freedom but for less. Strangest of all, it is a campaign not just against other people, but also against ourselves. (2006a, p. 215).

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