

Puzzling 'Responsibility' in Complexity and Education

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Introduction

Social responsibility is a prominent discourse in my field of adult/community education and increasingly in organization studies where adult education intersects interests of business and management. From a complexity perspective, concepts of agency and moral intention—central to many conceptions of social responsibility—are challenged by notions of flows, co-specification, self-organization and emergence. In other words, the issue of 'responsibility' stands to be reconfigured by complexity. In this regard, analyses of ethical action using complexity theories (e.g., Bai, 2003; Varela, 1999) are helpful. Yet complexity science does not itself address issues of responsibility. Therefore questions of who responds and to what, how we might understand a 'call' to responsibility or participation in responsible action, and what paths the educator might/should tread are puzzling from a 'complexified' educational perspective. This paper puzzles through dilemmas of responsibility in complexity theory, then, drawing from Derrida, Levinas and Biesta, explores the possibility of an educational vision of social responsibility animated by complexity theories.

While perspectives within the broad discourse of social responsibility are diverse (e.g., Wildemeersch et al., 2000), many draw upon a critical cultural analysis of systems. This analysis points to structural inequities and neo-liberal market ideologies that generate individualism, hyper-competition, oppression and environmental degradation. The educational position is often constituted, ideally, as one of social justice: generating political awareness, resistance and even social transformation. For example, writers such as Ian Martin call adult educators to mobilize themselves and others around social transformation:

The central purpose of critical and creative adult education, as distinct from the current hegemony of lifelong learning, should be precisely to challenge this depoliticization of

politics and to raise such matters as issues for urgent democratic deliberation and debate. (Martin, 2003, p. 569)

In this social change tradition which has dominated Canada's adult education throughout the 20th century, social responsibility and active civic participation have been widely accepted as self-evident goals—whether through worker empowerment, community development, citizen and global education, or participatory literacy. Social responsibility is often cast nobly, even messianically, in opposition to educative goals of assimilation: accommodating people to a global economy, increasing their skill performance and reinforcing dominant discourses of individualism, flexible adaptation, entrepreneurism and self-interest. Pedagogical concerns of social responsibility are dedicated to raising individuals' awareness and mobilizing their participation in issues of social justice, inclusion and equality, environmental sustainability, their own oppression, and so forth. However, in such educational discourses including critical, feminist, anti-racist and other emancipatory pedagogies, one danger pointed out repeatedly is the presumption of the emancipator pronouncing a vision of democracy for others. There is a problematic revolutionary zeal and moral imperatives operating that can become controlling, and lead to undesirable consequences.

Complexity science, particularly in its current uptake in educational writings (Bai, 2003; Davis, 2004; Davis & Sumara, 2006; Osberg, 2005) appears to offer more generative alternatives with its emphasis on participatory epistemology, mindful engagement, and disrupting certainty. In fact, complexity in education may open new ways for rethinking responsibility and interrupting the more controlling, moralistic discourses promoting social responsibility in education: "We cannot avoid responsibility because we cannot avoid responding in some ways to each and every person and situation we encounter and thereby affecting the world in some ways" (Bai, 2003). At the same time, however, complexity science does not necessarily speak to issues of power relations, desire, positional interests, and other dynamics of socio-cultural human systems that figure significantly in understanding issues of responsibility and ultimately, of education. Therefore it seems fruitful to explore questions of responsibility alongside complexity science in its educational uptakes.

There is danger in applying any body of theory to an educational problem, which inevitably results in prescription for some pedagogical method. Similarly, educative concerns with their moral imperative and inherent impulse to act for change should be brought to complexity theory with caution, or important elements of socio-cultural systems and educational practice that remain completely unaddressed by the explanatory foci of complexity will disappear from discussion. These caveats must be foregrounded in considering complexity theory alongside the philosophical problem of responsibility as it is taken up in educational practice/debates. Here, the approach is to focus on picking apart issues raised by each domain for the other. That is, I am interested in the questions and possibilities that considerations of responsibility bring to complexity theory in an educational context, as well as questions opened by the reversal. The strategy I employ is to read complexity theory *against* responsibility theory, and to read the ensuing questions *with* the educational impulse. From a *reading against/reading with* position, I hope to avoid resolutions, unsettle applications, and to hold open the aporias that will sustain perpetual uncertainty and inquiry among these three domains.

Responsibility, ethics and education

Before exploring new visions for educational responsibility offered by these themes of complexity theory, it is important to delineate more precisely what is meant by responsibility and what issues it bears. Conceptual discussions of responsibility are wide-ranging, from causal (who caused the problem) to consequential responsibility (who takes the blame), from attributed (who is held accountable) to distributed responsibility (how accountability is apportioned among agents). In the context of education and in particular, the context of social responsibility as an educational purpose driving curriculum and pedagogy, the focus is upon *moral responsibility* that is felt and enacted. The pedagogical questions tend to rally educators' commitment to curricula oriented to particular sites of moral responsibility for social issues (solidarity with oppressed peoples, civic participation, democratic action for equity, resistance to market globalization, environmental sustainability, and so forth) and to focus on how best to develop this responsibility in students. However the present discussion steps back from the prescriptive to ask critical questions about how moral responsibility can be understood in terms of what comprises educational responsibility (that of the educator for learners in particular, and community and society in general through pedagogical practice.)

Moral responsibility traditionally invokes notions of both obligation and moral decision-making. Obligation calls forth a sense of duty to care for self and others extending beyond one's own self-interest, and accountability to others for one's actions. Others in this sense can be interpreted broadly: other human beings, other collectives such as community or national interests, authorities, tradition, animals or non-sentient beings of the natural universe, concepts or ideals. Moral decision-making to acknowledge and act upon one's responsibilities incites questions about the conception of the 'good', the attendant criteria or 'laws' that should guide individual action, and the extent of one's freedom to choose. Within all of this, some view a distinction between responsibility as felt and responsibility as acted. For example in education, there may be emphasis on raising learners' awareness of and personal commitment to civic responsibilities, as well as guiding them to enact their particular responsibilities as students.

In the field of ethics, critical debates have long swirled around the questions: Who is responsible to whom, for what, and to what extent? Responsibility has been developed within a tradition of rational philosophy as a question primarily of ethical decision-making, invoking issues of universal laws and the problem of the contingent particular situation, as well as bonds and obligations that inhere in an individual, conceived as autonomous, intentional, and capable of acting independently of others. However Levinas (1981) and educational philosophers who have taken up his conception of responsibility (e.g. Biesta, 2005; van Manen, 2001) have begun from a basic critique of the assumptions embedded in this rational tradition. Levinas (1981) views the subject as coming into presence through actively 'being': which is 'otherwise than being'. First, Levinas counters the view that individuals act and reason as autonomous agents, and stresses the intersubjective relationships that enmesh human beings with one another beyond their conscious intention or rational application of moral principles. Second, Levinas dismisses the act of rational ethical

decision-making, arguing that ethical responsibility is moved by and enacted within moments of connection, participation with others that calls forth *response*. Responsibility, then, inheres in the actual relation between human beings. For Levinas (1985), responsibility is enacted as a response to the 'call' of the other, a response which is not a rational decision motivated by duty but an immediate bond to the need of the other. In this response the subject emerges. And in this intersubjective ethics, the response is of caring or justice to a call of need, e.g. from an Other who is vulnerable, suffering, or otherwise positioned assymmetrically to the one who is called. Derrida (1995), in his meditations on responsibility working from Levinas and Kierkegaard, shows the problem of considering just who or what is Other when all are enmeshed, and the conflicts between responding to the Other's call, the community expectations, and the other Others excluded by a particular response.

These considerations shift the definition of responsibility from notions of felt duty to the active responding to others, broadly conceived, within complex webs of connection. A focus on response turns attention away from defining what is the good and what ethical laws should guide action toward questions about how response is excited, by whom or what, what forms it takes, and what are its consequences. Thus, responsibility is not necessarily a modernist or utterly rational construct, but a phenomenal and relational dynamic whose logic is not necessarily irreconcilable with complexity theory.

Complexity theory and education

To be clear about the understandings informing this discussion I have selected four themes that, for me, distinguish a complexity perspective. It is not my intent here to debate details of complexity theor(ies), nor to defend complexity theory's explanation of reality, cognition, knowledge and subjectivity. Nor do I attempt to present a comprehensive view of complexity science, which is by now represented with wide-ranging degrees of precision and rigor in the social sciences as a heterogeneous and contested family of theories. Instead I draw on those themes that seem to have most frequent uptake among educational writers such as Davis and Sumara (2006), Davis, Sumara and Luce-Kepler (2000), Laidlaw (2005), and Osberg (2005), who themselves draw upon complexity theories of, among others, Capra (1996), Prigogine (1997), and Waldrop (1992).

The first theme is *emergence*, the understanding that in (complex adaptive) systems, phenomena, events and actors are mutually dependent, mutually constitutive, and actually emerge together. Humans are completely interconnected with the systems in which they act through a series of 'structural couplings' (Maturana and Varela, 1987). That is, when two actors or systems coincide, the 'perturbations' of one excites responses in the structural dynamics of the other. The second theme is that of *flows*. The focus is not upon isolated actors and objects foregrounded against some contextual backdrop, but on the dynamic, nonlinear actions and connections flowing between all these parts. Third is the complex system's continuous state of *uncertainty* and surprise, a condition that Prigogine (1997) famously described as 'far from equilibrium'. What is happening within and among systems is affected by so many active micro-interactions and improvisations that cannot be tracked, whose outcomes are affecting one another to form continually emerging phenomena, that

actions and choices are unpredictable. Fourth is the consequence of disequilibrium, which is continuous adaptive change. A complex system is self-modifying—sensitive and responding to changes within it and around it - in constant dialogue with its environment. Its many components are always alive, always interacting creatively with parts directly around them. These interactions form patterns all by themselves—they do not organise according to some sort of externally imposed blueprint—so complexity theorists describe such systems as *self-organising*. New novel forms of order are continually emerging. The key to a healthy system—able to adapt creatively to changing conditions—is *diversity* among its parts.

Overall, in complexity theory knowledge and action are understood as continuous invention and exploration, produced through relations among consciousness, identity, action and interaction, objects and structural dynamics. New possibilities for action are constantly emerging among these interactions of complex systems, and cognition occurs in the possibility for unpredictable shared action. Knowledge and therefore responsibility cannot be contained in any one element or dimension of a system, for knowledge is constantly emerging and spilling into other systems. No actor has an essential self or knowledge outside these relationships: nothing is given in the order of things, but performs itself into existence. In educational applications of complexity theory, attention is drawn to the relationships among learners and the Learning is defined as expanded possibilities for action, or becoming 'capable of more sophisticated, more flexible, more creative action' (Davis, Sumara, & Luce-Kapler, 2000).

These principles of co-emergence and interpenetration of people and objects, the flows connecting them, the uncertainty arising from their many interactions and the self-organization emerging from the system's diversity and creative adaptations are helping to challenge conceptual subject/object splits. Complexity theory refuses the notion that universal laws can be applied to systems of activity, that autonomous individuals are separated from Others, that they act according to independent choices and rational intentions, and that therefore they bear personal moral responsibilities that govern their choices for action. These notions point towards a complexified view of responsibility as woven into fully embodied nets of ongoing action, invention, social relations and history in complex adaptive systems.

The problem of responsibility in complexity theory

Nonetheless, it becomes immediately apparent that certain dilemmas are generated when reading responsibility against complexity theory, at least as represented by the themes selected for discussion here, and when reading both *with* educational considerations.

What forms and meanings has responsibility in an emergent universe?

First, a central dilemma is whether notions of responsibility, understood as either response or obligation, are at all compatible with a complexity universe of flows and co-emergence. As Bai (2003) asks, what does it mean to be a human being, a person, in a relational universe? How does one being relate to another, and what is it for relational beings to have responsibility towards each other? Since educational processes fundamentally shape particular conceptions of humanity and social behaviors among learners (and teachers), these are central questions. Complexity itself neither

implies nor encourages any 'oughts' for behavior among its elements, and educators are left to map their own answers to the central question: How should we act in a relational universe? Clark (2003) argues that we need an ethics to negotiate and regulate conditions of uncertainty. This may be particularly pressing when we believe all of our actions are so interconnected as to pose profound implications for the system's emergence. For educators, who are also pressed in the thick of emergence to form judgments that affect students immediately and the community eventually, the question of responsibility is about how to approach such judgments when one cannot know what shapes are emerging let alone assess them as desirable or undesirable.

The notion of co-emergence also invites considerations about what sorts of responsibility might arise out of entanglement in volatile processes, and what forms of novelty and surprise might arise out of response and responsibility in emergent processes. If actors simply respond spontaneously, care for the vulnerable may or may not emerge: indeed, social history has proven quite the opposite. And accountability, which rests on notions of personal and collective responsibility, remains an important if currently over-rationalized dynamic in educational purpose and delivery. What are the implications of responsibility when causes cannot be disentangled from effects? Finally, co-emergence requires conceptualization of responsibility in an inter-objective universe, where the flows connect humans and non-humans. How do we understand responsibility to and among objects (and tools and discourses), and from objects to humans?

How can alterity and care for others be understood?

Second, if there is no autonomous, determinate individual separate from interactions and relations embedding and co-specifying all actors within the webs of a complex system, who takes responsibility for whom? Bai is one of the few who have undertaken close examination of ethics in complexity theory. She describes being as 'inter-penetration', and writes that "to speak of an object is to speak in a shorthanded way of the patterns of complex, dynamically interpenetrating relationships. These relationships are dynamic, non-linear, hence non-deterministic We are our relationships. We are nothing other than our relationships—with each other, with the world."

This statement might be interpreted to imply that there is no distinct Other to which a subject is called to respond, and therefore no singular subject to feel and heed this call. Yet co-emergence and self-organization depend upon diversity, and interaction among diverse parts. For diversity and difference to exist, there must be distinction among elements: there must be alterity. And where there is alterity there must be singularity, and symmetry among singularities is hardly reasonable to assume; indeed, social theory has established the ubiquity of asymmetry in social systems. Even when subjects are considered to be partially singular but connected in relationship, we are led to ask what compels these relations, these inter-connections, beyond chance encounters? Psychoanalytic theorists show how humans in educational pursuits of knowledge are influenced by desire, manifested as attraction and repulsion (Britzman, 1998). Social theorists show the influences of dominant cultural discourses, positional interests, economic and social asymmetries that govern behaviors and connections within social systems. Palladino and Sutton (2001) argue that complexity theory has failed to account for these influences. Asymmetry begs the

ethico-political question of responsibility among parts, which cannot be answered easily when the default position is to some ontology of inter-penetration.

What is desirable and what desires are possible in self-organization?

Education begs the question of what constitutes a desirable future, or even a desirable or healthy system. Complexity theory, however, does not indicate what is desirable beyond the survival of the system in some form —either to ensure maximum benefit for greatest number, to honour humanity, or to adhere a priori to rational ethical laws or virtues. Complex adaptive systems in the natural world do not necessarily care for their vulnerable parts, seek equity among parts, nor do they arbitrate assymetries. Many systems left to self-organize emerge as destructive, dehumanizing, even hierarchical systems which shut down rather than promote creativity. Indeed, the exercise of human desires, positional interests and power relations within any social systems often produce order and control rather than emergence. The few empirical studies available report discouraging outcomes of attempting to induce complexity among social organizations. Houchin and Maclean (2005) for example, in a longitudinal study of four organizations, showed that using complexity concepts of decentralized self-organization and promoting co-emergence through diversity, feedback and interaction actually induced anxiety that created fragmentation and reinforced power differentials. They concluded that self-organization can actually favour the powerful, marginalize or destroy the weak, and induce actions that cause destruction or degradation of some elements. One response to this could be that complexity was not actually created in these cases, but such an assessment implies that 'true' complex adaptive systems are manifestations of pre-existing ideal forms, which contradicts the central tenets of self-organization and diversity. But the other issue of self-organization and creative adaptation, as Blanchot (1995, p. 2, 48) points out, is that what may be for some an act of creation, an irruption of novelty, is for others a 'disaster'—loss, disorientation, a radical unworlding. In fact, destruction and destabilization are necessary part of continuous organizing processes of systems operating far from equilibrium. This disequilibrium promotes and is promoted through experimentation and play, but also through rupturings, disasters, and deaths. What position can responsibility take in such conditions? How can an educator act, and towards what educational purposes?

Re-thinking responsibility in complexified education

Writers who have applied ideas from complexity to education in school as well as work environments tend to describe the dynamic non-linear interactions as benign encounters of co-specification out of which new creative possibilities emerge. Kauffman (1995, p. 30) describes the world of complexity as one of 'enchantment' marked by 'gentle reverence for ever-changing and unpredictable places in the sun we craft ever anew for one another'. Bai (2003) writes of universal beneficence and generosity. Davis (2004) claims that complexity discourses "advocate an attitude of mindful participation in the unfolding of personal and collective identities, culture, intercultural space, and the biosphere" (p. 176). Davis and Sumara (2005) encourage teachers to induce emergence in classrooms by creating conditions that have

been associated with complex adaptive systems: diversity, interaction, redundancy, decentralization, and feedback. In this invocation educators insert themselves as responsible agents into a system, manufacturing conditions to produce effects based on a view of a desirable future—continuous adaptation, creative improvisation, collective co-emergence of knowledge and action, and so forth.

But when such a view is constructed entirely within complexity theory, its proponents may be tilting towards a certain totalization in the same way that those arguing for social justice impose a view of structural oppression and desire for social responsibility on education. In both cases as for us all, a moral imperative is at work, reminding us to ask ourselves where is the self-reflexive awareness of the theorists' own positional interests, what explicitly is the view of responsibility, and how can this view be justified within its own theoretical parameters.

Yet to eschew the insertion of responsibility in educational processes for fear of controlling or colonizing others is, as Biesta (2005) points out, to be irresponsible. The educator must *do* something to fulfill responsibility as educator, must bring about something, must act purposefully. So, given these issues, what can responsibility mean in a 'complexified' educational vision?

Immediacy—Focus on the imminent

One place to start is with a little book entitled *Ethical Know-How* by Francisco Varela (1999). While Varela is speaking from a theory he and colleagues called enactivism, his tenets of emergence, inter-connectedness through co-specification, and self-organization are closely aligned with the themes of complexity theory adopted for this discussion. His work is frequently referenced by educational writings that incorporate complexity science (e.g. Davis, Sumara and Luce-Kapler, 2000). Varela argues that ethical knowhow is enacted in spontaneous everyday responses—"immediate coping" rather than through acquiring and applying ethical rules. He claims that despite our illusions of reasoned choice and intentional action, "we always operate in immediacy in the world" without deliberate pre-reflection that effectively governs our behavior. Therefore ethical learning, for Varela, is about discovering how one acts through immersed with others in the everyday: that is, reflecting on one's ways of participating with others and the consequences of these encounters. He eschews the disciplining of behavior towards any pre-determined 'good', arguing instead for removing barriers to "natural ethical wisdom" innate in beings, a wisdom that Varela maintains prompts "spontaneous compassion".

It is here that Varela indicates what responsibility might mean in a relational, emergent universe. First his notion of response focuses upon local encounters, in spatial terms, and his temporal focus is upon the immediate—connections and immersions unfolding as they are enacted. Varela's emphasis is on the quality of the connection itself, on what is created in-between and with-in beings in the moments of encounter and interaction. That Varela is concerned with compassion in these encounters is particularly telling: compassion—with passion, especially *suffering with*—invokes emotions of ardency, abandon and desire as well as empathetic caring, even solidarity with the other. However, Varela does not clarify why this quality emerges or is desirable, nor what prompts compassion among beings—or even the relation of compassionate response: whether mutual or directed towards the one

in need, conditional or unconditional. An equivalency among beings appears to be assumed, as though positionality is not at issue.

Further, Varela's conception of spontaneous response, while it may describe an individual's experience of responding or even a casual viewer's perception of responsiveness, does not explain the complex relations at work. What causes the response to this one and not that one? Why a response in this way and not some alternative? The source for Varela's focus on compassion is also ambiguous. It derives not from complexity science's explanations of behaviors across systems. Indeed as Varela develops the idea with reference to "a transcendence of ego" and "freedom from the 'grasping' desiring I", he seems to be applying moral guidance from some doctrine external to complexity science, in ways that take us back to 'teaching' particular forms of 'response' approved by some pre-determined universal principles of the good.

However Varela's encouragement to attend not to ethical laws but to the responses and connections that emerge in immediate local encounters among beings is helpful, and reminiscent of Bauman's (1993) writings about ethics in a postmodern age. Ethical being, writes Bauman, embraces uncertainty, lets go of rational intention, and engages the micro-interactions. Reason will deprive the self 'of what makes the self moral That non-calculable urge to stretch towards the other, to caress, to be for, to live for, happen what may.' (p.247)

Openness – Seeking new connections

Responding to 'calls' of others requires a discernment of these calls to begin with. Karpiak (2000), another educator drawing upon complexity science, writes at length about attunement: the capacity to sense other possibilities. This has some resonance with Levinas' emphasis upon a general orientation to connection with the other. Bai (2001) also describes this orientation, which for her comes through an awareness and desire for interconnectedness. Such attunement or orientation to connection presumes an openness, which poses questions about when and to what are elements disposed to open themselves to connection with other elements?

The dynamic of opening is also treated by Deleuze and Guattari (1987), whose concerns with processes, flows across bodies, and complex becomings seem consistent with themes of complexity science. Further, unlike Levinasian ethics modeled on a subject-to-subject, self-to-other relation, Deleuze and Guattari in no way privilege the human, phenomenological subject. In their discussion of processes of becoming, they portray a driving force of creativity manifesting in the desire to seek out new connections. In the resulting excess of energy the self is always open to reconfiguration but also interlinked with the environment in ongoing exchange. This will to encounter and connect is itself ethical: a body opening to others. Such opening, such vulnerability, is a risk. There is always uncertainty as to the resulting possibility or connection bringing harm or creative transformation. But then all generative forces are violent, destroying current existence. Drawing from these ideas, Clark (2003) concludes that to act ethically is to remain attuned, receptive and responsive, working with the forces at hand: the dynamics of the system in which one is implicated. The attunement or opening is not only an acceptance of risk, but a generous orientation: Deleuze and Guattari (1987) write that the relations of generosity and generativity are at the heart of becoming and the advent of

the ethical. Indeed, Bai (2003) emphasises what she calls ‘the generosity principle’ animating ethical relations in complexity.

Leaping into uncertainty – Responsibility without knowledge

While these reflections on a generous orientation and openness to connection help address the question of how we become sufficiently aware to respond to others’ call, they still leave open the question of who we are drawn to, and why, and with what consequences in a complex universe of asymmetrical beings. One source of assistance here may be Derrida (1995), whose later writings on ethics expanded and extended Levinas’ conception of the compelling call to respond to an other unconditionally. Derrida, like Varela, portrays responsibility not as an abstract notion but an intimate and everyday experience:

Always there is implied involvement in action, doing, a *praxis*, a *decision* that exceeds simple conscience or simple theoretical understanding. It is also true that the same concept requires a decision or responsible action to answer for itself *consciously*, that is, with a knowledge of a thematics of what is done, of what action signifies, its causes its ends, etc. (Derrida, 1995)

In particular, Derrida emphasizes that any action of responsibility requires a ‘leap into uncertainty’, beyond what can be known, beyond the existing laws and norms of responsible behavior. One main reason for this uncertainty is that one’s action is always, in a sense, damaging. This is because of all the other Others that are and must be excluded in responding to the call of a particular Other. The example Derrida dwells upon is drawn from Levinas’ own explanations: the near-sacrifice of Isaac by his father Abraham following direction from God. In responding to this call of the Father, Abraham must betray both obligatory paternal bonds and community standards for which such infanticide is unthinkable. As Derrida concludes: “I cannot respond to the call, the request, the obligation, or even the love of another, without sacrificing the other other, the other others” (Derrida, 1995, p 68). The unrealized possibilities in the calls of these other others, and our irresponsibility in turning from them, haunt our every decision and action. This is why, according to Derrida, our enactments of responsibility must unfold in secrecy, and involve sacrifice. We always sacrifice others to respond to the immediate, and our action of response is far too complex to withstand the judgment of community standards and universal laws which are always more simplistic than everyday dilemmas. In fact, Derrida cautions that one never ‘act in good conscience’, following universal principles, because to do so is irresponsible: one simply resorts to generality rather than participating fully in the conflicting calls of the immediate. So, true responsibility consist in oscillating between the demands of that which is wholly other and the more general demands of a community. Responsibility is enduring this trial of the undecidable decision, this interminable experience, where attending to the call of a particular other will inevitably demand an estrangement from the “other others” and their communal needs, and where closure to the problem is never reached. Whatever decision one may take, according to Derrida, it can never be wholly justified. Thus this decision is a leap into uncertainty. To act otherwise, to resort to ethical laws or community directives, dissolves one’s singularity, one’s coming into presence—in presence of this singular other that is calling one forth.

Conclusion

In this preliminary exploration of responsibility read both with and against themes from complexity science in educational contexts, I have tried to highlight some useful intersections. It appears that reflections on responsibility by Levinas and Derrida are resonant with complexity science in emphasizing the importance of *relations* among beings, and of 'becomings' as generated within these relations, not pre-existing them. What responsibility issues raise are questions about just how, when and what beings relate to others in different circumstances. These questions help invoke the ethico-political dimension that is inherently absent in complexity science, which is one reason why its precepts have sometimes proved difficult to apply to social systems fraught with power relations, desire, positional interests, and economic and social asymmetries. Considerations of responsibility also illuminate certain silences in complexity science, as we are currently applying it, around issues of alterity and difference, care for (vulnerable) others, what constitutes a desirable future, and how one should act in a relational universe—all issues that educators must deal with.

But I have also explored some helpful alternatives offered by complexity themes to certain notions of social responsibility that have become rather uncritically embraced in educational theory and practice, particularly in contemporary adult education. Ideas of consciousness-raising, resistance and emancipation—indeed, any moral imperatives driving an educational vision imposed upon others—are deeply problematic. Complexity challenges these notions to consider webs of relations, interconnectivity, and emergent designs and strategies. To expand upon these themes, drawing from philosophical writings on responsibility, we are led to consider the nature of response to one another among beings, and the consequences of this response. From these writings I have suggested alternative approaches to educational responsibility that remain consistent with complexity themes but that incorporate considerations of power, positionality, language and desire that are key dynamics in human systems. These approaches include focusing on the immediate and imminent, opening to the possibility of connections, attuning to the other's call and responding to it, leaping into uncertainty by accepting the turmoil of sacrifice and secrets attending one's participation in response.

But to return to the central problem of living responsibility according to these characteristics or any others while unsettling the very notion of responsibility—Gert Biesta (2005) advises that educators end up living the double: the responsibility of the undoing while doing. This follows Derrida, who talks of being committed to both design and its transgression. Biesta writes that educators must give up their strategies and curricula, and take a responsibility for something that they cannot know, "a responsibility without knowledge".

Ultimately, what responsibility means for education, from a complexity perspective, is actively living in the aporia—between collective law, the unconditional call of an other, the call of other others—with no certainty about what might emerge or what is right. But still, we can and must act within this undecidability. It is in our attunement to the imminent, our openness to connective possibilities, and our active response to calls of these possibilities, despite their risk, that we and others emerge in educational relationships.

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