

Exploring the Complementary Nature of Education and Learning

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The paper by Joakim Larsson and Bo Dahlin “Educating far from Equilibrium: Chaos Philosophy and the Quest for Complexity in Education” can be called a manifesto of anti-dualism. Inspired by Dewey’s century old creed, the authors present a well-researched argument for a complementary approach towards balancing historically conflicting modes of thinking, knowing and educating. In my response to their article I will focus on both philosophical and scientific sources that exemplify the principle of complementarity – first called as such by Niels Bohr who problematized the mutually exclusive descriptions of nature at its most subtle, quantum, level in terms of either particles or waves.

In the move from *either/or* to *both/and*, Bohr saw a connection between his idea of complementarity and Eastern philosophy. His epistemic position considered that what we may perceive as binary opposites at the level of ordinary experience are in fact not contradictory but complementary. For Bohr, the interplay of *yin* and *yang* tendencies forming one integrated whole in Chinese philosophy of Taoism was relevant to, and informative for, his principle of complementarity in physics. Yet the adoption of the *both/and*, integrative, principle as it has been in the physical science, appears to have been long overdue in social sciences, including education.

Integrative or holistic practices are largely absent among Western educational systems and relegated, if at all, to Eastern traditions and philosophies, such as Tao, Yoga, or Buddhism (cf. Roberts, 2012). The Western philosophical thought and, by implication, existing educational theories continue to be informed by the Cartesian substance dualism with its strict division between *res extensa* (corporeal substance as extended, material, body) and *res cogitans* (incorporeal substance as immaterial, non-extended, mind). Education habitually confines itself to narrow instrumental rationality, the logic of which is reduced to reasoning directly from premise to conclusion without risking an inclusion of any uncertain, in-between categories such as interpretation or mediation. So in the West, philosophy and education alike continue to suffer from the great bifurcation between such supposedly opposite, dual, categories as subject and object, mind and body, or – at the sociocultural level – self and other.

The kind of integrative approach that reconciles what otherwise are doomed to remain the contraries derives from what is called systems thinking, which considers every living system as a network. The idea is not new: the *philosophical* concept of a network in its different guises has been in existence since ancient times to convey the meaning of interrelated, interconnected, interdependent – that is, relational – phenomena; from medieval mysticism to Neoplatonism to the current poststructuralist turn such as pertaining to Gilles Deleuze's philosophy as indeed elaborated upon by Larsson and Dahlin. The method of *analogy* (versus linear logical reasoning) that mystics around the world have practiced for centuries defies the privileged role allotted to the conscious subject that observes the surrounding world of objects – from which he is forever detached – with the cool “scientific” gaze of an independent spectator so as to obtain a certain and indubitable knowledge or *episteme*.

Mystics and poets (from whom Plato used to withhold academic status) historically played a participatory, embodied role in the relational network that forms an interdependent holistic fabric with Nature, thus overcoming the separation between subject and object, between self and other. This split has been haunting us since the time of Descartes, confining us to what philosopher Henry Corbin used to call the “banal dualism” of matter versus spirit (cf. Semetsky, 2011). Corbin coined the in-between ‘Imaginal world’ representing a distinct order of reality corresponding to a distinct mode of perception in contrast to purely imaginary as the unreal or just utopian.

Still, such participation remains foreign to *classical* science founded on the Newtonian mechanistic paradigm with its linear causality and the separation between subject and object, between observer and observed; it appears alien as well to the Cartesian dualist philosophy that contrasts body with mind, thought with the world and knowledge with action, and which still plagues both educational research and the bulk of educational philosophy. In the area of philosophy of education, Nel Noddings' (1984/2003) ethics of care uses the concept of *relation* as a fundamental point of departure in both personal and global contexts. Relation is both ontologically and epistemologically basic. It is a relation that establishes a correspondence or analogy between the mind and the world: this connection allows us to conceive of the human mind as being *extended* towards the natural world – versus it being confined within the isolated Cogito – and thereby defying its own status as non-extended and immaterial. Serving as a minimal unit of analysis, relation interrogates a stable subject position taken by an independent and autonomous agent equipped with anthropocentric consciousness.

So far, behavioral and social sciences, including the discipline of education, have been modeled on a limited and narrow view of natural sciences, ignoring the concept of a network in terms of the interconnectedness between people and events. The reductionist paradigm and the fragmentation of knowledge continue to remain in full vogue. But, and contrary to the reductive approach of mechanistic science, systems science is founded on the concept of the web of life. The web – as a network of relations – conveys the idea of the *interwovenness* (see Capra, 1997) of all phenomena.

Fritjof Capra is adamant that many societal problems represent different facets of one single *crisis of perception* that derives from the fact that the influential people in Western culture – among which, importantly, are many of educational leaders – still subscribe to the concepts of an outdated worldview represented by a perception of reality inadequate for dealing with/in a world as a complex interconnected system. Systems science, as Capra reminds us, implies a shift from measurable quantities to qualities – the fact indeed noticed by Larsson and Dahlin. These intensive qualities comprise what Deleuze and Guattari dubbed “nonmetric, acentered, rhizomatic multiplicities” (1987, p. 381) as the dynamic patterns (cf. Kelso, 1995) of relations whose functioning is described in terms of the radical conjunction *and*.

Taking two, different, terms that are apparently opposed to each other, A versus B, Deleuze instead connects them, making them a couple: “A *and* B. The AND is ... the path of all relations, which makes relations shoot outside their terms” (Deleuze & Parnet, 1987, p. 57). The relation *and* is external to its terms and forms a *transversal* (cf. Semetsky, 2008) – that is, non-linear – connection between the heterogeneous levels on which these terms are “located”. Being mutually coupled, A and B do form one complex system of analogical (not strictly logical) relations. Still such relational, non-linear, structure – a network, a rhizome – does not presuppose the absence of logic. In fact it is “fundamentally linked to a logic – a logic of multiplicities” (Deleuze & Parnet, 1987, p. viii). This is an unorthodox logic of both/*and* versus either/*or*: A and B are not some conflicting dichotomies but form one complex whole – a multiplicity, in Deleuze’s terminology – in which a transversal line inserts itself “not so much... in their opposition as in their complementarity” (Deleuze & Parnet, 1987, p. 131).

Deleuze’s example of learning to swim in his magnum opus *Difference and Repetition* (1994a) is paradigmatic of such a complementary relation between body and mind that is embedded in a complex system of mutual relations. A novice athlete learns to swim via intense bodily encounters with waves. She struggles because she is facing the unknown and yet unthought-of that includes her not-yet-knowing-how-to swim. She indeed exists in a far from equilibrium, chaotic state while forced to face a real-life problem: swimming or sinking! Learning cannot be based on an *a priori* conscious representation; this would be the reproduction of the same, denounced by Deleuze. Instead Deleuze emphasises the “sensory-motivity” of the genuine learner who, exemplified in the image of the novice athlete, tries to *coordinate* her own sensor-motor activity with an intense, as if opposite, force of water.

A swimmer’s real environment is Nature, historically associated with the unconscious as opposed to the conscious rational mind that can “conquer” it. In contrast to this dualistic model, a swimmer is learning in practice, in her *embodied* experience, that thinking is “... not just a theoretical matter. It [is] to do with vital problems. To do with life itself” (Deleuze, 1995, p. 105). Thought and non-thought, mind and body, consciousness and the unconscious, are both engaged in practical, experiential and experimental, learning. For Deleuze, the task of philosophy is the creation of concepts, such as a concept of swimming that *emerges* for a novice athlete within the very process of her learning to swim. It is not enough for the creation of concepts to be informed by empirical sense-data passively received by an independent spectator.

A learner’s experience is transcended (Deleuze’s empiricism is radically transcendental) by virtue of multiple bodily *affects* that permeate experience and express themselves “in and through the unconscious, thereby establishing the bond of a profound complicity between nature and mind” (Deleuze, 1994a, p. 165). Via multiple feedback between herself and the sea, a swimmer continuously reevaluates her experience. Such an evaluation is an effect of the encounter with the unknown and the unconscious, as yet unthinkable because it is not conceptual but affective whenever a learner’s emergent knowledge is being coordinated with her bodily actions. The swimming example presents the sea as a literal embodiment of fluid uncontrollable forces and the epitome of a “substratum in the depth of the subconsciousness, the basic pattern of the relations of the live creature to his environment” (Dewey, 1934/1980, p. 150).

The prerogative of thinking as a method of resolving what Dewey called disturbing, perplexing and problematic situations is taken away from the Cogito, the supposedly *a priori* self-conscious and knowing subject, and is being put back in the very bodily, spontaneous and unconscious, interaction with the natural world. It is such an interaction – a relation, indeed – that enriches a purely cognitive process with an affective dimension acknowledged by both Dewey and Deleuze; and emphasized by Larsson and Dahlin in terms of “Schiller’s domain of *Spiel*” as a creative domain. Such

affective thought transcends the boundaries of the conscious Cartesian subject; and the libidinal economy of the unconscious is an important factor that influences human learning. The ultimate task of education, according to Dewey, consists in nurturing a particular “type of mind competent to maintain an economical balance of the unconscious and the conscious” (Dewey, 1991, pp. 215-216) that should include, besides intellectual seriousness, an element of free play as well. It is the unconscious that “gives spontaneity and freshness” (p. 217) to our experiences while consciousness provides a necessary dosage of control.

So, apart from the recourse to mystical or Eastern philosophies, what may be the comprehensive framework for achieving an economical balance – that is, being able to maintain a complementary relation – between the apparent opposites at all levels of description, both theoretically and practically? The cutting-edge empirical science of coordination dynamics grounded in the philosophy of so called *complementary pairs* provides an answer (Kelso & Engstrøm, 2006) while also bridging the gap between sciences and humanities, especially important in the context of educational philosophy as a discipline that often finds itself within a schizophrenic schism between education as a social science and philosophy proper and, as a result of this in-between mode of existence, experiencing a sort of perpetual identity crisis.

Kelso and Engstrøm (2006) present the complementary aspects as being inextricably linked so that what we habitually perceive dualistically such as mind and body in fact form one complementary *bipolar* pair not unlike wave and particle at the subatomic, quantum, level as discovered by Bohr. The “poles” are engaged in the coordinated relational dynamics so that they are “mutually coupled” (p. 41). It is such a coupling that demonstrates a continuous balancing act pertinent to a relational network whose defining characteristic is the presence of feedback loops, or reciprocity as a mutualist or circular causality. These feedback loops enable self-regulation and self-organization, hence breaking the linearity of the habitual direct mechanistic cause-effect link or, at the level of reasoning, a direct link from a stable premise to a single logical conclusion full stop, uncorrupted by any mediation.

The corollary is that a complex system is capable of *maintaining its balance* due to the self-regulating action of feedback that act upon an error or deviation (addressed by Dewey in terms of *tension*) which may happen because of the disruption in the system’s equilibrium. The term complexity, etymologically, is adapted from the Latin expression *complexus*, which literally means “plaited together”: *com-* (together) and *-plexus* (plaited) (cf. Alhadeff-Jones, 2008). *Plexus* shares a similar root (*plectere*) with the French noun “*le pli*”, which means “the fold”, and another meaning of this term is “network”. Complex structures are enfolded, self-referential, structures. Error describes a chaotic fluctuation as the tension or difference between an organism and its environment that creates a far from equilibrium condition indicating the presence of a problematic, unstable and uncertain, situation that signifies the lack of balance pertaining to this situation. While Larsson and Dahlin refer to self-organization in their paper, the mechanism of its functioning appears to be underexplored. Yet the concept of self-reference or self-organization is crucial for networks and specifically in the context of learning as one of the central parameters of education.

It is a self-organizing process that enables any community, taken as a system, to learn, and importantly, as Capra stresses, to learn from the occurring errors or deviations, because these errors travel along and necessarily fold back into a system so that community can learn from the occurring deviations by reevaluating its experience of the latter. Such is a community’s learning capacity, as Capra says, and which constitutes its very intelligence. Dewey would have agreed: he asserted that the prerogative of cooperative – or coordinating, using Kelso and Engstrøm’s term – dynamics consists in the “response to another’s act [that] involves contemporaneous response to a thing as entering into the other’s behavior, and this upon both sides ... It constitutes the

intelligibility of acts and things. Possession of the capacity to engage in such activity is intelligence” (Dewey, 1934/1980, pp. 179-180).

And true intelligence is always already a creative intelligence. Dewey spoke about the cooperative or civic intelligence necessary for associated living which, for him, was what democracy is all about. It is due to the presence of feedback loops that a system tends to become creative of its own novel modes of existence as new ways of knowing and being that therefore function as emergent properties manifesting at some critical – as Capra would say, *turning* – points in the dynamic process of the complex system’s evolution and learning.

The aforementioned story of a novice athlete learning to swim is indeed exemplary in this regard. This is what creative intelligence is about: to swim and not to sink. A real-life unpredictable situation necessarily “frees [thought] from truth as supposed paradigm and reconquers an immanent power of creation” (Deleuze & Guattari, 1994, p. 140). Such “thought” is not an exclusively cognitive faculty. It partakes of the unconscious because it does not “spring from reasoning, but from an *immediate coping* with what is confronting us ... [It is] the situation [that] brought forth the actions from us” (Varela, 1999, p. 5, italics in original). Deleuze used the French verb *savoir* as knowing-how to emphasize the difference of such a vital experiential education from the traditional formal instruction. Only through multiple connections between itself and its other (its environment) “an organism increases in complexity” (Dewey, 1934/1980, p. 23) – it learns! Dewey insisted that the more an organism learns the more it still has to learn. The system can evolve towards ever new levels by means of continuously reorganizing itself as to achieving a series of unsteady temporary equilibriums from initial disequilibria: order from chaos.

Non-incidentally, Kelso and Engstrøm (2006) do refer to Capra with regard to the basic *interdependence* of polar terms in contrast to the dualistic opposition that makes the terms in a relation independent of each other. A pair – a couple – is always already bipolar with poles enfolded into each other, such as a swimmer and the waves. The terms in the relation are coupled or connected, that is, their logic exceeds a classical syllogistic logic that does not allow for the inclusion of an in-between relation, which enables a feedback loop and makes a system self-organizing or self-referential. It is exactly “self-reference [that has] been making trouble for philosophers for centuries” (Kelso & Engstrøm, 2006, p. 253) – for analytic philosophers, to be precise, for whom logic is limited to linear propositional thinking as the prerogative of Cogito that declares “I think” *a priori* while disengaged from action.

Kelso and Engstrøm use the tilde as a squiggle “~” for pinpointing such in-between relation to indicate a syntax – what Deleuze called “a grammar of disequilibrium” (Deleuze, 1994b, p. 27) – describing this complex dynamics. They assert that in “the case of human beings, complex nonlinear self-organizing systems of energy~matter have managed to evolve to the point of organizing a sense of self~other” (2006, p. 253). A self-referential relation is what establishes the meaningful correlations between/across different levels – Deleuze-Guattarian *plateaus*, as insightfully noticed by Larsson and Dahlin – comprising a complex dynamical system, in which “sensory and motor, perception and action, are reconciled” (Kelso & Engstrøm, 2006, p. 47) as a couple. The tilde symbolizes a relation as an “entity [that] circulates in both series ... and [is] at once word and thing, name and object” (Deleuze, 1990, p. 40) by virtue of the two functioning as one complementary pair.

We may list an unending multiplicity of reconciled complementary pairs in which the terms are coordinated, that is, they exist in balance and harmony in a state resembling the Aristotelian golden mean: *res cogitans~res extensa*, body~mind, rationalism~empiricism; science~art; organism~environment; yin~yang; immanence~transcendence; nature~nurture; individual~society; private~public; certainty~uncertainty; novelty~confirmation; material~spiritual; and so on. In the area

of children's moral and spiritual education, Radford (2006) addressed an "inescapably tense relationship between inner and outer perspectives" (p. 393) and challenged the dualist approach to "inner and outer realities... in favor of an understanding in which we see ourselves as part of the social and natural" (Radford, 2006, p. 385), greater, world where our actual physical experience is enriched with the spiritual dimension, thereby demonstrating the reality of the virtual.

Indeed, Deleuze's is the ontology of the virtual that reflects not static *being* but dynamic *becoming* (Semetsky, 2006). The level of the virtual is no less real than any actual existence, and Larsson and Dahlin positing their innovative construct "virtual pedagogy" as relevant to Steiner-Waldorf schools would have also benefited from the detailed analysis of the actual~virtual relationship as it appears in Deleuze's many works (e.g., Semetsky, 2009) in addition to *A Thousand Plateaus* as cited by the authors. In Scholastic terminology, for example, virtual means the ideal or transcendental, but not just possible: it is maximally real, *ens realissimum*. Virtual tendencies have the potential of becoming actualized: it is "from virtuals [that] we descend to actual states of affairs, and from states of affairs we ascend to virtuals, without being able to isolate one from the other" (Deleuze & Guattari, 1994, p. 160): both are enfolded in one complementary pair.

Such analogical relation (undoubtedly, a contradiction in terms for the philosophers in the analytic tradition who would not hesitate to label this logic circular) is akin to what contemporary mathematician Louis Kauffman (2010) calls virtual logic that spreads beyond true facts into the world "populated" with aesthetic moments, the significance of which is duly noticed by Larsson and Dahlin.

Mind and nature cease to be "conflicting, or competing aspects – *contraries*" (Kelso & Engström, 2006, p.186) but become coordinated, thus complementing a theoretical *episteme* with practical *phronesis* resulting from the feedback between knowledge and action (cf. Varela, 1999). It is when the human mind "comes in contact with the world" (Dewey, 1934/1980, p. 267) that novel concepts become created – such an affective, creative act being both a prerogative and the would-be pragmatic effect of cooperative dynamics. This virtual contact (symbolized by "~") is what keeps the complementary mind~world pair in balance due to coupling so that the mind and the world continuously sustain each other. Only when grounded in such reciprocal relation the human mind can become capable of genuine creativity that manifests itself as an emergent property pertinent to non-linear complex systems.

All natural, nonhuman structures as open-ended, interactive, complex systems tend towards emergence as a condition of their own sustainability and evolution. Yet human structures in our culture, which are often designed on the basis of an *a-priori* planned, purposive and conscious activities and pre-existing theoretical goals, missions and/or policies, often tend to crystallize and become rigid, thus closing themselves to new opportunities and new "ends-in-view", as Dewey would have said. They stop learning. The task of transforming human structures into mutually coupled pairs that are coordinated with the natural world represents a contemporary challenge at all levels, among which the level of education is crucial (Semetsky, forthcoming).

The question of educational leadership becomes important even as the very notion of a leader as an *individual* moral or epistemic agent is moot. A creative leader is always already embedded in the relational, cooperative dynamics. A leader's responsibility becomes, rather, *response-ability* (cf. Klyukanov, 2010) as an intelligent and ethical, integrative (Semetsky, 2012) act that balances chaos and order, novelty and confirmation, self and other. It is multiple couplings and feedback that create a cooperative dynamics within those existing structures; this produces a different image of leadership from the role that has been traditionally reduced to maintaining the *status quo* and ensuring the structure's stability rather than promoting its growth and development. However, the educational leader who is aware of both the science of coordination dynamics and the philosophy of complementary pairs would have

facilitated the emergence of the novelty, hence promoting conditions for supporting creative tensions even if the existent well-ordered structure might have been temporarily destabilized or even broken.

It is the creative breakdown of the *status quo* as performed by the free spirit of the leader that is able to enrich practical experience with “the magic of the artist” (Dewey, 1934/1980, p. 118); and it is specifically a creative artist equipped with such “special sensibility” (Noddings & Shore, 1984, p. 66) who has an ability to be especially attuned to the environing world, forming with it a single organic whole. As Larsson and Dahlin succinctly put it, she (a teacher, a leader, the rest of us...) “must not cling to conceptions of what *should* happen in school”! To overcome the current crisis of perception (and conception) is a life-task of contemporary education.

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