Creating Conditions for Healthy Learning Organizations: Embracing Complexity and Principles of Healthy Dynamical Living Systems

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Abstract

Complex collectives and phenomena – the mind, physiological subsystems, the biological body, social and cultural configurations, governance structures, evolved species, and the larger ecosphere, for instance – manifest themselves in many diverse forms across a wide range of possible dynamical patterns. Over the past two decades, these various and varying complex collectives increasingly have been thought of, and described in, terms of certain dynamical principles and patterns, framed by the emerging contemporary field of "complexity science." These complex collectives, conceived as "bodies" or "living" organizations, are extending the usually-taken-for-granted sense of an organizational body. As such, the notion of what a "healthy" body might look like for other complex living organizations can be raised, allowing one to consider what a healthy learning organization might look like for social collectives of various kinds.

Conventional medical research suggests that physiological irregularities reflect the presence of particular pathologies or disorders. These irregularities, however, appear as highly *ordered* patterns determined by stable, predictable processes. Healthy physiological systems, on the other hand, show differently ordered organizational patterns and processes that reflect a number of important organizing principles for complex living forms across various scales of organization. This paper will examine the dynamics and dynamical patterns of healthy learning organizations and possibilities for "healthier" alternatives through the use of cross-scale analogies of particular dynamical patterns between different "living bodies." By attending to a number of complexity-related principles behind seemingly disparate living phenomena, this paper will consider the possibility for healthy learning organizations and the kinds of conditions that need to be in place for such phenomena – starting with the need to change the way individuals *think* about organizations and the health thereof.

Introduction

> *Nature is not economical of structure – only of principles.*
> *-Abdus Salam*

In recent decades, an increasing number of scholars, researchers and practitioners have begun to embrace, to a far greater extent than previously seen in many different disciplines, a new way of thinking about and understanding living phenomena framed by concepts addressed in a relatively new and promising field known as "complexity science." To be sure, "complexity" (for short) is prompting a profound change in the thinking of individuals in a transdisciplinary and transphenomenal way (Davis & Phelps, 2005). This way of thinking and acting is marking an important paradigmatic shift and, as such, is announcing some important innovations in the ways in which we might continue to think about matters educational. As a conceptual framework for thinking about a variety of multidisciplinary concerns from the natural sciences to the social sciences, the study of complex phenomena, as a transdisciplinary framework, is more a study of dynamical patterns and processes rather than some particular manner of analytic inquiry (Davis & Sumara, 2006). Put differently, complexity science is proving to be helpful as a way for thinking about and understanding a world that is a vast entanglement of "bodies" of all kinds: anatomical subsystems, the biological body, social collectivities, political and governance structures, bodies of knowledge, the world of evolved species, and the ecosphere (Davis, 1996; Stanley, 2005a).

In matters of health, a traditional view of life, death, health and illness is rooted in everyday assumptions about the body-as-object that fills a particular space not shared by other bodies. In other words, our bodies are thought of as containers that can be discerned, distinguished, and identified from other bodies. The implications for such a notion suggest that the origination and location of disease, as one typically experiences it, is rooted *in* the physical body. As such, the notions and concepts of disease and illness are understood to be a malfunction of certain "building blocks" in the body that no longer work as they should.

So how do human beings become ill? Illness, conventional thinking suggests, is the result of some outside disturbance to one's physical structure. Of course, this sense of illness is not something that is accepted unconditionally by everyone. Nevertheless, such expressions of illness are, to be sure, common experiences felt by many people.

As Dossey (1982) reminds us, fragmentation and isolation are prominent phenomenological aspects of conventional and traditional views of health. Disease and illness are things that happen *to* us at any time, isolating us as human beings in the world. He continues:

> Bodies, as in the classical view of atoms, stand alone, both in space and in time. Although they form patterns, at heart they are single units in a deep, fundamental sense. Connectedness is seen only in terms of interaction of quintessentially separate bits and pieces. (p. 141)

To be sure, scholars and practitioners in the medical field and beyond find such a view of the world limited and limiting. As the concern here is for the living, the notion that life is a property of single bodies does not fit well with the view of life as an emergent qualia where the entire universe, with life springing up across different scales of being, is a web of connectedness. The living world itself is a "declaration of interdependence" (Berry, 2000).

Not only are connections and relations that constitute the living an important principle in matters of health, other principles are equally, and vitally, important: these include variability, non-linear interaction, and redundancy, to name a few. Consider the principle of variability, for instance: as a structural and dynamical principle for life across many scales of organization, variability is an essential concept for any discussion about various complex phenomena. Historically, when the notion of homogeneity was assumed to be an essential functioning principle for various scales of organizational bodies, any differences that were detected were assumed to be errors, abnormalities or deviances, which were then to be corrected (McDaniel *et al.*, 2003). This line of thinking has proven to be highly influential – although not always good – within and across several areas of human concern, including the manufacturing of goods, the education system, psychological services, and the legal system (Maruyama, 1982). For living phenomena, however, strong homogeneity or a lack of variability can prove to be potentially deadly for the health and well-being of living organizational bodies.

Considering the adaptive nature of living phenomena, the notion of living organizations as learning organizations is not far away. It seems quite appropriate, therefore, for this paper to consider in a broad manner the nature of "living organizations," as framed by the principles of complexity, in light of particular dynamical patterns that could be described in terms of healthy learning organizations. For this reason, the aim of this paper is to consider, as part of an emerging new mindset, the nature of healthy learning organizations in light of complexity science thinking as principles of healthy organizational bodies. As such, one might wonder, what does a healthy learning community, comprised, as it is, of diverse individuals, look like?

Dynamic Phenomena:
"Complicated" and "Complex" Organizational Structures

> *All things are connected like the blood which unites us all. Man did not weave the web of life, he is merely a strand in it.*
> *- Chief Seattle*

Historically, a number of different complexity-related theoretical frameworks – catastrophe theory, chaos theory, self-organized criticality, and complex adaptive systems are but a few – have emerged to describe a large class of dynamical phenomena, encompassing a wide range of forms, scales of organization, and organizational dynamics (Stanley, 2005a). Moreover, a growing collection of conceptual tools and theoretical perspectives, paradigmatic speaking, have emerged for the purpose of describing, understanding and creating the kinds of conditions – a non-exhaustive list of conditions, to be sure – for a wide range of complex phenomena. This trend towards understanding complex dynamical phenomena, framed in this manner, can be seen across the natural sciences and the social sciences (sometimes under the direct influence of or adaptation from the natural sciences) (Briggs, 1992).

Recently, a distinction has come into greater prominence in various literatures between the concepts of "complicated structures" and "complex structures" (Davis *et al.*, 2000; Zimmerman *et al.*, 1998). The distinction suggests a difference between a sense of "structure" that is fixed, rigid, and architectural and a more playful, adaptive, biological sense of the notion. Healthy living phenomena function in the latter mode; however, under duress, illness, disease or aging, living phenomena tend to *resemble* the dynamical patterns of stability, rigidity and sometimes death.

The 20th century, historically speaking, has seen a shift toward a realization that there are different classes of phenomena that can be categorized according to their underlying dynamics and the nature of their dynamical patterns. The complexity sciences emerged from this realization, suggesting the need for different interpretive and descriptive frames. Warren Weaver, an early cyberneticist and information theorist in the 1940s and 1950s, was one scientist to question and address, on a formal level, categorical differences in dynamical patterns. In a seminal paper written in 1948, he outlined three different classes of dynamical phenomena which he described as "simple," "disorganized complexity" and "organized complexity." Since then, this way of classifying dynamical phenomena has attracted the interest of many other natural and social scientists.

A "simple" system, Weaver suggested, could be thought of and talked about in terms of small numbers of independent parts or variables that determined the system: this kind of phenomenon, *e.g*., single-body projectiles, planetary orbits, and generally many mechanical systems, are composed of interacting parts that are well-defined. To Enlightenment thinkers like Newton and Galileo, such a framework proved to be sufficient to understand and model such systems.

Eventually, scientists and mathematicians envisioned more complicated systems where the number of interacting parts or variables that were used to understand or model the system were increased. As individuals considered systems with increasingly larger numbers of interacting parts or variables, the need for additional analytic tools became increasingly more necessary. As a result, statistical instruments proved quite useful – especially during the 19th century when the desire to study and understand more complicated phenomena took root, as with the need, for example, to have standards for various industrial equipment and factory-made objects.

These conceptual ideas and tools were quite different from those more fitting for the study of simple Newtonian mechanics. Weaver described this second class of dynamical systems as "disorganized systems." Whereas the earlier conceptual ideas for "simple" systems were appropriate for describing the interactive dynamical parts of some phenomenon, statistical tools and instruments provided a way to understand global behaviours of a collective with numerous *independent* parts. In other words, statistical inferences could be made for macro descriptions of systems where the analysis of large numbers of agents in interaction might prove to be computationally impracticable, if not impossible.

There are, however, a wide range of other organizational systems, including physiological systems, social collectivities, and cultural and ecological phenomena, that are not examples of disorganized complexity at all, but are what Weaver originally described as "organized complexity." Such phenomena, like classrooms or the workplace, the nervous system or traffic jams, are not particularly fitting for analytic tools that were originally designed to interpret chance events or statistical distributions. In fact, this third class of dynamical systems marked a big break and acknowledgement that such systems were volatile and unpredictable because they had a capacity to modify themselves or adapt. Today, the terms "simple" and "disorganized complexity" are not so prominent and have been reduced to the concept of "complicated" systems, and the term "organized complexity" has been reduced to the concept of "complex" systems (Waldrop, 1992).

In "complicated" organizations, moreover, the sum of all of the parts produces a complete "thing" that can be taken apart and put back together to its original form. Although the parts may be connected in a specific manner, there need not be any "relationships" *per se* among the various parts even though the various parts interact with one another in precise ways. Thus, in complicated organizations, "connections" are like strings that tie things together and the interactions and overall organizational dynamics are completely determined in their collective action. The relationships of complex organizations, however, as in human relationships, suggest something more than the mere interactions of agents or parts in a system. Relationships are the organizing principle for the world (Lewin & Regine, 2001). Herein lies an important organizing principle: the connected and connecting nature of relationships. Such a principle, moreover, is a critical one in matters of healthy organizations.

On the Meaning and Dynamics of Health and Disease

> *Health is not a condition that one introspectively feels in oneself. Rather, it is a condition of being involved, of being in the world, of being together with one's fellow human beings, of active and rewarding engagement in one's everyday tasks.*
>
> *- Hans Gadamer*

As Wendell Berry (1995) reminds us, we seriously must be diseased considering how much we hear about the state of our health. Health, as its etymological root suggests, is concerned with notions like "healing" and "wholeness." The lived-experience of disease and illness, however, tends to make us conscious of disconnectedness, incompleteness, and isolation that come from a sense of unhealthiness (Ratson, 2003). Questions about how and why so many aspects of our complicated and busy lives and the world around us seem so unhealthy appear in no small measure.

Indeed, health is not simply about our own biological bodies and how we feel in and with those bodies: it is about all relationships and the thoroughly connected world, in the varying degrees that it is, of which we are a part. Moreover, the idea of health involves more than the medical establishment and the science of medicine: it is a phenomenon with some hermeneutic relevance. Health is a matter of concern for us all as it is always and already about us, where this "aboutness" is simultaneously concerned with those things that are in our environs or our surroundings and the interpretive nature that one has with one's self (van Manen, 1998). To be sure, like many areas of human life, the field of medicine and health also has become the subject of immense technical domination so much to the point where "modern medicine has advanced to the point where doctors can virtually ignore us and still do a pretty good job" (Ratson, 2003, p. 15).

Historically speaking, it has been suggested or otherwise implied that the human body functions in an orderly, knowable and predictable way. As a result, conventional thought still suggests that disease and aging come from external stresses from the world around us that affect our otherwise healthy bodies in ways that express, albeit metaphorically, a certain orderliness and machine-like quality. Today, for instance, the computer is the predominant image that continues to influence and shape various claims about cognition, our bodies and other human matters. For instance, particular neurologically-linked behaviours are said to be "hard-wired" like the circuit boards that contain the central processing units of computers. Neurological activity, however, reflects a self-organizing, changing pattern of on-going self-regulating neurons. In other words, the brain is not hard-wired since it manifests itself through a wide range of dynamical patterns. Still, some very specific metastable patterns do appear which are sometimes described in the language of the mechanical. That said, many kinds of organizations, including the social, cultural and ecological, and their dynamical patterns continue to be described in terms that reflect metaphorical images of machines or living organizations (Morgan, 1997).

Researchers have shown that various physiological organizations like the heart (Goldberger *et al.*, 1990) and processes like the human gait (Hausdorff *et al.*, 1998) show evidence for a wide range of dynamical patterns. Even more, researchers like Goldberger (2002) have questioned whether the principle of "homeostasis" is the body's main modus operandi, a view originally described by Claude Bernard in 1878 as the stability of an organization's structural interior milieu. Goldberger's unexpected and counterintuitive findings, in fact, suggest that physiological systems have a capacity for rather complex behaviour for individuals who are young and healthy. Today, the notion of "homeodynamics" seems more appropriate, allowing for a more flexible view of how a system might function under a wide range of perturbations – even to the extent of instability and possibly death (Stanley, 2004).

Bassingthwaite, Liebovitch and West (1994), likewise, suggest that a very different view of health and healthy dynamic organizations is emerging. As human beings age or develop certain illnesses, particular systemic behaviours become increasingly regular, ordered, and reflections of periodic interactions (Goldberger, 1997). Irregularity and unpredictability, it seems, are important aspects of healthy physiological systems, and, indeed, for a healthy life. Since living phenomena can present a wide variety of different dynamical patterns, it has been suggested that one might consider looking at such phenomena in terms of "comparative dynamics" (Stanley, 2004). Following other branches of comparative inquiry, *e.g.*, "comparative anatomy," "comparative literature," and "comparative education," *etc.*, this notion of "comparative dynamics" suggests that one should take note of the wide range of dynamical patterns for a given phenomenon for comparison. As a study of dynamical patterns, the aim of a comparative dynamics approach is to address the relations amongst the interactions of a system and the ways in which systemic patterns emerge and change. In other words, a comparative dynamics approach focuses on the dynamics of a phenomenon and on the similarities and differences of those dynamical patterns that arise from within a given organization of dynamical patterns.

The introduction of the term "comparative dynamics" arose from a realization that under different conditions, the dynamics of a particular phenomenon might give rise to a wide range of dynamical patterns that could be described as "unhealthy" or "healthy" (Stanley, 2005b). Even more, one might extend this notion of "health" to many other scales of organization, moving beyond the scale of some particular biological being. In terms of social configurations, for instance, the concept of "unhealthy" is already used in popular parlance to describe, amongst other things, particular human experiences like divorce, the presence of sick ideas and toxic workplace environments (Frost, 2003). The concept of comparative dynamics, therefore, is an invitation to attend to other cross-scale complex phenomena in an all-at-once fashion, including the biological body, bodies of collectives like knowledge, social organizations, cultural bodies, political bodies, the living bodies of different species, and the ecosphere. As embedded wholes, a comparative dynamics approach, therefore, allows one to attend to the omnipresent relationships that emerge at all scales in the integrated wholeness of life (Stanley, 2006).

On the Shape of Complex Structures:
Examples from Human Psysiology

Complexity science is bringing new perspectives to the way individuals frame, understand, and act within their local contexts. For many scholars and practitioners influenced by the world of science, this new perspective, as previously noted, is shifting their attentions beyond the mere technical achievements of the discipline. Complexity thinking is finding a place in the arts, literary theory, philosophy, education, politics and post-modernist thinking, for instance. After centuries of trying to straighten out the world, these "new scientists" and "post-modernists" are tending to the kinkier aspects of the world, giving rise to some rather interesting shifts within the larger social collectivity. This apparently new sense of order is profoundly different from the older, symmetrical, simple, and sequential ordering of the world; it is something a bit more "fuzzy" (Doll, 1993). Asymmetry, chaos and "fractal" forms are the "new order" of the day.

The topic of "fractals" is a common one in complexity-related discussions. These things are dynamical patterns and processes that appear as cracks and crevices, and fractures and fragments. They are a part of a "new aesthetic," pointing to a particular kind of beauty that is quite perfect in its apparent imperfections. The concept of a fractal has permeated into the larger collective understanding of the roughness and kinkiness of the world, its energy, and its capacity for transformation and dynamical change (Briggs, 1992). Peering deeper into the structure fractal phenomena, even more scales of detail come into view where, in some cases, byzantine-like structures of self-similarity appear with every magnification in scale. Like a tree with its branches, smaller limbs and twigs, and the veins of its palmated-leaves, one finds scales of organized structures that bear a shared resemblance across all scales: the larger tree looks like a smaller limb with the smaller limbs and twigs on it.

In a Euclidean world, one might experience a discontinuous jump of sorts from the single dimension of a straight line to the two-dimensions of a plane figure to the three-dimensions of a solid object, and so on. On the other hand, fractals are often described as dynamical patterns that lie "in between" dimensions. Put differently, they are objects with fractional dimensions depending on the degree of their crinkly, kinky nature where a fractional dimension announces a particular degree of complexity not seen in the usual dimensions of Euclidean space. Nature, to be sure, shows itself to us across many different scales where "evolutionary activity creates worlds within worlds, all moving, changing, feeding back into each other from small scale to larger scale, back to small scale" (Briggs, 1992). Taken to either extreme – the very small and the very large, as well as, everything in between – the whole and part play out in this image of scale-invariant detail, always a whole and a part in the wholeness of an all-at-once world.

The concept of a fractal provides individuals with a way to help them to "describe, measure, model, and understand many objects and processes in living things" (Bassingthwaighte *et al.*, 1994, p. 5). Within the human body, for instance, the entangled mass of neural assemblies, blood vessels, bile ducts, and tracheo-bronchial tubes in the lungs represent examples of structures which some researchers describe as fractals physiologies. Moreover, non-linear dynamics are at the heart of healthy complex physiological processes. These include, for instance, fluctuations in the volumes of breaths, voltage and current changes across cellular membranes, blood flow patterns through the network of coronary arteries to the heart, and the electrical signaling patterns of the His-Purkinje system of neurons that trigger the muscles of the heart to contract (Bassingthwaighte *et al.*, 1994; Walleczek, 2000).

Before the introduction of the concept of a fractal, scale-free structures like the tracheo-bronchial system and heart rate dynamics were tremendously complex to analyze and interpret. Today, fractal structures are still somewhat difficult to identify owing, in part, to the appearance of randomness in some organized structures. Random structures, however, have fluctuations that are governed by mechanisms of chance. In the world of fractals, however, while there may be room to "play," not anything goes.

What must be born in mind is that many anatomical and physiological structures exhibit fractal structures only under particular conditions when the system might be described as "healthy." When illness or some disease strikes, a person often develops symptoms that are remarkably periodic and predictably ordered, *i.e.*, non-fractal. As such, pathological periodicity rather than fractal variability, generally speaking, is the sign of an unhealthy system. In such situations, people with certain diseases show a loss of individual variability which manifests itself in patients who look remarkably like one another, sharing the same pathological dynamics, appearance and form (Goldberger, 1997). In terms of fractal physiologies, a loss of structural complexity can be a sign of an unhealthy system or degradation of that structure.

To be sure, complexity thinking and concepts like "fractals" are changing the way human beings think and act. The innovations that complexity has brought are changing the way many organizations are "doing business" these days. Think tanks, private consulting organizations and research centers are busy exploring and enacting approaches to their work that are inspired by insect societies, self-organizing schools of fish and network-like structures of the human immune system. Education, on the other hand, seems to be a bit behind the times. But, before anything drastic might be done to improve any aspect of education and the larger project of schooling, perhaps a change in thinking might be necessary.

The Need for Re-description: Some Pragmatic Intentions for Healthy Learning Organizations

In *Contingency, irony, and solidarity*, Richard Rorty (1989, p. 73) discuss the contingency and fragility of a person's "final vocabulary" to "justify their actions, their beliefs, and their lives." Through the notion of "ironism," something that Rorty describes as "the opposite of common sense," he presents the idea of an ironist as someone who deliberately interrogates the usually taken-for-granted formulations of final vocabularies, offering a re-formulation of particular world views. In some sense, therefore, this paper has been an attempt to be ironic where a re-description of "learning organizations" has been offered, framed by a different metaphor: health. As Davis (1999, p. 26) similarly notes under the influence of Rorty's thinking, being ironic is the ability to "question the familiar, to trouble the taken-for-granted, to seek out the transparent prejudices that inform perception."

For the purpose of this paper, the aim has been to not simply introduce a potentially new or different figurative language, but rather to deliberately highlight and interrupt those ideas and images that are typically used to describe and make sense of learning organizations. To do so, commonsensical ideas about learning organizations can become more opaque and open to critical inspection. For instance, the concept of "structure" – as in "constructivism" – is often associated with architectural notions and terms such as "foundation," "scaffolding," and "building blocks" (Davis & Stanley, 2001). The use of such terms in educational discourse conjures up images of deliberate planning and the following of steps (Davis & Sumara, 2002). While this particular image of learning may have its roots in an early analogy with notions of building and architecture, the metaphorical dimension of "structure" appears to be all but lost. Moreover, notions like linearity, rigidity, permanence, orderliness and foresight also present themselves in such a view of learning and constructivist pedagogy. On the other hand, drawing upon a biologically-based interpretation of "structure" and the help of complexity-related concepts, one can consider the idea of a complex social body as always being in the process of unpredictable change like all other living things. To be clear, this kind of change is neither accidental nor deliberate; neither open-ended nor thoroughly constrained. That is, there is a space somewhere between the simply organized and the truly disorganized for the slightly imperfect, ever changing, and always adapting organizational bodies that are living systems.

To be sure, our ideas and thoughts don't really come out of thin air. They are largely metaphorical, embodied and largely unconscious (Lakoff & Johnson, 1999). In other words, human action is inseparable from human thinking, inseparable from human being. As Humberto Maturana and Francisco Varela (1992) suggest: "All doing is knowing, and all knowing is doing" (p. 26). As such, the idea that thinking may be something distinct from action is called into question – that is, the apparent distinction between "theory" and "practice" may be called into question.

Thus, I wish to claim that by changing the ways that we think about and understand our shared experiences – and, in particular, our experiences with learning and the various learning contexts in which we find ourselves – we change the ways in which we act. In other words, changing the ways in which we think about matters does matter a great deal in and to practice. As such, the link to innovation in education that this paper brings to the field points to being more attentive to the opaque concepts that are used to describe and understand process of learning that give rise to learning organizations. In so doing, the possibility to re-describe how we might understand learning organizations opens up new ways of actually doing things differently where, more importantly, the possibility to address the conditions for healthy learning organizations might emerge. This is a difference that can make a difference for a healthier learning organization. That is, rather than trying to close down discussions and understandings of learning and learning organizations by reaching for some "final vocabulary," a re-description of such systems, like schools and classrooms, offers a radically new way for society to re-invent its views of learning in light of a new language: in this case, the metaphors of and figurative language associated with health.

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