SHARED ACCOUNTABILITY:
AN ORGANIC APPROACH

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Despite its long history, accountability in education means different things to different people. There is little consensus about how to apply the concept intelligently and creatively in schools.

(Frymier, Jack, 1996)

Educational accountability is nothing new. As far back as ancient Greece, there is evidence of concern with establishing lines of responsibility or accountability for children's learning: "Fathers themselves, ought every few days to test their children and not rest their hopes on the disposition of a hired teacher: for even those persons will devote more attention to the children if they know they must from time to time render an account" (Plutarch, quoted in Wynne, 1972, p. 30). In Victorian England, the British Parliament established a plan through which teachers were paid on a "Payment by Results" basis according to their students' achievement. Yet, as Frymier attests above, educators fail to agree on what it means to be accountable and countless attempts at educational accountability[1] have been equally unsystematic, hit or miss and or misguided.

Over the last century, trends toward accountability in education are based mostly on models better suited to describe and regulate the functioning of machines or other inanimate systems than that of vigorous teaching and learning practices. Our system of education (and just about every other sector of society) has been influenced strongly by Isaac Newton's[2] body of beliefs about how the world works and is organized. "Newtonianism", now identified as "classical science", holds that: 1) all "systems" (including people and human systems) are orderly, regular, uniform, and can be understood and regulated or controlled if we reduce their complexity ("reductionism") by isolating and sub-dividing their basic components into ever smaller parts; 2) systems function in a linear, step-by-step manner. Their actions and reactions are proportional such that small exertions are used for small problems and large ones for large problems. Each cause has one effect and each effect results from one cause ("mechanics" or "mechanical"); and, 3) systems seek stability and equilibrium, and so theoretically should be as predictable as clockwork ("determinism"). For these reasons, we refer to educational paradigms that adhere to Newtonian ideas as "mechanistic".

In contrast to Newton's clockwork perspective, teaching and learning call for the coordination of large, diverse groups of people in situations in which lines of authority aren't always clear, individual roles are stretched by multiple responsibilities, and ordinary actions produce seemingly unpredictable consequences. Because these kinds of processes are representative and characteristic of the behavior of living organisms, we refer to them as "organic" or natural.

A new scientific paradigm, non-linear dynamical systems theory (or non-linear dynamics, for short -- also known popularly as chaos and complexity theory), presents a more organic perspective of how the world works and is organized than that obtainable through classical science. Because non-linear dynamics focuses on such every-day issues as diversity,

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[1] The devising of ways to assess student achievement and establish lines of responsibility for their success.

[2] (1642-1727) English physicist/mathematician whose work describes three laws of motion known as Newton's laws: 1) inertia; 2) action and reaction; and 3) acceleration proportional to force.

unpredictability, instability, disequilibrium, and qualities that emerge out of the interaction among things ("the whole being greater than the sum of its parts"), it constitutes an intuitively understandable picture of how order, change, and transformations take place. This new paradigm offers some vigorous and compelling insights that can help galvanize the nature of educational accountability through a better understanding of such concepts as: communication; interaction; collaboration; reconciliation; how people and things self-organize; appreciating and drawing on peoples' resistance to change; and distributed control via relational rather than bureaucratic models. As a theoretical perspective, non-linear dynamics does vastly more justice to educational processes than does the classical predisposition to reduce all systems and their activities and interactions to the sum of their parts. Thus, we propose its application as a more organic conceptual framework conducive to creating effective, efficient processes of educational accountability.

In this chapter we describe how education leaders can perceive and develop effective accountability processes that take into account education's inherent complexities and its accompanying assortment of interrelated family, social, and community matters. Specifically, we provide:

- A discussion of how a great many insights fundamental to non-linear dynamics have been applied intuitively (as "common sense") in New Haven, Connecticut's two-year process to create an effective practice of accountability. With appropriate adaptations, this experience can have national and international applicability;
- An historical review of educational accountability (trends and foci) in the U.S.;
- A summary of how the sciences have influenced education and of how non-linear dynamics, can help generate a new perception of education and educational accountability; and
- Recommendations for designing effective educational accountability processes.

Accountability In U.S. Education: An Historical Review

During the first two decades of the 20th century, school districts in most major urban areas of the U.S. were characterized by "efficiency bureaus" staffed by educational "efficiency experts" who toiled, seemingly around the clock, devising scoring formulae to quantify teacher-performance and, by this means, prescribe "scientific" remedies for the ills of education (Callahan, 1962). This system of educational accountability can be traced to Frederick Taylor's claim at the start of the 20th century that schools would function efficiently if "scientific management" principles were utilized to structure their programs as well as the activities of teachers and administrators.

During the 1930s, 40s, and most of the 50's, calls for educational accountability faded considerably in the United States. Then, in 1957, the successful Soviet launch of Sputnik touched off spontaneous perfunctory measures for school reform. The results were large-scale efforts in school-output evaluation (Project TALENT)[3] through standardized tests; increased emphasis on sciences, reading, writing, and math; revamping curricula including the development of "new math" and inquiry-based learning; and the lowering of the age of initial enrollment in school. Despite the influence of the inclusive human development approaches inspired by the Civil Rights Movement

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[3] This project analyzed the performance of students from a large number of schools on uniform objective and traditional tests, against such variables as levels of expenditure, size of classes, qualifications of teachers, and student socioeconomic background. Not intended as an accountability effort, it, nonetheless, had a profound effect on accountability legislation that followed. (Source: Hansen, 1993)

(e.g., the Elementary and Secondary Education Act [ESEA] of 1965, designed to make remedial support in math and reading available to underprivileged students; the establishment of Head Start in 1964, designed to address the cognitive, social, and health needs of underprivileged pre-school children to prepare them better to succeed in first grade and beyond; and the passing of legislation related to the education of children with special needs), this period symbolizes the beginning of federally mandated accountability for government-funded programs and techniques.[4]

Hansen (1993) provides the following assessment of the purposes and eventual results of these procedures:

> The principles underlying these techniques were very similar to those that had been applied without effect in the first quarter of the century. Their thrust was to improve efficiency and cost effectiveness, while focusing primarily on input and process variables. … Accountability in the 1970s seemed to focus on getting "more bang for the buck" (Elliott, 1989). The tools of that period (PPBS, MBO, MIS, PERT)[5] were intended to enhance the efficiency of schools, not the quality of education as indicated by student outcomes. (p. 11).

 "Control", not necessarily "improvement", seems to be the dominant operative concept in most efforts toward educational accountability.

When the U.S. Department of Education's report, *A Nation at Risk: The Imperatives for Educational Reform* was published in 1983, again, initial reactions concentrated unreservedly on accountability through test scores. Students' scores on standardized tests determined the success or failure of teachers and schools. Bonuses and other rewards were conferred for increased scores; penalties were applied for test-score declines. Test scores were compared among teachers, classrooms, schools, and districts, and the federal government compared scores of U.S. children to their counterparts in other countries. Over time, U.S. education has become increasingly dependent on these single measures to gauge student development and decide on future educational strategy as evidenced by the enormous influence on educational accountability which the National Assessment of Educational Progress has made since the first countrywide testing took place in 1970.

A Nation at Risk was highly critical of public schools, linking the decline of the United States' ability to compete economically in the world to an alleged deterioration in the quality of its system of public education. In part, it states that: "A rising tide of mediocrity ... threatens our very future as a nation and a people. We have, in effect, been committing an act of unthinking, unilateral disarmament" (Paragraph 1).

This follows on the thinking of economist Milton Friedman (1955) who conceived of schools as being important parts of a nation's economic system. He maintained that schools are like factories. Children are the products fashioned by schools. To produce a better product, the same forces that regulate free enterprise must control schools: "choice" and "competition".

> But the school is not a factory, and the child is not a product. The child is no more a product of the school than the patient is a product of the hospital or the prisoner is a product of the prison. Those who accept the analogy of the school as factory and the child as product do a disservice both to the student and to the profession.
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> (Frymier, 1996, ERIC Fastback 395.)

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[4] Federally mandated accountability procedures explicitly called for the extensive use of business principles in education through the use of concepts such as "performance contracts"; "educational outcome audits"; "cost accounting strategies" and "outcome measures" that bind expenditures and outcomes.

[5] PPBS (Program Planning and Budgeting Systems); MBO (management by objectives); MIS (Management of Information Systems); PERT (Program Evaluation and Review Techniques).

Friedman's perspective, and that of the proponents of most efforts toward educational accountability discussed here, relies on mechanistic models that follow Newton's theories. In the following sections we critique this point and propose the application of non-linear dynamics as a more organic conceptual framework for education leaders in designing effective systems of educational accountability.

The Influence of the Sciences on Education

Classical science holds that every event in the universe is determined by initial conditions (step-by-step, proportional cause and effect) that can theoretically be uncovered and understood perfectly. Nothing is unintended because neither coincidence nor chance plays a role in how all the pieces of the universe assemble and work together. Everything (people included) is reducible to the sum of its parts. By isolating and sub-dividing anything repeatedly, we can reduce or eliminate its complexity –revealing its orderly, regular, uniform, stable, and balanced nature– as a way to understand and regulate. Consequently, every thing and event should be as predictable and controllable as clockwork: with enough information, one can foretell everything about the future and re-construct everything about the past (Pierre-Simon, Marquis de Laplace, 1749-1827).

The unprecedented success of industry during the Industrial Revolution resulted in the eager, universal application of this factory model to everything from other innate systems (railroads), to social systems (governments,[6] community agencies), and even individual living organisms (i.e.: workers through "efficiency experts" and the production of poultry, beef, shrimp and other living "commodities" in controlled environments). In this manner, Newtonianism came to permeate most if not every sphere of society, including education. Wrought by the economic, cultural, and political forces of the time, the Newtonian model became a lens through which all else was viewed.

The vast majority of efforts at educational accountability over the last 100 years have been mechanistic in nature. As discussed above, such efforts have been characterized by the explicit, "full-strength" application of Frederick Taylor's "scientific management" principles, with their attendant "efficiency bureaus" and "efficiency experts"; large-scale school-output evaluations; and extensive use of engineering principles and procedures along with practices from the defense and business sectors. The tendency to address issues of educational accountability through standardized testing, comparison, and competition is rooted deeply in education. At its core is a firm allegiance to centralized control, in which power and authority are vested in a "controller" of the total system's behavior, someone/something or small group at the top of a pyramidal structure who makes decisions for others to carry out. Langton (1989) recounts that, throughout the extensive history of clockwork automata, most earnest efforts consist of a "manager" program (e.g., a revolving cylinder with dowels tripping switches successively) that determines the behavior of the entire model. How the system danced was dictated by this regulating mechanical or electronic device.

In education, this "controller" is an overriding administration, or administrator, at the neighborhood school, local district, and state levels. When mechanistic models are applied at any of these levels, rigid bureaucracies and constraining hierarchical structures usually arise. Such bureaucracies greatly limit the kinds and frequency of communication and interactions that are possible. "Non-controller" constituents of such bureaucracies usually feel alienated and superfluous to the mission of the organization. When questioned about senseless or detrimental policies or

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[6] Interestingly, the checks and balances created for governing in the U.S Constitution and Metternich's "balance of power" in Europe, were influenced by Newton and Laplace's writings.

decisions, their corresponding attitude is usually, "I don't make the rules, I just enforce them". Diffusion of new ideas, such as educational accountability, in such rigid environments is futile or, at best, uncreative.

Friedman's regarding of schools as factories and children as their products is a commonly made analogy. It provides added evidence that the application of mechanistic Newtonian concepts to the process and structure of education is indeed quite prevalent. Applying industrial, economic, engineering, or other such mechanistic principles to education, allows for a line of reasoning that reduces an extremely complex process to its superficial appearances. For example, proponents of vouchers contend that competition, will improve education, because if competition is allowed with private and religious institutions, public schools will have to outperform the competition or "go out of business". Parental choice in education, consequently, becomes the force that sets the wheels of reform into motion.

The obvious flaw with this argument is that public schools are, and need to be, non-profit organizations. As a taxpayer, consider whether or not it is your intention to require the local board of education to yield profits year after year (Frymier, 1996). Most people would probably agree that their primary mission to educate all children, dictates that service, not profits be the main commitment/responsibility of the public schools.

Further, if we follow Friedman's line of reasoning, that students are products of the schools, to a consistent conclusion it backfires because the "excellence" of a "product" does not depend solely on the quality of the process to which it is subjected. Excellence depends heavily on the quality of the "raw material" to be processed. Logically, then, some students should be rejected as being sub-par. To do otherwise would reflect poorly on the school's quality control. Consequently, the assumption behind vouchers, that public schools will be driven to improvement by a profit motive, is not only invalid, it is inappropriate and irresponsible.

The mechanistic perspective remains a dominant paradigm in education. Notwithstanding, the seriousness of the issues that we face currently in education (and thereby the need for effective educational accountability) as well as the transformational nature of the economic, political, and social changes taking place in our society, oblige us to admit and deal squarely with the enormous limitations of mechanistic models applied to education or to any other human activity.

An Organic Paradigm of School reform and Accountability:
Toward a New Perception of Education

To understand better how an organic paradigm can provide a more realistic representation educational processes, we must take a closer look at some of the basic differences between non-living (mechanical) and living (organic) systems that render conventional (Newtonian) analysis highly ineffective when applied to living systems.

Living vs. Non-living Systems

Both non-living (mechanical) and living (organic) systems can self-organize.[7] Self-organization is the tendency of systems, in situations of great turmoil, to apparently and spontaneously bring themselves into existence or re-arrange themselves into new forms or patterns, that is, to produce order (the emerging of tornados, mobs, or special-interest groups are good examples). We say "apparently" because the "self" part of this term gives the inaccurate

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[7] The field of self-organization seeks general rules about the growth and evolution of systemic structure, the forms it might take, and methods that predict the future organization that will result from changes made to the underlying components.

impression that these systems create themselves in isolation from and in opposition to their environment. In fact, self-organization is brought into existence *by* interaction with the environment, through the processes of ecological interconnectedness and co-evolution that result from disequilibrium among the system's constituent elements or members. Disequilibrium, then, generates interactions among these same constituent elements. If a system is in total balance or equilibrium, nothing can happen. It is static and, in a sense, dead. Disequilibrium, therefore, produces and (for a time) maintains the newly "self-organized" structure. This structure, in turn, dispels energy (i.e.: through friction) thereby reducing the initial amount of imbalance.

　　　　Unlike mechanical systems, however, living systems (micro-organisms, animals, institutions, governments) try to take control of their environments by seeking out a sufficient amount of "thermodynamic disequilibrium", such as food, money, or power, in order to keep themselves alive. In non-living systems, like clouds and hurricanes, when the level of disequilibrium has diminished sufficiently the systems cease to exist: clouds evaporate and hurricanes dissipate. Thus, a basic difference between mechanical and living systems is the ability of living systems not only to self-organize, but to evolve to fit their environments better; search for new, more conducive environments; or even generate environments wrought to benefit the system itself. This is why the mechanistic, one-size-fits-all attempts at accountability do not work: they are not responsive to the situation at hand. Clearly, living systems present a degree of complexity immeasurably beyond anything possible in the realm of non-living systems.

　　　　Most living systems exhibit a quality we call "fractal structure" (see Figure 1). Fractals (Mandelbrot, 1982) are mathematical (or real-world) objects whose organizational structure replicates itself (reiterates) repeatedly in roughly the same way at different scales or levels of magnification (see figure # 1). Ferns, cauliflower, broccoli, trees, and many other plants are examples of fractal structure. If you cut off one of its branches, you'll notice that the branch resembles the whole plant. Do the same with a branch of the branch and note that it resembles the branch, which resembles the whole plant. You can continue this procedure, as long as physical limits allow, with similar results.[8]
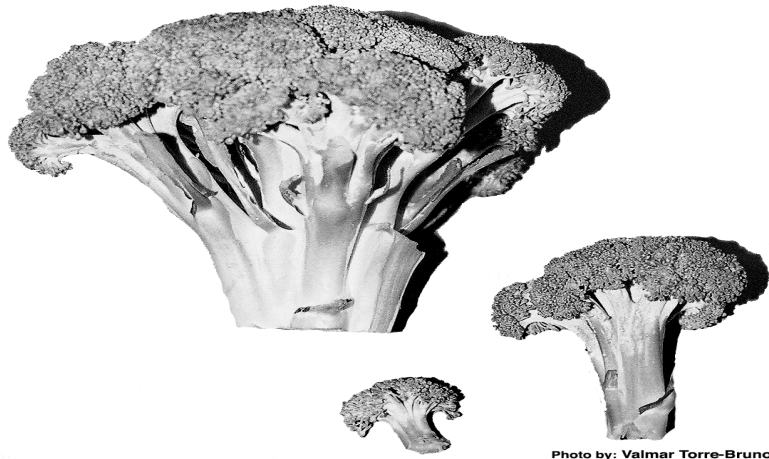

Photo by: Valmar Torre-Bruno

Figure 1 – Fractal Broccoli

Much of nature exhibits fractal structure that is "self-similar". If you cut off one of the branches of a broccoli plant, the branch resembles the whole plant. Do the same with a branch of the branch and note that it resembles the branch, which resembles the whole plant.

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[8] Likewise, the shapes of mountains, clouds, coastlines, lungs, brain neurons, tree bark, lightning, etc. exhibit the same amount of irregularity and fragmentation at any level of magnification. If you magnify a small piece of any of these, you get roughly a tiny copy of the whole. Further magnification produces even tinier copies of the whole, and so on. For this reason, fractal objects are said to be "self-similar".

Despite their self-similarity, fractal patterns usually demonstrate great irregular complexity, thus appearing to have no obvious order or organization (akin to human behavior or the "amorphous" activities of many school districts). However, there is a "hidden" regularity to fractal structure and behavior –a property called "scaling". These patterns and irregularities are statistically identical at all scales of observation (there is order in chaos). Scaling relationships indicate patterns of a natural, or organic sort. It appears that most of nature is organized this way. Thus, fractal geometry allows us to understand and work with organic order. Applying this form of organization to processes of educational accountability holds great promise as a viable alternative to current hierarchical static bureaucracies. Thus organized, the various teams required to undertake the process of educational accountability, can better address the issues that place students at risk of failing educationally or falling through the proverbial social cracks.

Prigogine (1984) warns us that, "…the more complex a system is, the more numerous are the types of fluctuations (inconsistencies in its functioning) that threaten its stability" (p. 188). That being the case, how do living systems as complex as the ecology or human organizations, or a new process of educational accountability manage to evade perpetual chaos?

Living systems avoid complete turmoil by doing what non-living systems cannot: manage and influence information. All life forms and organizations possess a sort of "blueprint" or paradigm of themselves and how they relate to their environment (as found in chromosomes and other genetic material, mission statements, by-laws, constitutions). By applying the information found in their blueprints, living systems keep themselves alive, and continue to evolve, discover, and create. The evidence demonstrates that the threshold of stability in living systems is determined by how the system reacts when it experiences opposition between instability caused by fluctuations and the stabilizing effect of communication and diffusion processes.[9] In other words, how the system deals with problems (what Torre, 1984, 1987, 1989, 1995a, and 1995b) calls "reconciliation").

"Reconciliation" results when the opposing forces of "activation" (to want to move in a particular direction) and "restraint" (to be held back from moving in the given direction) are integrated. In other words, a third force resolves the opposing forces of activation and restraint: reconciliation. Reconciliation goes beyond the concept of "compromise" (concessions or middle ground) to stimulate new ways of thinking and acting so that all constituents get what they need (see the story about *The Day-Care Center and the Fire Station* in Appendix 1, as an example).

Educational accountability implies moving a particular school or district in a different direction or through a different method (activation). Typically, one will encounter resistance (restraint) from those set in their ways, those leery of your intentions or those wanting to think through the implications. Reconciliation of these opposites requires the interweaving of the non-linear interactions among cognitive (intellectual), affective-perceptive (emotions), and pragmatic (action or "hands-on") mental processes in an individual or the analogous processes in an organization (i.e.: fluctuations, communication, and diffusion processes). Solutions (reconciliation) emerge out of this interaction. For this reason, in complex organizations in which people interact in a variety of ways, communication and diffusion processes among a variety of individuals are likely to be efficient. Indeed, as Sarason (1990) pointed out so clearly, attempts at school reform in the

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[9] A diffusion process is the course of action required for an innovation (i.e.: accountability) to proliferate across a school, district, or society. An example is what happens as a cube of sugar dissolves in a cup of tea by spreading (diffusing), eventually, throughout the entire volume, dispersing evenly without stirring.

past have failed, at least in part, because they have not taken a systemic approach to school reform. According to Sarason, reform efforts that do not treat the school as an integrated system comprising numerous interacting subsystems (e.g., teaching-learning, administration, organization, socializing) are doomed to failure.

In organizational development, resistance to change is portrayed or implied as negative, reactionary, or counterproductive. In fact, it is often blamed for the failure of new programs and ideas and the resistant groups and individuals are ostracized. But resistance to change (restraint) can provide creative tension in a system. Rather than dissipation of tension through compromise or imposition of beliefs, reconciliation takes into serious consideration the objections brought by the opposition, thus insuring optimal decisions based on everyone's needs. Without resistance to change, however, there is nothing to keep us from acting too quickly on a half-baked idea. While there are those who resist change for obstructionist or selfish reasons, most resistance is presented by people with less sinister motives. Resistance might represent reflection on the part of someone asking: "Why are we doing this?" … "Does this new approach avoid previous mistakes or help us do more of what we really need to do?" Alternately, some resisters may be simply awaiting social clues that the innovation is accepted, safe, or OK for them to try.

When we say that human institutions are resistant to change, we understand that this is so because many of the individuals who make up the institutions question challenges to the status quo. But lumping all of these different forms of resistance together, hinders our ability to reconcile apparently opposing forces into constructive paths-forward (Torre, 1995a, 1995b). By recognizing the variety of motives for resistance, we can move toward better solutions and avoid the detrimental "group-think" (the party-line) and perpetual regurgitation of ineffective ideas. An organic perspective sees resistance to change as an indispensable and potentially beneficial quality of the process of innovation (see Torre, 1984, 1987, 1989, 1995a, 1995b) and the process of reaching reconciliation ensures a more effective solution to the problem at hand.

The promise of this kind of organic approach to organizing the various teams required to undertake the process of educational accountability is that a system based on these principles can better address the issues that place students at risk of failing educationally or falling through the proverbial social cracks. Living systems are not reducible to their physical components. They must also function at a coherent, representational level, a level at which momentous interactions can take place. Out of such interactions (as this section demonstrates) we get the process of emergence, in which qualities or characteristics (that don't exist in any single component) come forth in the system, effectively enabling the whole to be "greater than the sum of its parts".

An Organic Paradigm: Toward a Relational Model

Given what we now know about the differences between mechanical (non-living) and organic (living) systems, our paradigm for informing an effective process of educational accountability needs to approach shared responsibility in a new way. We need a paradigm that ensures that students, parents, teachers, administrators, neighborhood, business, and faith communities, municipal and state officials are unified around the complex demands of continually determining and assessing what our children should know, understand, and be able to do, … and how we continue to involve and evolve all who need to share the responsibility for helping them fulfill this purpose. Our paradigm needs to go beyond the mere analysis and observation of individual and collective behavior and interaction. It needs to facilitate the answer to such fundamental questions as "why" and "how" these behaviors and interactions emerged in the first place; what are the appropriate conditions that allow or foster the "self-organization" of constituents toward beneficial action; and how can we stimulate the emergence of such conditions.

We know that the ability to control information and diffusion processes highlights the enormous difference between living and non-living systems. Any organic paradigm designed to develop a process of educational accountability needs to provide processes designed to encourage sincere consideration of new thinking and change, as well as means for clear, honest, and meaningful communication and interaction among all constituents. This is what we mean by a "relational model". The process by which things happen and people interact is given at least equal consideration along with the "content" and direction of decisions made. This is not possible in a bureaucratic (mechanistic) model.

Conventional (classical science) analysis is only useful when applied to stable, linear, continuous, smoothly changing phenomena. Human behavior and social interaction, however, is idiosyncratic, disjointed, and often perplexing, with apparently whimsical reasoning and unpredictable changes. Thus, the more propitious approaches to modeling complex or living systems are approaches that do away with the idea of an overall regulator (controller) of behavior, and alternatively concentrate on means for the distributed control of behavior and responsibility.

Dynamism in a group or institution emerges out of the organized interactions of a large number of individuals, with no overall controller in command of the behavior of every component. Instead, each player, him or herself, represents a behavior. Rather, than solving pieces of a puzzle and putting them together to understand the entire system, living systems must be considered as a whole. Thus, instead of starting with a particular behavior and trying to dissect it into its component parts (top-down), one would bring together elements of a phenomenon a little at a time until the interaction among these re-create the qualities and or behaviors of the whole. (bottom-up) (Langton, 1989).

Our organic paradigm, therefore, utilizes a bottom-up, dispersed (distributed control) determination of behavior as its fundamental approach to the modeling of realistic organizational dynamics. Its main purpose is understanding and influencing the emergent properties and behaviors of the processes aimed at educational accountability. It is not possible to understand this process with a top-down analytical approach. We would only mimic its superficial mechanics. Such artificially mechanized schemes can seem credible because they are so common in a society established on Newtonian principles, yet teach us little about the nature of human behavior and interaction.

Non-Linear Dynamics in Action:
New Haven's Plan for Shared Accountability

As a tangible illustration of the concepts outlined above, in this section we highlight the work of the New Haven Accountability Task Force.

Contrary to mechanical, linear models of organization, organic non-linear ones often emerge out of everyday interaction and functioning. By definition, organic models presume that the best fitting solution to any problem will emerge if the principal parties involved participate earnestly, openly communicate their individual or group needs, and give the process an honest chance to work. Rather than arriving at a solution through application of a model, this interactive process leads participants to an effective solution intuitively. Such was the case in the development of the New Haven Shared Accountability Plan. In a sense, the relatively recent advent of the dynamical sciences may be evidence of how science is ultimately beginning to catch up to our better wisdom and intuitions.

As in other urban districts around the US, New Haven's low test-scores were presumed to reflect the quality of the instruction and programming taking place in its public schools. Simultaneously and contradictorily, the district was receiving data from the Connecticut Department

of Education indicating that students in New Haven were learning at a faster pace than their suburban counterparts. They were finishing the race behind, but were actually running faster. The problem was that New Haven students were starting the race behind students from neighboring districts.

Faced with increasing pressure to improve its schools, New Haven created a Task Force, chaired by renowned child psychiatrist Dr. James Comer, to develop a plan. In addition to parents, teachers, administrators, and Board of Education members, the Task Force included influential members of the business and faith communities, college and university faculty, and local community organizations. A previous group of similar representatives from the district had assembled around the question: "What is important for our children to know, understand, and be able to do?" These efforts led to the development of curriculum frameworks and subject-area, grade-level standards. The new Accountability Task Force subsequently addressed the questions: "How do we demonstrate the full range of what schools do?" and, "What should we assess and how should we assess it?"

The Accountability Task Force believed firmly that schools, were neither solely responsible for student success, nor could they accomplish student success by themselves. Academic achievement is a result of multiple influences including schools, parents, poverty, health, nutrition, and family structure. Having a sense of who else needed to be involved in this process, the Task Force addressed the issues of *how* to get others to share the responsibility and do their part to help New Haven's children learn and develop. After two years of meeting to study and discuss the accountability movement in vogue throughout the country, the Task Force had developed a comprehensive plan designed to meet the needs of the many constituents, to be fair to all involved, and to focus on the challenges unique to the district. The resulting plan reflects many of the principles of non-linear organization and functioning discussed above.

First, the entire structure of the New Haven Shared Accountability Plan takes into account the notion that teaching and learning – as well as the functioning of our schools – takes place in the context of complex social interactions, both within the school and between the school and the community. Given the organic nature of school and community structures, efforts at accountability focus on the individual level – the interactions between students and teachers, between students and their parents, and among students – but also on an institutional level, with the schools and other community organizations and structures each functioning as a "living" entity. The idea of shared accountability, with responsibilities held collectively among all school and community constituents, recognizes the importance, in fact the necessity, of these interdependencies.

Shared accountability also recognizes the importance of multiple influences (causes) as determinants of developmental and educational outcomes, as well as the need to distribute, rather than centralize, control of the entire process through a variety of parent, teacher, parent-teacher, school-community, and other such teams who come together regularly to fine-tune the expected outcomes, process and goals, and decide on new capabilities to be developed by students, teachers, administrators, Board of Education members, or the district as a whole. In this manner, the very structure of the accountability plan itself was fractal in nature and provides the appropriate level of disequilibrium required to generate interactions among these same constituent elements.

Based on these ideas, the Task Force identified ways in which each sector of the community (the proverbial "village") could support the academic achievement and more general development of its students. Starting with the schools, the Task Force outlined responsibilities at each level of the system: the central office, the educational leader at the school, the collective staff at the school, individual teachers, and students.

Once these responsibilities were specified, members identified other significant determinants of student success and extended the list of responsibilities into the surrounding community. The group called upon parents, area businesses, faith-based organizations, colleges and universities, and individual citizens to do their part to ensure the healthy development of every child. For parents, this means making sure that their children get enough to eat, get adequate rest, and come to school on a daily basis. Further, parents need to familiarize themselves with the curriculum and ways to support, at home, what goes on in school.

For area businesses, this could mean offering release time and flexible scheduling for parents to encourage them to be involved in their children's schools, supporting high quality daycare and pre-school programs for children of employees, offering internships to high school students to provide real-life work experience and help students see meaning in school, or providing financial support for school activities.

Area Colleges and Universities were asked to support children by opening campus activities and performances to families in surrounding neighborhoods, establishing partnerships with city high schools to provide opportunities for students to take classes, participate in campus activities, and use selected facilities, and develop programs, like the New Haven Teachers' Cohort programs (two graduate degree programs specifically designed to meet the needs of the district).

Community-based organizations and faith communities were asked to provide supports such as family literacy services, after-school and weekend enrichment programs, parent education and English-language instruction for non-English speakers. Individual community members were asked to volunteer as tutors or mentors and contribute to local community-based organizations that offer services to children and families. In this way, the plan recognized that schools should be responsible for providing high quality instruction, for encouraging and supporting students, and ensuring equitable access to all programs, and that the responsibility for meeting the many other needs of students could be met through cooperation and collaboration.

Another theme that emerged through the planning process is the belief that schools do more than teach students discrete skills that can be measured by tests. The over-dependence on single measures or standardized tests to gauge student development and decide on future educational strategy is an outgrowth of the application of mechanistic practices to educational accountability: if the world is seen in terms of mechanistic inputs and products, measuring success with tests makes sense. Unfortunately, standardized tests have most often been used to diminish the scope of education, settling for easily measured results that may be of dubious relevance for the target students and districts. The New Haven Shared Accountability Plan does not eliminate the use of these tests, but rather gives them a limited role and places them in proper perspective as valid and reliable formative instruments and procedures that have the potential to help raise academic standards.

The plan recognizes that it is not the possession of these skills alone that will prepare young people for responsible and purposeful lives. Rather, it is the entirety of their development as whole living organisms. The future success of the students enrolled in our schools depends on our capacity to value and support the full range of their development.[10] In New Haven, the Accountability Task Force considered a range of skills, behaviors and characteristics that are important to future success. Among these are the capacity to work collaboratively with others, a strong work ethic, responsibility, flexibility and creativity. These attributes are not easy to measure

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[10] The New Haven Public Schools addresses many of these concerns through the six developmental pathways of the School Development Program and the "Emotional Intelligence" focus of the Social Development Program. Details of these approaches are available upon request.

and the details of how to assess some of them remain to be worked out, but they are at least as critical as the capacity to read scientific texts and perform algebraic functions. Thus, the members of the Task Force believed strongly that it was important to include them in the plan. Undoubtedly, New Haven will focus on what we measure (i.e.: standardized tests). Yet, we are clear that just because something is easy to measure does not mean that it is the most important factor to assess. Honest educational accountability requires that continuous efforts be made to develop ways to assess those more organic attributes that we know, intuitively as well as through our collective experiences, have enormous influence on children's academic and life success.[11] Thus, the Shared Accountability Plan includes measures of school characteristics that foster the development of these individual qualities: assessments of school climate, student and staff morale, school-home communication, the number and kind of family supports offered, and opportunities to participate in the visual and performing arts, receive instruction in a world language and participate in cultural exchange and travel-abroad programs.

The New Haven Shared Accountability Plan further illustrates the non-linear model of organization by incorporating a "diagnostic assessment" process that allows the system to recognize the uniqueness of each circumstance and be responsive to the particular needs of students, teachers and administrators. In response to complex multi-dimensional situations, we need to develop multiple paths to arrive at the desired destination (e.g., different approaches to reading instruction for children growing up in different cultures with different language traditions) and recognize that similar paths do not lead to the same outcome for all children (e.g., not every teaching method works with every child). Such situations argue for a more organic approach to accountability. Rather than applying a formulaic, one-size-fits-all intervention, the diagnostic assessment is conducted by a team that examines the particular situation that has resulted in low performance or slow progress. This team includes the individuals who are the "target" of the accountability intervention and will bear the responsibility for carrying out the intervention. After identifying the factors that contribute to the performance problems, the team creates a unique improvement plan, designed to address the specifics of the situation. In this way, the plan allows for participation – self-regulation – in the process of developing a solution to the identified problem(s). In other words, this assessment process fosters the self-organizing of a focused living system that can address areas of restraint, organically, and with a goal of reconciliation rather than a compromised solution that may, in the end, be no better than the practice it replaces.

Finally, the plan allows for feedback in all directions: up; down; and laterally in the system's hierarchy. For example, in addition to being assessed within it, students will be given opportunities to assess their educational experience. Parents will receive feedback regarding their support and participation in the school but will also be given opportunities to share their perceptions and assessment of the school through surveys and parent meetings. Teachers will be evaluated by their supervisors but will also be given opportunities, through surveys and focus group discussions, to express their thoughts and feelings about their experiences in the school and treatment by administrators. This strengthens the process of self-organization/self-regulation through the flow of information and the continuous dissemination and diffusion of information about the process, progress being made, modifications, and the like. Thus, managing information as a way to address the instabilities caused by inconsistencies in individual expectations vs. achieved results (fluctuations) through the stabilizing effect of communication and diffusion processes. By giving the

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[11] Initial efforts at accessing such organic attributes come via our Social and Health Assessment instrument administered by Yale University. Details are available upon request.

process through which things happen and people interact at least equal consideration with the content of the curriculum and direction of school or district, this relational model allows the system to work together at many levels (and diverse ways) to formulate more effective plans to support the children it serves.

The plan's structure, which encourages multi-directional communication, also allows the district to draw benefit from peoples' resistance to change. A large number of teams and other vehicles for participation are provided so as to generate much dynamism through the organizing of many kinds of interactions among a large number of individuals, without the need for an overriding regulator in charge of directing the behavior of every group or individual. As an alternative to imposing top-down, predetermined solutions to identified problems, the New Haven Shared Accountability Plan distributes responsibility among constituent groups and individuals and brings them together in an attempt to create the conditions necessary to achieve our expected outcomes by taking their objections, comments, concerns, and questions into serious consideration before final decisions are made (bottom-up). Out of such interactions we expect that the process of emergence will generate solutions and paths-forward unlikely to be obtained from any single constituent.

Conclusion

The predominant metaphor used to explain or justify accountability systems is that of quality control as it exists in the world of manufacturing. Using this metaphor, the schools are seen as institutions that process raw material (students) and produce a product (educated students). Efforts based on such perspectives do not take into account the level of complexity that exists in schools or in their educational processes. Associated practices tend to treat individuals and groups more like parts of a machine than as complex, interacting living organisms. Such models relegate problems and solutions to the simplest, often caricature, forms of themselves, thereby forcing insular responses to complex dilemmas. These responses may themselves further escalate problems. Most often, these interventions simply modify existing conditions, which return to their prior state when the intervention is discontinued.

Nevertheless, this classical science perspective has had an enormous impact on how education and educational accountability are perceived and approached in the U.S. "Accountability" is often code language for finger-pointing and blaming teachers for the ills and inefficiencies of our educational institutions. Politicians frequently employ harsh and inflexible language in their election campaign rhetoric that reduces the concept of accountability to the mechanics of firing teachers and administrators, restructuring schools, tightening up already burdensome rules and regulations, or other similar quick fixes. Equally as reductive is the tendency to look for "Magic Bullet" solutions by vaulting from one fad packaged curriculum program or teaching method to another, seeking to hit upon the "right" button or answer that responds to the complex social, economic, political, and biological challenges confronted by today's children.

The individual and societal trauma generated by this approach is profound. It restrains children's ability to learn, interact in beneficial ways with peers and teachers, and be nurtured through the development of their emotions and creativity. High drop-outs rates, absenteeism, failing grades and test scores, behavior problems and/or violence, and other issues intended to be addressed by efforts at accountability, persist and are sometime made even worse.

In contrast to mechanical models, non-linear dynamics allow one to perceive and develop effective educational accountability processes that take into account the inherent complexities of education and the accompanying assortment of interrelated family, social, and community matters that affect everyone. An organic paradigm facilitates the recognition and anticipation of typical

patterns of interaction and systemic barriers to the achievement of desired goals. A process of accountability based on an organic perspective can serve as the vehicle through which a school district transforms itself from a mechanical bureaucracy into a dynamic, flexible, responsive process of education.

A better, more organic metaphor than that of schools as factories is one that views schools as gardens and teachers as gardeners. When a gardener – whose livelihood depends on cultivating healthy, vital flora – approaches a plant that has weathered a drought, struggled in infertile ground, fought pests and disease, and been choked by weeds, he or she must provide the plant whatever it needs. The goal is to help the plant survive and gain strength so that it may become productive. Using this metaphor, schools are responsible for nurturing the growth of students to their greatest potential.

If we extend the gardening metaphor further, we can reach solutions that the manufacturing metaphor does not allow:

- Plants – and people – are most vulnerable to environmental stresses during their earliest development. Adequate support for young children and their families, including childcare and pre-school education, is critical if we are to support our children's optimal growth.
- Neither the gardener nor the teacher is responsible for all successes and failures. External conditions influence outcomes. Just as governments provide emergency relief and support for areas experiencing drought or flooding, State and Federal governments need to recognize and provide support for cities bearing the major burden of society's ills.
- It is possible – and necessary – to predict and prepare for harmful external conditions. State and Federal governments have provided billions of dollars to design and build massive irrigation systems for agriculture. If these leadership bodies and the public they represent are serious about ensuring optimal educational attainment for our students, we need to be prepared to support the development of optimal conditions for student growth.

The extension of this metaphor does not remove accountability from schools, teachers, or students. Just as a good gardener must keep abreast of current research, techniques, and information, good teachers and administrators must know and implement strategies that have proven to be successful in the local climate. It is still they who must tend the garden, but they should do so in the best conditions the community is capable of providing.

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APPENDIX 1

The Day-Care Center and the Fire Station

After teaching the concepts of activation, restraint, and reconciliation to a group of my students, I asked them to deliberate on a particular situation abstracted from an out-of-town newspaper:

A municipality needs to provide funds for a day-care center and a fire station at the end of its fiscal year. Both agencies have requested financial support for expanding their physical plants and for the purchase of new equipment. The municipality does not have sufficient money to fund both agencies' projects, but the entire pot of available funds is in excess of what is needed to fund either project alone. The problem is how best to meet the child-rearing and fire safety needs of the community with the available resources.

Discussions in the City Council led to the expected arguments in defense of a variety of standard "solutions" to the predicament:

1. Allocate all funds to one project, with the expected outcome that it will be able to meet its commitments and obligations while the other is left to subside or would have to de-escalate its services. As a result, either the day-care or fire fighting needs of the municipality will not be met.

2. Divide available funds between both projects according to some formula to be negotiated. Presumably, neither project will go by the wayside but, realistically, would probably be unable to fulfill its obligations entirely.

After some deliberation, the students in my course offered a third, nonstandard approach to the above situation. They proposed that the city council:

3. Allocate all of the funds to the fire station so that it could expand its physical plant beyond its needs, thereby creating sufficient room to house a sound-proof (also expanded) day-care facility. The city could, then, sell the old day-care center's physical plan, generating the additional funds necessary for purchasing the equipment needed for both the fire station and day-care center.

The students' proposal would not only solve the problem posed originally; it also solved subsidiary problems not even considered in advance. It rendered the day-care center about as safe and secure as it could possibly be (the center would now be housed in the fire station), and provided a built-in field trip for the children in the day-care center because they could easily and frequently visit the fire station. And the proposal provided relief from the boredom the fire-fighters normally experienced waiting for a fire to occur--they would now have the children around to divert them during periods of inactivity.