

# **The Vision, Meaning, and Language of Educational Transformation: How Chaos, Complexity, Theory, and Flocking Behavior can Inform Leadership in Transition**

**Stephanie Pace Marshall**

This is a remarkable time to be an educational leader.

Our society is going through intense social and political upheavals, and this has left virtually all institutions and institutional leaders confused, isolated, and sometimes endangered. The education system as we know it is now an artifact.

The educational contract for 19<sup>th</sup> century schooling was designed to produce workers and citizens who would advance the economy by following the rules of machine and factory-driven production, but the educational covenant for the 21<sup>st</sup> century mind must be grounded in an agenda that is decidedly different:

- It must overcome the Newtonian mindset that has prescribed our current constructs of teaching, learning, and schooling and led us to separate and segregate learners and learning.
- It must be built upon a foundation of connection, coherence, shared and mutually created meaning, dynamic relationships, and the human experience itself.

To pull this off, educational leaders for the 21<sup>st</sup> century must re-invent two things: our institutions and ourselves. We must change our linear and reductionist thinking about learning and schools and we must change the way we think and interact with one another. If you are not totally confounded about how to do this, then you don't understand the problem!

## **Desperate Measures**

As leaders, we are called on to lead, but the old metaphor of the captain at the helm – or even the benevolent, participatory captain – is adequate at best and usually dysfunctional. In desperation, we have often resorted to bulls-eye planning. We shoot first and draw the circles later. Five years before the new millennium, we need leadership more than ever. But what does it look like?

As a student of organizational development, I have explored much of the literature on organizational design and restructuring; but my most profound knowledge came from the physical and biological sciences and the new science of complexity. This is the context for understanding organizational leadership that I wish to share.

As human beings, we always have grounded our institutions, including our schools, in the science of our times. How scientists view the natural world always has had profound implications for how we constructed our world.

As educational leaders we have worked hard using our current understandings about teaching and learning to design systems we believed would enhance the achievement and creative capacity of students and staff.

While we have been doing this, science has undergone a revolution – a profound paradigm change that will forever alter the way we view and make sense of our universe, ourselves, and our institutions. The application of this new understanding to our work and our relationships can inform our role as leaders as we create authentic, empowered learning communities.

It is fashionable in the 1990s to speak of paradigms and paradigm shifts. When a paradigm shift occurs in science, the scientists' conception of the world changes; this is precisely what has happened. A "new" physics for a new social order is emerging.

Discoveries in modern physics, in fact, have caused the scientists' description of the universe to change from the metaphor of a clock to the metaphor of a kaleidoscope, and this metaphor and all that it suggests holds great promise for transforming our schools into authentic learning communities.

Reflect for a moment about how the metaphor of the clock has permeated and conditioned everything we do – our beliefs, our behaviors, our rules, and our world – and how it has created the context for how we think and what we do.

For three centuries the dominant scientific worldview has been the image of a static, repetitive, predictable, linear, and clockwork universe. Sir Isaac Newton gave us classical physics, the laws of gravitation and mechanics, and the description of a deterministic world. This Newtonian worldview also profoundly influenced our psyche, our beliefs, and our behavior, consequently how we designed our institutions. We have been obsessed with linear systems and their effect has controlled almost every dimension of our culture.

We have efficiently managed our world by drawing lines and boxes around everything and by separating things into discrete observable, measurable categories. We created dichotomies, divisions, departments, boundaries, and closed systems. We focused on predictive cause-and-effect models of human behavior; we separated knowledge into disciplines. We designed hierarchies and linear structures. We divided people into management and labor. We fragmented ourselves, our beliefs, our behavior, our organizations, our learning, our schools, and our world. We separated our bodies from our minds, our minds

from our hearts, and our hearts from each other. We forced compassion to compete with intellect.

Depriving our insight from Newtonian physics, we behaved as if we believe that by studying the parts we will understand the whole, and that analysis will inevitably lead to synthesis. But this shouldn't surprise us. After all, isn't that the way a predictable and clockwork universe works?

We may have thought that the structure of our educational system was derived from the principles of Frederick Taylor, Adam Smith, and the needs of the 19<sup>th</sup> century industrial revolution. In truth, it is even more fundamentally rooted in 17<sup>th</sup> century physics, and evidence abounds.

### **Model Environment**

Walk with me for a moment into the imaginary Sir Isaac Newton High School, a school created as the model for America (and indeed, the world). What do you see? What do you hear? What do you feel is going on?

What we see, tangibly, are corridors, cubicles, cubbyholes, and classrooms – self contained, isolated, and unconnected. We see departments, divisions, contracts and complex rules. The school has constrained time in discrete blocks, courses, coverage, Carnegie units, and competition.

What do you hear? Largely, we hear single voices, mostly of teachers, sometimes of student-to-student or student-to-teacher, but talk is linear and mostly one-way. There is conversation, but little dialogue.

What do you feel? I can't tell you what you feel – but I feel:

- Constrained creativity and opportunity, and need to ask permission to be different;
- Untapped potential, diminished curiosity, and stifled imagination;
- The presence of a learning paradigm that says that education is passive and incremental, not dynamic and developmental;
- Learning is dispensed information, not constructed meaning;
- Potential is finite and bounded, not capable of being enhanced;
- Learning is defined by the calendar and not by performance;
- Coverage and reproduction are more important than understanding and meaning;
- Rote memory is better than spatial memory;
- Prior knowledge is unimportant and irrelevant;
- Evaluation only can be objective and external, not qualitative and self corrective; and

- Competition in learning is far more powerful and meaningful as a motivator than cooperation and collaboration.

I feel that what Rexford Brown of the Education Commission of the States calls “the primary conditions of thoughtfulness—mystery, uncertainty, disagreement, important questions, ambiguity, and curiosity” – are thought to be soft and lacking in rigor because they can’t help our score on the SAT, the ACT, or the Advanced Placement exam.

By design we have constructed and operated our Newtonian schools as we have understood our world, and these constructions have produced learning-disabled institutions, students, and staff, including us, who have suppressed creativity and potential to survive. This efficient, orderly, and linear design of schooling no longer makes any sense to me.

It is contrary to everything I believed about human potential and capability. It negates my observations about the need we have as learners for meaning and sense-making; for exploration, and discovery; for risk, adventure, and mystery; and for integration and connection.

It belies what the neurosciences teach us about how the brain functions and learns. It challenges the personal, active, volitional, and social dimensions of learning that are so essential to authentic meaning.

Clockwork families, clockwork marriages, clockwork organizations, clockwork relationships, and clockwork schools were in many ways destroying our capacity for self-renewal and growth because they were destroying our capacity to relate with, care for, and connect with one another. Through isolation and fragmentation, we were by design tearing ourselves apart. In short, I was coming to the conclusion that much of what we were doing in the name of educational reform was simply not natural.

The unexamined application of Newtonian laws to social systems caused us to design a linear system, based upon predictive models of change and a belief that reality was objective and knowable – when in fact human systems are complex, dynamic, and organic; change is unpredictable; and reality is what one evokes and experiences. Our system was injurious to our health; it was making us sick.

## **A New Scheme**

As complex learning systems, schools are far more organic and dynamic than linear. We, therefore, must design them to function less like clocks, and more like kaleidoscopes, and to do so, we must ground our educational transformation in the science of our times. We must understand, however, that the paradigm of

new physics does not replace the paradigm of the old, but it doesn't explain all phenomena.

Because we now understand that most of nature (weather, ecological systems, developing embryos, and even the brain) is not linear; we need a different conceptual scheme and a different way of viewing and understanding the universe. Then we need to apply this understanding to the re-invention and transformation of America's schools. The beginning of the 20<sup>th</sup> century brought an end to Newtonian domination and presented a conception of the universe as holistic, dynamic, and interconnected. What can we learn from the new science that will enable us to:

- Create the empowered, entrepreneurial and relational learning communities we seek?
- Bring coherence, integration, and simplicity to the complex systems in which we work?
- Build meaning, capacity, and accountability into our enterprises?
- Bring all those committed to the education of children closer together as collaborators and partners in educational transformation?

The new science does not answer all these questions for us, but it does reframe some of them. What we are learning is that it is a science of connection, interaction, and integration, not a science of separation and reductionism. It is based on:

- The behavior of subatomic particles that is not directly observable;
- The prediction of patterns and probabilities, not events;
- The recognition that objective reality does not exist apart from our experience and that we cannot observe something without changing it;
- The realization that chaos and disorder can be a source of order;
- The acknowledgement that inherent order and harmony exist in the universe.

The vision of reality we are discovering is grounded in the interrelatedness and interdependence of phenomena. Albert Einstein reminded us that "no problem can be solved from the same consciousness that created it. We must learn to see the world anew." The new view of science reveals a universe of inherent order. It is, according to Margaret Wheatley, author of *Leadership and the New Science*, "a universe rich in processes that support growth and coherence...Nothing happens in a quantum world without something encountering something else. Nothing is independent of the relationships that occur." Even in the most seemingly chaotic systems, like the movement of clouds or the swirling motion of a liquid, an internal structure exists.

Order is created by “strange attractors” – forces or shapes of probability that seem to prevent the system from going beyond certain invisible boundaries. It is self-referencing. One of the most powerful illustrations of this construct of emergent order is found in the field of complexity theory, that deals with the structure and order of complex, dynamic, and adaptive systems, such as an ecological system.

What is so fascinating about these complex systems is that the order that emerges does so from a simple set of rules that govern the interaction of the individual components of the system to each other, and not the total system itself. From this interaction of the individual components, system stability emerges. This has been simulated in a computer program with interesting results.

One of the most intriguing of these simulations is called “The Experiment of the BOIDS.” In this experiment, the program attempts to capture the essence of emergent order, in this case the clocking behavior in birds, by placing a large collection of independent bird-like agents called BOIDS into an obstacle-filled environment.

Each BOID follows three simple rules, according to M. Mitchell Waldrop, author of *Complexity: The Emerging Science at the Edge of Order and Chaos*. It tries to:

1. Maintain a minimum distance from other objects in the environment, including other BOIDS;
2. Match its own velocity with the BOIDS in its neighborhood; and
3. Move toward the perceived center of the mass of the BOIDS.

This simulation has been run thousands and thousands of times, and amazingly, with these three simple rules, a flock forms every time. What is even more surprising, however, is that not one of the rules given to the BOIDS said “Form a flock.”

### **Individual Relationships**

Four observations in this simulation have profound implications for us as leaders, not because we are trying to get flocking behavior but because we are interested in complex behavior, like learning and teaching, emerging from individual relationships.

- Rules that create complex flocking behavior do not relate to flocking behavior. They relate to what an individual BOID should do in relation to other BOIDS.
- Flocks form from the bottom up and not from the top down.

- The close interaction of the BOIDS with each other allowed the flock to adapt to changing conditions naturally. The focus of each BOID was on ongoing behavior and not the final result.
- Complex behavior, like flocking, need not have complex rules. Simple rules will yield profoundly complex results. Perhaps this is the most important observation of all.

## **Moving to Order**

How does something so seemingly remote and unconnected to our life's work as chaos, complexity theory, and flocking behavior possibly contribute to our ability to be leaders in educational transformation? What these new understandings of the natural world enable us to do is to challenge and then change the current context of education by creating a completely new one. I am not talking about moving boxes on an organizational chart. Re-invention is not about changing what is, but about creating what is not.

The current context of education, which is grounded in un verbalized underlying assumptions and invisible premises of a linear, predictable, hierarchically controlled and rigidly structured world, must be discarded to allow for the emergence of self-organizing systems that are held together by a compelling and shared vision of what they can become, by a deep set of core values, and by a commitment to goals and objectives, collaboratively established, collectively assessed, and individually supported.

In short, the paradoxical conditions necessary for educational transformation are individual freedom of choice and collective responsibility for the whole – individual and group autonomy and interconnections. What might happen if these principles were allowed to guide the re-invention of Sir Isaac Newton High School? What might we see now? Has anything changed? Let's go back.

First, we notice the name has changed to the Newton Learning Community. As we enter the building we see that the learning space has been reconfigured – it is far more open, flexible, and inviting now. There are no bells. Clusters of students, teachers, and community members are working together and intergenerational learning is prevalent. The curriculum is integrative and largely problem-based, so we see groups of students engrossed in highly sophisticated and complex problems – problems that actually impact the community in which they live, because that is where they came from.

Using multiple resources, including the Internet, they have been analyzing current research and sharing it in electronic dialogue with teams of students at other learning centers and teams of experts at several laboratories. All are working on the same problem. Their integrative and interdisciplinary approach to problem-sensing and problem-finding reminds us more of expert learners who

are drawn to principles and patterns than novice learners who are drawn to causality. The final resolution of each student team's work will be compared with the experts' recommendation and will be presented to the local city council, which will vote on whether to accept their recommendation.

Their assessment of the students' work will become a part of each student's portfolio and learning log. Students are intensely engaged in what they are doing; they serve as mentors and tutors for each other; personalized learning plans with specific outcomes enable each to learn at his or her own rate and in their own way. They have been taught not to seek the right answer; rather they seek the best resolution to the problem at the time because they know they will revisit this problem again and again as new information is gained.

The learning environment has been designed for an optimal experience; the flow and dynamic of active learning is pervasive and contagious. Lines of causality have been enhanced by circles of interrelationships.

We pass teams of teachers who are designing interdisciplinary curriculum frameworks for the group of students for which they share responsibility. Teaching teams have been given authority *and* accountability for all decisions affecting teaching and learning.

This is a place where significant learning standards are collaboratively established by faculty, students, administrative support teams, and the community, but the means to achieve them are not prescribed. Potential, creativity, and self-renewal are clearly prized. Choice has replaced control. Newton has decided to order itself with few rules, but it has a core identity, a clear and shared vision, explicit values, and an abiding belief held by all its members, that each member of the community must and will contribute to its growth.

## **Fostering Learning**

Sir Isaac Newton High School looked like a school. Newton Learning Community feels like an interactive museum. As we begin to create authentic learning communities throughout our districts, we must ask several critical questions:

- What are the sources of the order we wish to create, and where do they come from?
- How will we create coherence, integration, and purpose in our community?
- What structures can we derive that will support and celebrate learning, that will enable rather than deplete, that will evoke rather than direct, that will be fluid and flexible over time?



- How do we connect our need for autonomy and freedom with our organization's and or public's need for accountability and order? What might that order look like?
- What simple rules or parameters will enable complex learning, experimentation, and growth to occur?
- What are the "strange attractors" of our community? Are they explicitly known and understood by all? How can we sustain their power?
- How can we be sure that we are enabling potential to flourish?
- What are the skills we need to let go and enable our community to find its own identity?
- How can we continue to care for one another and support people in paradox?
- How can we remove boundaries and maintain security and trust?
- How do we sustain relationships and meaning? How do we support growth and change?
- How do we give ourselves permission to fail? What does failure look like in this place?
- How will we recognize if the love, faith, and trust we bring to our community begins to diminish? Will we be courageous enough to take the risks required to enable them to emerge once again?

These are difficult questions, but they are essential if we are to change the context of education. We cannot change what we do until we change how we think, and we cannot change how we think until we change who we are.

One simply cannot transfer as a whole any particular model or body of knowledge from one system to another. The models are informative, but knowledge, models, and expertise are co-created by thoughtful people working in and with their environment. Because of this, we need to trust, more than ever before, our own capacity to re-invent ourselves.

Our world is a non-linear, adaptive, dynamic, and pattern-seeking world of inherent order, interconnections, and potentials. It is a world where increasingly complex behaviors are created by very simple rules – rules that govern the relationships of individuals to each other and are established from the bottom up.

It is a world where deep inner creativity and coherence are woven into the very fabric of nature. What the world of new science says to us is that if we are truly going to create learning communities for the 21<sup>st</sup> century, we must look differently at our classrooms, our schools, and our work. We must view them as dynamic, adaptive, self-organizing systems, not only capable but inherently designed to renew themselves and to grow and change – not by rules established from the top, but by relationships created from within.

## **A New Reality**

The new science is incredibly liberating for leaders because now we do not need to have all the answers. What we need to do is “trust that something as simple as a clear core of values and vision kept in motion through continuing, purposeful dialog can lead to order,” as Wheatley suggests.

Our job as leaders is not to re-engineer a new education structure, but to enable the creation of mutable architectures – kaleidoscopic enterprises if you will – that adapt to the dance of life.

Externally imposed models, rules, guidelines, or formula cannot create the preferred future. Only through our relationships, engagement, and dialogue with others in our neighborhood do we create our own reality.

For years we have been trying to fix the parts, fix the curriculum, fix the schedules, fix the kids, and fix the tests. Now we realize we must first change the way we think and relate with one another. We must create a new way of seeing and being in the world, and this will cause us to change what we do.

Clearly our task as leaders is to move away from:

- Hierarchy and fragmentation toward connection and integration;
- The isolation of schooling toward the idea of a true community of learners;
- The confrontation of divisive structures toward the collaboration of partnerships; and
- A linear system with little focus and clarity of purpose toward an organic system drawn into the future by a compelling vision of what we can become.

We are trying to create a community that:

- Enables students and staff to come together to find greater intellectual and social coherence in what they learn;
- Enables them to interact freely with information of all kinds;
- Encourages collaboration with faculty; staff and students;
- Fosters connections and integration; and
- Truly affirms what Parker Palmer, the Eli Lilly visiting professor at Berea College and a senior associate of the American Association for Higher Education, calls “the covenantal nature of reality itself.”

## **A Different Lens**

To transform our educational system, Rex Brown says, “will require new kinds of policy and new kinds of leadership. We need leaders to create conversations, to change the levels and kinds of discourse going in and around schools, and to

stimulate inquiry, questioning, problem-solving, and a focus on learning for everyone in the system, not just students.”

The 17<sup>th</sup> century Newtonian worldview created a mechanistic and machine-based metaphor for management. Now we know better. We must take our metaphor for leadership not from the machine but from the ways that living systems organize, adapt, and change. There is a simpler way to lead, but to do so we must see through a very different lens.

As educational leaders working in collaboration with others in our neighborhood, we have remarkable opportunities now to change the face of public education in our nation by widening the circle of hope and opportunity and by being the “dream catchers” for our children’s future.

Margaret Wheatley clarifies our challenge best when she says, “I believe that we have only just begun the process of discovering and inventing the new organizational forms that will inhabit the 21<sup>st</sup> century. To be responsible inventors and discoverers, though, we need the courage to let go of the old world, to relinquish most of what we have cherished, and to abandon our interpretations about what does and doesn’t work.”

We cannot restructure a structure that is splintered at its roots. Adding wings to caterpillars does not create butterflies—it creates awkward and dysfunctional caterpillars. Butterflies are created through transformation.

This means that it starts with us. As leaders, we are the ones who must:

- Explore the paradoxes that continuously confront our systems;
- Provide opportunities to inject energy into the system;
- Promote diversity of all kinds;
- Allow creative tension;
- Bombard the system with information (sometimes even to create temporary confusion!);
- Establish communal relationships of meaning; and
- Create trusting, response-able, and love-able communities.

I know it sounds disquieting, but in organic systems, growth is found in disequilibrium, not in balance. As leaders in educational transformation, our role is not to control but to enable order to emerge naturally – and we are still learning how to do this well.

