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Shifting the Metaphor: Designing 21st Century Curriculum Based on the Principles of Living Systems and Sustainability

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“We also pour considerable amounts of money into our educational systems, but we haven’t been able to create schools and institutions of higher education that develop people’s innate capacity to sense and shape their future, which I view as the single most important core capability for this century’s knowledge and co-creation economy.”

- C. Otto Scharmer, 2009

Abstract: If sustainability is to be an integral part of rethinking the organization of multiple disciplines, then it is necessary to surface the mental models underlying our present curricular structures. Assumptions presently underlying design of most schools are based on the factory model, which raises two essential questions: 1) How can using the concepts of sustainability and structure be used to create a shift in our present thinking about schools and learning; and, 2) What will move schools to a more naturalistic way of designing learning environs, focused on nurturing the development of a sustainable future for our students? Upon collectively exploring these questions, we can begin to design innovative curriculum to prepare future students and teachers. This essay begins with an overview of the concepts of sustainability and structure, as found in systems thinking, and ends with a conceptual framework for thinking about possible new designs for a 21st century curriculum based on sustainability. These concepts are used to stimulate a dialogue about the essential questions that result in a shift, moving from the twentieth century metaphor of schools as “production-lines” to one of schools as “seedbeds” and students as “seeds,” based on principles of systems thinking and ecology.

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Introduction

If one thinks of the humanities and social sciences as exploring the human condition through the study of society and the behavior of its people, then these disciplines can be significant for understanding of how sustainability can lead to educational change. Sustainability is thinking about humankind’s relationship with the environment and how economic development impacts the environment. The relationship between ecological and economic activities throughout this planet, as Jeffrey Sachs argues, is now cast in terms of sustainable growth and development, social justice, and gaps between rich and poor. These issues are important concepts underpinning one’s understanding of why sustainability, at all levels within the educational system, is critical to needs of the next generation. To actualize this understanding, a key can be found in developing new metaphors for the activity of schooling.

Today, the critical drivers in developing these metaphors are advances in informational technologies, the evolution of neurosciences, genetics, nanotechnology, robotics, and changes in the structure of work. For example, Kurzweil defines a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will irreversibly transform. The energy of this change is exponential growth. He shows in practical terms that the technological advances we saw in the last twenty years of the Twentieth Century will only take fourteen years to develop in the first twenty years of the 21st Century (2014); and after that it will only take seven years to advance twenty years (2021)!

These activities are greatly impacting the world of our students by affecting the future of work and the quality of life on this planet. All of these advances are increasing the complexities of a person’s daily activities within any organization. This complexity is causing both personal and organizational angst, because our traditional methods of leadership and organization are no longer applicable to the emerging realities of the 21st Century. As educators, the question that we face concerns whether we think of sustainability as a subject to be taught or as an underlying principle in helping to design new learning environments for this emerging world. Coupled to this question is the prevalence of reductionist thinking that leaves one with the dilemma of thinking systemically about our students’ future but acting within silos of past thinking.

So, why is this important? Why should you, as an educator, care? If you do not, you will abdicate your responsibility in preparing the next generation to live in their future instead of yours! In his book, High Noon, J. P. Rischard identified twenty global issues that must be addressed, within the twenty years after 2003, if we are to survive as a sustainable civilization. These issues fall into three categories: 1) how we share our planet with each other; 2) how we share our humanity related to social and economic ideas; and 3) how we deal with legal and regulatory issues affecting our global behavior (65-66). Within these categories, key issues are identified, such as climate change, water deficits, global infectious diseases, population distribution, poverty, biotechnological rules, illegal drugs, terrorism, and intellectual property rights. These are some of the issues facing our children’s future. We must prepare
them to understand these problems in order for them to find the solutions within their future. We must ask if our present K-20 structure is designed to deal with the complexities of these issues.

**Sustainability and Structure—What They Are**

In order to design educational systems that can address Rischard’s global issues, it is important to understand two critical concepts: sustainability and structure. Reflecting on assumptions and values found in them will lead to new avenues for addressing these issues.

**Sustainability**

Sustainability has become one of those words used by many different people and organizations. It has become a “catch-all” phrase popular within the media and political discourse. The problem is not with the word, but in what could be called a “shallow” understanding of its underlying concepts and principles. Michael Fullan defines this shallowness: “the terms travel well, but the underlying conceptualization and thinking do not” (10). This lack of understanding the deeper assumptions that underlie sustainability has led organizations to base daily operations on non-sustainable practices. In developing a deeper understanding of sustainability, in order to find new metaphors for school design, it is important to innovate around learning environs focused on the future. Five definitions, based on Lester Brown, Michael Fullan, Peter Senge, Robert Lattimer, and John Ehrenfeld, set a context for understanding how sustainability can underpin a new design of curriculum and schools.

Lester Brown, one of the world’s leading thinkers in sustainable development, famously defined a sustainable society as one that satisfies its needs without diminishing the prospects of future generations. This simple and eloquent definition has shaped much of the discussion in today’s literature pertaining to sustainability. It sets the moral purpose for our actions. He argued that this moral purpose creates the need for new skills that “will thoroughly challenge the educational and training facilities of universities, corporations, and government agencies” (9).

To address this challenge, an understanding of the interrelationship between the economic and ecological needs of a community must emerge. Fritjof Capra points out that, in order to build “a sustainable society for our children and future generations, we need to fundamentally redesign many of our technologies and social institutions so as to bridge the wide gap between human design and the ecologically sustainable systems of nature” (99). He continues by saying “a sustainable human community is one designed in such a manner that its ways of life, businesses, economy, physical structures, and technologies do not interfere with nature’s inherent ability to sustain life” (230).

This definition presents a dynamic process that human communities are in coevolution with nature, instead of a static state. To utilize this dynamic in the process of rethinking the design of our schools, Peter Senge suggest that three guiding ideas
are needed for creating a more sustainable future:

1. There is no viable path forward that does not take into account the needs of future generations;
2. Institutions do matter;
3. All real change is grounded in new ways of thinking and perceiving (“The Necessary Revolution” 9-10).

These three principles set the stage for school systems to rethink the present assumptions and values that underlie how they are structured and carry out their daily operational practices.

In the field of educational change, Michael Fullan defines sustainability as “the capacity of a system to engage in the complexities of continuous improvement consistent with deep values of human purpose” (p. ix). The concepts of social justice, collaboration, equality, and creativity in fostering the common good are some of the deeper values that a school engenders beyond just the acquisition of information. This definition enhances Capra’s sense of social responsibility.

Robert Lattimer’s concept of universal sustainability broadens our traditional thinking of sustainability as environmental issues and their relationship to the economy. Universal sustainability is about creating new patterns of relationships with oneself, others, and nature; it is about thinking more deeply about these relationships and the systems we create as humans. A primary assumption of universal sustainability is a need to cut across organizational boundaries of the economy, political systems, science and technology, social systems, and education.

In economics particularly, universal sustainability builds a strong case for rethinking the underlying assumptions related to our present definition of capitalism. This rethinking impacts the direction and the purpose of organizations as they interact globally. In education, the understanding of these cross-boundary expansions is important to the redesign of the present K-20 curricular structures.

Finally, John Ehrenfeld defines sustainability as “the possibility that humans and other life forms will flourish on earth forever” (49). The intriguing aspect of this definition is the word “possibility.” As he points out, the word “possibility” is not a present-based word, but it gives us the chance “to visualize and strive for a future that is neither available in the present nor may have existed in the past” (49). This definition is different than the other four because it is based in the idea that, as humans, we have potential to bring forth the future, based on what has yet to be satisfied. He argues that the “future is the possibility out of which one lives and acts in the present” (50). Understanding this process of bringing forth our personal and group aspirations is critical in redesigning curriculum and schools.

By combining beliefs and assumptions found within these definitions of sustainability, one can begin to envision new educational frameworks that integrate sustainability as a guiding principle for the curricular innovations and leadership needed to change structural organization of our schools. Common to all five definitions, the following principles can be found: 1) development of possible futures; 2) commitment to a deep set of human values that support the future; 3) acknowledgement that structures found within institutions are important organizing
processes for human interaction; 4) understanding of cross boundary thinking; and, 5) most importantly, realization that new ways of thinking are critical to meet the needs of future generations.

Structure

Coupled to the definition of sustainability is the concept of structure. Structure is critical to understanding systems thinking. Donella Meadows defines a system "as a set of things interconnected in such ways that they produce their own pattern of behavior over time" (2). In a general sense, structures shape the behaviors of people over time. Structures always intersect with the humans within the organization. This is important to understand because, when a new structure is imposed on people, many times it will fail, because the process didn't include everyone affected by its development. In looking at how the word structure is used within educational organizations, one thinks of organizational charts, schedules, curriculum design, contractual arrangements, and policies. These structures shape the way people within the school go about their daily routines and activities. After a period of time, the influence of the structures is no longer overt and one loses sight of why and how the structure was created in the first place. For example, within the K-12 structure, why do we have grade levels, tracking, and nine months of schooling?

This lack of understanding leads one facing rigid, immovable objects within the organization. Think of the meetings where people say "we can't do that because the policy or schedule will not permit us to do that." Robert Fritz points out that because "we fail to understand the powerful nature of structure, we are less able to create new and desired outcomes" ("Corporate Tides" 15). This inability to understand the dynamic nature of structures on behaviors within schools is what leads to a continuous cycle of reform effects that do not change the system. Fritz defines structure as:

an entity (such as an organization) made up of individual elements or parts (such as people, resources...reward systems, departmental mandates...workload/capacity relationships, and so on) that impact each other by the relationships they form. ("Path of Least Resistance")

Building off this definition, one realizes that the present structures within our schools are the same as they were one hundred years ago, even with greater access to information through the Internet. In particular, the way curriculum is organized, the day is scheduled, and how the school building is physically laid out, schools are basically the same as they were when this writer went to school 58 years ago! This is why we continue to see the "pendulum-swing" between different educational practices and theories; the K-20 structure stays the same, no matter how powerful the new ideas!

For example, look at the two images below (Fig. 1), one showing the structure of most schools today and the other a representation of the Internet. What are the underlying assumptions about learning and the patterns of relationships among teachers, students, information, and the world at-large found within each?
Figure 1: Structures Affecting the Flow of Information and Patterns of Relationships
The image of the schoolhouse shows the present curricular structure as boxes that house content information (disciplines) and grouping patterns of people (grade levels). This structure shapes our present realities of what a school should be. Look at how media reinforces this structure in popular movies and television shows like, “Ferris Bueller,” “Welcome Back Kotter,” and “Glee,” to name a few. These images blind us from seeing the emerging future needs of our children.

The image of the Internet shows a different structure. Given the evolution of social media through the Internet, it is creating possibilities for new patterns of relationships among teachers, students, content area experts, and the community to emerge. In looking at the structures of the Internet and our schools, one needs to ask how congruent they are; how do their assumptions for a new reality demand that we prepare students to demonstrate understanding and the application of information in a globalized workplace? By not surfacing the assumptions found in schools, the consequence is that we lose sight of why the school was designed in the first place and, therefore, we try to make “new ideas and practices” fit the “old structure.” Just think about the millions upon millions of dollars spent to integrate technologies into the classrooms. What has really changed in the fundamental, daily operations of a school?

It was stated above that, taken collectively, the definitions of structure and sustainability underpin how educational organizations can begin to rethink the present mental models that are driving our K-16 schools. The way we are willing to utilize them in our thinking and conversation will either enhance or block the development of innovative structures for sustainability learning in the 21st Century. Tension between the current realities within the school and Ehrenfeld’s possible futures creates energy to think of new metaphors for schooling.

The Present Metaphor: The Well-Oiled Machine

Robert Pirsig once pointed out in his famous book, *Zen and the Art of Motorcycle Maintenance*, that if a factory is torn down but the rationality which produced it is left standing, then that rationality will simply produce another factory. Today, the American educational system is at a crossroad. We are still driven by a series of assumptions based in thinking that arose out of the eighteenth century Enlightenment. This period was influenced by Descartes’s rationalism and the Newtonian concepts that human organizations functioned as a machine. This is a very powerful metaphor in how our organizations are shaped. In the forward to *The Living Company*, Senge describes that “The machine metaphor is so powerful that it shapes the character of most organizations. They become more like machines than living beings because their members think of them that way” (x). The machine greatly influenced the development of twentieth century industrialism, sparked by Fredrick Taylor.²

Efficiency and standardization are important concepts found in the principles of scientific management. Using the lens of a “well-oiled machine” creates a sense that, in order to keep an organization functioning efficiently, the individual parts need to be monitored so that nothing will go wrong. This mindset has led to the development
of a management structure based in a top-down power model. In a world where complexity is minimized and easy to control, this model works well. The job of those in charge is to maintain its efficiency. A major assumption about people within this model is the distinction between “mental” work (smart people) and “labor” (not so smart). Management is about command and control with “time and motion” studies needed to reduce work activities to their smallest parts. The result was a reductionism of the system and a fixation on the parts while losing sight of the total system. For the twentieth century, the system worked very efficiently.

The effect of the machine metaphor on the teaching and learning process led schools to design curriculum in order to sort students to become industrial managers (a few) and workers (the many). In looking at the evolution of educational systems, the need for conformity, standardization, and efficiency in pedagogy and organizational operations become the hallmark of our present system. The structural outcomes were compulsory education, the development of high schools, standardized procedures in teaching and learning, tracking of students, separation of knowledge into discrete subjects, and anathema hierarchical management of schools. Efficiency and standardization are very powerful “mindsets” within our present culture; they shape how our society “sees” school. These mindsets limit the flexibility and adaptability within the schools to deal with the complexity and changes related to the future of work and living in the 21st century.

Even with the evolution of informational technologies, today there is still a belief that information should be “pushed” at students because they are “empty vessels” that need to be filled. Students are not able to develop critical thinking until their heads are filled with basic information. Bloom’s taxonomy has created a linear mindset about the structure of information. For example, individuals can’t think mathematically until they master basic computational skills. What this mindset creates is a belief that learning is about getting the right answer on a test.

A classic example in America is the Federal legislation No Child Left Behind (NCLB). The aspiration of NCLB to give every child a quality education is a great societal goal but, after twelve years, implementation has been a disaster. More and more children are being left behind and ill prepared for a highly competitive, globalized economy. The competitive rating of schools by communities, states, and countries reinforces the “right answer” mentality. The unintended consequence is the development of a student attitude that it is more important to get the right answer in school than it is to deal with the complexities of applying information to real world, complex situations.

Why? We have what de Geus calls no “memory of the future” (35), which is necessary to truly create schools that can embrace universal sustainability. These memories are developed when schools can nurture possible futures and the actualization of what we can create. The present realities of kindergarten to graduate school reform demonstrate this lack of a “memory of the future,” because most reform efforts create memories of the past, locked into our twentieth century metaphor of the industrial factory. What the mind has not experienced before, it cannot see. In not seeing forward, there is very little discussion of the nature of deep change, how
to bring it about, and what does it mean for schools and their communities. If we can begin to nurture what Senge calls a positive future, where we are living in the question of “what we want to create,” then we can innovate for the schools needed in the 21st century and beyond.

**Shifting the Metaphor: Living Systems as an Organizing Principle**

De Gues introduced the concept of the “living organization” in his study of why there are very few large organizations that are more than 100 years old. He states, “like all organisms, the living company exists primarily for its own survival and improvement: to fulfill its potential and to become as great as it can be” (11).

Related to Michael Fullan’s definition of sustainability above, de Gues identifies four key components that underlie the living company. The first is that an organization needs to be sensitive to the environment in which it exists. When this is a fundamental operating principle, the organization is in a continual state of learning and adapting to its environment. Second, there is a focus within an organization on building a sense of community and a persona of itself, to create its identity within the environment. Third, the organization builds constructive relationships with others within the environment and within its own structure. This leads to tolerance of different views and decentralization within its own internal culture. Finally, the fourth component is related to its ability to sustain its own growth and evolution as an organization.

Understanding the tension between the aspiration for the future and the current realities within the organization is the key for any organization to be sustainable. New metaphors for schooling that shift from those of industrial-age thinking to ones relevant to the principles of sustainability and ecology are the catalysts for change.

Building on the concept of a living organization, Capra believes that, to ensure a sustained future for our children, there needs to be an understanding that, as humans, we need to think of our organizations as living systems. He states:

> Understanding human organizations in terms of living systems, i.e. in terms of complex nonlinear networks, is likely to lead to new insights into the nature of complexity, and thus help us deal with the complexities of today’s business environment. (100)

This concept is not just related to the business environment but any human organization, in either the private or public sector. It underpins development of a conceptual framework to shift from our present machine metaphor to one based on flexibility and adaptation to the environment. Sustainability is embedded in the understanding of networks of relationships that give rise to continuous change in living systems. Three key processes are found to underlie the natural process of change within any living system: adaptability, diversity, and creativity. How these are found in nature is through the dynamic process of continuous transformation of the parts within living systems. A living system continually creates/recreates by adapting its structures through “web-like” networks with its surroundings. Adaptability, diversity, and creativity are the processes that can help us develop new metaphors for how to structure schools and curriculum based on living systems.
How would we design schools that are not based on a metaphor of a "production-line" found within a factory? How can we bring into sync the ideas within sustainability to innovate schools? What would be the underlying assumptions found within a metaphor that would nurture our thinking about schools in the future? How would information (content) be organized to actualize 21st century skills? These are the necessary questions to begin the dialogue about the future both within and outside the school systems. This will lead to the creation of redesigned schools with new assumptions based in the possibilities of the future. So, this new metaphor may be: the school is a seedbed and our children are seeds.

The underlying assumptions to actualize the metaphor of the seedbed should start with the following:

1. Generative-centered learning allows for the development of the intrinsic interest of students;
2. Learning is based on the diversity of intelligences and styles;
3. Understanding is manifested through a demonstration of the interdependency and change within the world, instead of just finding the right answer on a static test;
4. Conversations are inclusive among all who are involved in the learning process;
5. Education is seen as a vital part of the web of social relationships that link people and communities together;
6. Informational technologies would be utilized to enhance development of new relationships among different disciplines, leading to development of a sense of one's place within the ecosystem.

These assumptions are based in systems thinking and the understanding of living systems that focus on the ideas that: a) there is no path forward unless the needs of future generations are understood, and that b) new patterns of thinking and perceiving drive educational innovation. It also means, as Senge states, “simply stepping back and seeing patterns that are, when seen clearly, intuitive and easy to grasp” (The Necessary Revolution 23). Thinking in systems allows one to “see” the possibilities across boundaries that presently block our ability to innovate new metaphors for our schools.

**Schools As Seedbeds: Rethinking the Structure**

Knowledge, innovation, critical thinking, entrepreneurship, and creativity are the real capital of this emerging world. These are the skills that every student needs to master, based on their own aspirations for the future. These skills must become the basic building blocks at the beginning of a child’s first experiences in school, and continue to be part of their learning throughout their life. These skills do not match well to the present structure of schools.

Until there is a rethinking about the total school system structure, our children will not be well prepared to live and function productively, much less negotiate the present “high-stakes testing” mentality, because of mismatched organizational structures.
Based on the concepts and assumptions presented to this point, let’s explore one possible innovative design structure driven by the concepts found in sustainability and systems thinking.

**A Possible New Structure of Learning Spaces**

Fritz points out that, if a structure remains unchanged in light of outside forces, then the behavior of people will continue their previous behavior. If there is a sustained structural change, then it will lead to overall changes in the behaviors to meet the needs of a new future. To begin thinking about a new possible structure (Figure 2) to meet emerging demands of the 21st century world, let’s consider grouping children in three-year age bands, starting with age five and continuing through adulthood.7 These age bands are contained in a learning space. This concept of a learning space is based on Kurt Lewin’s view that social environments are dynamic fields of interactions of the people within them.8 The content within each develops the humanities and social sciences as an integral part of nurturing in students what it means to be human in a technological age.

![Figure 2. School as A Seedbed](image-url)
The first learning space is called Tools of Expression and Inquiry (5-8). Children learn to communicate through using different forms of expression, and ask questions as they construct knowledge related to thematically-structured learning activities. The purpose of this band is to: develop literacy through notational systems adding color and sounds to letters and numbers, creating knowledge and understanding from asking questions, and developing the habits for creative thinking.

The second learning space is Enhancement of Thinking through Core Knowledge (8-11), where children learn how knowledge becomes organized into categories. Each content space is viewed as a specific way of thinking and interacting with their world. Information is structured intra-disciplinarily as students explore the different aspects of specific content, e.g. Social Studies and its sub-disciplines of history, economics, civics and government, etc.

The third learning space is called Problem Solving/Interdisciplinary Relations (11-13). Students begin to manipulate the disciplines to find relationships and differences to problem-solve or construct new knowledge bases. The purpose for students is to expand their understanding of disciplines, pursue solutions to non-trivial problems, learn to value and integrate knowledge from multiple points of views, and create productive social relationships with others.

The fourth learning space is called Project Oriented Learning/Life-Long Learning (14-adults). Students expand their knowledge in any given field(s) of inquiry. They specialize in their studies by directing their own learning and career development. The learning environment is structured to allow students to interact with mentors and partnerships within businesses, higher education, and community organizations. The purpose of this space is to: apply knowledge to “real” world situations; accept responsibility for continuous learning; realize learning as a collaborative process; and connect to a larger community, making us responsible for sustaining it into the next generation. This space changes the structure, of what we call high school, to a new structure that “opens” the schedule to develop new relationships with the organizations mentioned above.

This is a representative view of a future, life-long learning environment structured on the principles of sustainability, systemic thinking, and living systems. This structure is an example of Ehrenfeld’s idea that possibility is not a present based word and gives us the freedom to explore the future in a very sustainable way.

A Deeper Dive Into a Learning Space

To illustrate how a particular learning space would develop, a sample project called the Rivers, Bays, and Ocean (RBO) is used. The essential question underlying the RBO is:

Is it possible for regional watersheds and aquifers to lose their ability to supply geographical regions with fresh water?

The purpose of the RBO in exploring this question is to build understanding and action around the need to integrate ecological and economic priorities, to enhance quality of life within regional watersheds and aquifers. The curriculum is focused on
cross-content learning activities that will nurture development of literate citizens to understand the problems identified by Rischard, and create skill sets to perform the work necessary to solve them.

This is accomplished within each of the learning spaces through the development of collaborative networks among government, non-profit organizations, businesses, schools, and communities. Each learning space is designed to leverage local resources to enhance lifelong learning related to these issues within watersheds. The curriculum is structured within the learning spaces to produce a "collective insight" about how given watersheds work and the strategic challenges they face, as a basis for coalescing diverse groups to think and work collaboratively. This "collective insight" will enhance the development of "prototypes" for schools and communities that are committed to creating a sustainable future for their children.

The focus of each learning space within the framework of the RBO is to:

- grow an ethic and practice of environmental stewardship;
- understand how to integrate ecological and economic priorities;
- enhance the quality of life for people within the watersheds;
- increase collaboration and thinking among government, non-profit organizations, and businesses to enhance student learning;
- understand the need to think regionally to solve complex ecological and economic issues; and
- regenerate the health of watersheds, ecosystems, and the human communities within them.

For example, looking deeper into the learning space of Project Oriented Learning/Life Long Learning, the environment is structured through networks of teams, both within the school and with "outside" groups. The students are not restricted to one learning environment and their schedule will be at multiple sites, depending on their developed program. These sites can be within a higher educational environment, a business, NGO, or other global learning networks. The environment will be blended, utilizing social media and MOOCs to interact with experts within their field(s) of study. All their learning activities are designed to allow learners to apply their knowledge by demonstrating understanding and its application to meaningful activities. For example, individual students, or teams of students, work with their local legislator to draft laws or policy to protect their watershed.

Letting Go—Coming In

To conclude this essay on new metaphors for developing innovative curricular structures focused on sustainability, the idea of "letting go—coming in" is the starting point for our future. Scharmer developed the concept of "letting go—coming in" to explain that "tuning into something new requires that you must first let go of something old" (199).

The intent of this essay is to raise awareness that concepts such as sustainability, systems thinking, living systems, innovation, and creativity can help nurture a deeper understanding of why it is critical to think about education with new metaphors.
There is a need to move away from thinking about reform in education to innovation in education. Reform is improving within the present structure, whereas innovation infers the act of creating new system structures.

In looking at past reform efforts to change our schools, we keep coming up with schools that, for the most part, look like they did 100 years ago in both form and structure. Lattimer has, through universal sustainability, called for a new understanding of what 21st century capitalism needs to be. In the world of economic globalization, education is at the center of this evolution in thinking.

Until all sectors of society can begin to change our habitual patterns of thinking about what schools are, hopes for a future sustainable world are greatly at-risk. The problem we all must begin to consider is Russell Ackoff’s warning - that the need to get the question right is the most important consideration. If not, we will continue to do the wrong things righter and the more wrong they will become. In order to discover the right questions, we need to let go of the past and allow the future to come in.

Notes

1. See Tyack and Tobin’s (1994) detailed historical perspective on how the present structure of schools developed in the United States.
2. *The Principles of Scientific Management*
4. For a more detail discussion see Capra’s The Hidden Connections (2002).
5. See Senge et al.’s *Schools That Learn: Updated and Revised* (2012) for strategies to develop these and other assumptions to change schools.
6. See The Partnership for 21st Century Learning at http://p21.org/ and Young Zhao’s *World Class Learners* (2012) for a deeper insight to these concepts. Zhao’s web site is an excellent source for interaction with these ideas (http://zhaolearning.com/).
7. Each of the bands will have “primary learning directions” which are directly taught as specific areas of learning and activities. Also, there are “integrated content directions,” which are integrated with the primary learning directions but not directly taught as a specific discipline. For example, in the first learning band, mathematics, reading, writing, speaking, art, music, and physical education are directly taught and are the focus of performance assessment. Systems thinking, science and technology, geography, civics and government, and history would be used to create the themes and “context” for the primary content areas. In the second band, mathematics, reading, etc. become the “skills” to express understanding and demonstrate performance of a specific discipline throughout the rest of the curricular structure.
8. Resolving Social Conflicts (1997). Also, see Scharmer’s Chapter 15 on social fields for a deeper understanding of my development of the learning space.
9. Montessori, Dewey, Piaget, Gardner, Senge, and programs such as Reggio Emilia greatly influenced this writer’s thinking about this framework, particularly the first band. Tools of Expression and Inquiry are critical because they students to develop the attitudes necessary for a constructivist K-12 system of performance accountability through project-based learning. Teachers are no longer in individual K-2 classrooms, but function as a “team” and work with a group of five to eight year olds.
10. This space is designed based on Howard Gardner's idea that the most important, irreducible, purpose of school—from elementary through high school—is to help students better understand the major disciplinary ways of thinking. This learning space is to help students to understand as humans we do organize information into categories called disciplines. This will help them to see how we think about and organize information, not to create separate silos of thinking.

11. This curriculum was developed by the author and his colleague Dawn R. Sutton and is presenting being utilized in the development of a new form of Charter school in Pennsylvania. The project will link schools and communities within both the Delaware and Susquehanna watersheds.


13. See http://www.youtube.com/watch?v=MzS5V5-0VsA

Works Cited


