2011

Loving the World and Our Children Enough

Nurturing "Decidedly Different" Scientific Minds, by Design

"Education is the point at which we decide whether we love the world enough to assume responsibility for it… And education, too, is where we decide whether we love our children enough not to expel them from our world… nor to strike from their hands their chance of undertaking something unforeseen by us, but to prepare them in advance for the task of renewing a common world."
Hannah Arendt, The Crisis in Education (1954)

"There is a new world struggling to be born. This transformation will not emerge **through the reinvention of social structures and institutions, although that will occur.** Nor will it emerge through the reformation of governing policies and priorities, although they too will change. Rather, it will come from an altering of mind—the transformation of human consciousness and the emergence of integral and wise global minds that will creatively live into a new worldview of an interconnected living planet and a sustainable and interdependent human family. …the fullness of our humanity and the sustainability of our planet rest with the transformation of human consciousness and the nurturing of decidedly different minds."
Stephanie Pace Marshall, Ph.D., The Power to Transform: Leadership that Brings Learning and Schooling to Life (2006)

Stephanie Pace Marshall, Ph.D.

Fourth Advanced International Colloquium on Building the Scientific Mind (Stellenbosch, S.A.) Handout
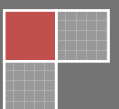
"Mind-shaping is world-shaping"

"We live in a time of converging global challenges and problems so interdependent and resistant to traditional modes of thinking and problem-solving, they seem to render us impotent.

Yet our cultural and cognitive paradigm is shifting.

Tiny fault lines are appearing in what were once unquestioned policies, institutions and lifestyles.

Unprecedented connectivity, undisputed global interdependence, and the emerging awareness that our individual and collective futures are inextricably linked in a ubiquitous, ageless and boundaryless global commons, are causing us to re-evaluate policies and re-design strategies historically viewed as "off the table."

We are beginning to change our minds, reinforcing Einstein's declaration that the thinking that created our seemingly intractable problems will not be able to solve them.

Impoverished thinking leads to impoverished problem-solving and world-shaping. Wise world-shaping requires that we and our children think in "decidedly different ways"

As human beings, our genius lies not in predicting the future, but in imagining and creating it. It is the nature and quality of our thinking that shapes who we become, and who we become shapes the world."
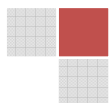
We are Born Learning Beings

We naturally imagine, wonder, invent, and explore our way into unknown territories and perplexing questions. Our curiosity and insatiable drive to know and figure things out is innate. Even if we wanted to, we could not stop learning and trying to make sense of our world and our place in it. We could not stop trying to understand who we are, why we are here, and how we belong.

And in our irrepressible quest to know, experience, explore, discover, and play, **We create our world.**

Children Will Create…

"Whether order or disorder, chaos or harmony, beauty or ugliness, accord or violence, they will create…

Humans are …shaped by experiences early in life…The best learning often occurs when children spend unplanned and uncounted hours outdoors investigating, experimenting, exploring, and playing…spontaneously and delightfully designing their own curriculum. In the right circumstances, the result is a lifelong love affair with birds, bugs, fish, plants, trees, water, seashore and landscapes, a love affair that is the foundation for an imaginative life rich in possibilities.

There is a worldwide movement to remake the human presence on Earth by designing with, not against, nature. *Ecological design involves the calibration of human intentions with the knowledge of how the world works as a physical system and the use of that knowledge to inform and discipline our intentions.*

*It is rooted in the awareness of our proper role as members in the community of life and as players in the ongoing drama of evolution**. It is predicated on the idea that nature is both a template and a model for human design, not something to be overwhelmed and mastered…***

Most important, ecological design—the practical application of the concepts of interrelatedness, systems, and long time horizons—is changing how we think, and how we think about the act of thinking.

No improvement in our gadgetry and technology alone is remotely adequate to our situation without a profound change in our mindset. We arrived at our present precarious situation as a result of flaws in thinking, perception, and paradigm.

That makes it a crisis for those who purport to improve such things" (David W. Orr. *The Third Teacher*. Foreword:14-5).

Shallow or Deep Learning?

Our children's responses to the "unnatural" design of schooling is often shallow learning, not the deep learning so essential for complex thinking, and creative knowledge generation and use.

Shallow Learning:
- Estranges learners from their deepest self
- Separates them from the experiences and questions that foster meaning and connection
- Diminishes their sense of belonging to others and to something bigger than themselves
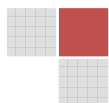
- Encourages the preeminence of rapid coverage and acquisition over engagement and more deeply constructed understanding
- Distorts the learner's knowledge of herself as a learner
- Prevents learners from accessing their abundant potentials and
- Disconnects creativity and imagination from learning

Shallow learning most often results in risk-averse, uncurious and emotionally disengaged learners ill-equipped to respond to the messy and ethically complex problems we face—problems that defy simplistic categorizations and rapid resolution.

The Need For Deep Learning

The nature and quality of our children's minds will shape who they become, and who they become will shape our world. The worldview now being mapped into the minds of our children is one of reduction, scarcity, fragmentation, competition, and winning.

Our current schooling story conceives learning as a mechanistic, prescribed, and easily measured *commodity* that can be incrementally and uniformly delivered to our children. This narrative could not be more brain and learning antagonistic.

While shallow learning fosters and validates only one way of knowing, deep learning is holistic, integrative and inclusive; it recognizes that we are living in a "both-and" universe, not an "either-or" one; it understands that it is often through the integration of polarities and seemingly disparate ways of knowing that genuine understanding and wisdom can be created.

Deep learning is both active and reflective. By immersing learners in interdependence and wholeness and meaningfully engaging them in the big ideas, questions, paradoxes, and ambiguities of the human experience, deep learning is transformative.

It reignites passion and curiosity and weaves a tapestry of connection and belonging that grounds learning in the roots of personal meaning and purpose.

Deep learning provides a context of connections and wholeness that reconnects children to all the ways they come to know and reestablishes their physical, cognitive, and spiritual intimacy and resonance with the natural world and one another.

The Quiet Crisis: What We and Our Children Have Lost

The profound systemic problems that now cast a malignant shadow over our global community, our own society, and the growing minds of our children will not be resolved until we reconnect to the roots of what it means to be fully human and to what we and our children seem to have lost:
- A sense of personal identity, meaning and purpose.
- A passion for learning.
- A sense of wholeness, connectedness, and relatedness to the natural world and to one another.
- A deep awareness that we are part of something bigger, more mysterious, wondrous,
- An understanding that we must bring all the ways we uniquely come to know into learning—the analytical *and* the intuitive, the objective *and* the experiential, the scientific *and* the aesthetic, the linear *and* the spiritual.
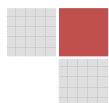
- The compassionate use of knowledge and a global concern for human and community prosperity and moral action in the world.
- A commitment to ecological sustainability and the embrace of nature as a sacred and healing dimension of our lives.
- The capacity for silence and solitude.
- The intimate connection and collaboration of youth and elders around shared purpose, and
- The joy of deeply and imaginatively exploring what we love. (Stephanie Pace Marshall. *The Power To Transform*: 11-12)

The Future will Belong to "Decidedly Different," "Both/And" Minds That Are Integral and Wise

In a world of unprecedented connectivity and undisputed global interdependence, our future will be shaped by *decidedly different* minds that:

- Discern wholeness, understand design, interdependence and systems;
- notice, analyze and connect illusive patterns within vast amounts of unstructured multidisciplinary data;
- deftly change course when hypotheses and prototypes fail;
- systemically and imaginatively unravel complexity;
- creatively generate new ideas, questions, designs and ways of thinking;
- embrace ambiguity, uncertainty and paradox;
- seek restorative solutions to conflict;
- naturally take risks, tinker, improvise and venture into unexplored and unconventional territory;
- fluidly navigate, integrate and create within, between and beyond multiple disciplines and domains;
- globally collaborate to wisely advance the human condition and sustain the health of the planet.
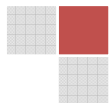
"Both/And"Thinking

By design, learning environments and experiences must invite children to develop their multiple potentials by cultivating the adaptive expertise, innovation and integration of "both/and" thinking; disciplinary, interdisciplinary and inquiry based; design based and systems based thinking.

Such thinking integrates and validates the power of:
- the intellect *and* the imagination;
- knowledge *and* relationships;
- research, hypotheses testing, and experimental design *and* prototyping, simulation, problem-solving, and storytelling;
- observation and evidence-based truth *and* improvisation and experiential truth;
- analytical measurement *and* aesthetic insight;
- observation *and* intuition;
- reason *and compassion and* empathy;
- curiosity and skepticism *and* wonder and awe; and
- expertise *and* wisdom and love (Marshall, 2006).

To meaningfully engage requires integral and wise minds able to bring a holistic, connected, and imaginative context to how we ethically act within, make sense of and create our world.

The significance of educating for "integral thinking" is the power of an altered worldview. ***When we perceive and experience wholeness, we are transformed.*** (Marshall, Ph.D., Stephanie Pace. "A Decidedly Different Mind." *Shift: At the Frontiers of Consciousness* 8(2005): 10-15.)
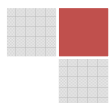
"The nature and quality of how our children think and what they think about is the new "currency" for breakthrough research and problem-solving, pioneering collaboration, human-centered design, innovation and transformative global change."

A word about wisdom

Wisdom is very different from intelligence. It is:
- a holistic process of reflection and judgment
- a way of thinking that cultivates and interconnected and balanced response to challenge
- a way of perceiving that takes the long view, sees the "big picture" and enables us to see beyond immediate events and bring awareness and reflective context to seeing and resolving complex questions

Wisdom enables us to hold paradox and ambiguity, seek what is enduring and fluidly integrate objective and subjective ways of knowing. It is the "integration of intelligence and compassion" (James Garrison, Pres. Wisdom University)

"Naturally Right," by Design: A Dynamic and Vibrant Learning and Innovation Ecosystem

"Design is not simply the making of things, but rather a striving for wholeness" (David W. Orr).

> **"What will it take to create a generative and life-affirming system of learning and schooling that liberates the goodness and genius of all children and invites and nurtures the power and creativity of the human spirit for the world?"** (Stephanie Pace Marshall, 2006)

It will take a radical new story, map and landscape that honors how we learn and ignites and nurtures our children's inventive genius and enables it to flourish, by design.

. . . . .

Story, Map and Landscape

"Mind-shaping is world-shaping.
 When we change the story, we change the map.
When we change the map, we change the landscape.
When we change the landscape, we change our experiences and our choices.
When we change our experiences and our choices, we can change our minds.
And when we change our minds, we can change the world.
Changing the story, changes everything." (Stephanie Pace Marshall, 2006)

The Story
"Stories are the secret reservoirs of values. Change the stories, individuals or nations live by and tell themselves, and you change the individuals and nations. Beware of the stories you read or tell; subtly at night, beneath the waters of consciousness, they are altering your world." (Ben Okri, *Birds of Heaven*, 34)

"Even in our data-driven culture, narrative trumps data every time. The power of story is simply disproportionate to the actual information it provides." (Stephanie Pace Marshall)

"Stories become "testaments, old or new, that choreograph the life of the community" (Stephen Larsen in Phil Cousineau: *Once and Future Myths*, 2001)
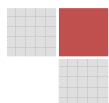
The Map

"We design for what we love. We design because we want what we care about to live. Design is about timeless influence. It is about intentionally shaping the conditions within which dreams and possibilities are invited or denied." (Stephanie Pace Marshall)

"Design is a map--a representation of our deepest passions, beliefs and commitments. It is an idea, a conception, and an image made visible-an act of faith--that from the design we imagine and conceive, we can actually create a new way of being in the world." (Stephanie Pace Marshall)

The Landscape

"To educate our children wisely requires that we create generative learning communities, by design. Such communities have their roots in **purpose**, not prescription; **meaning**, not memory; **engagement**, not transmission; **inquiry**, not compliance; **exploration**, not acquisition; **challenge**, not threat; **personalization**, not uniformity; **interdependence**, not individualism; **collaboration**, not competition; **questions**, not answers; and **trust**, not fear." (Stephanie Pace Marshall)

Adding wings to a caterpillar does not create a butterfly.
It creates awkward and dysfunctional caterpillars.
*Butterflies are created through transformation.*
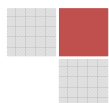
The Current Reductive Story and the New Integral Story*:
A Comparison

	The Current Reductive Story: Prescriptive and Uniform Transaction	The New Integral Story: Generative and Personalized Engagement
Mental Model of Learning & Schooling	**Deficiency and Memory:** *Analyzing, "Fixing" and Re-mediating Identified Learning Limitations;* *Accepting External Authority for Learning*	**Abundance and Meaning:** *Activating, Developing and Connecting Unknowable Learning Potentials;* *Developing Internal Authority for Learning*
Learning Identity	**Passive Acquisition and Pragmatic Compliance:** Short-Term	**Purposeful and Transformative Engagement** Life-Long
Learner Identity	**Disengaged and Conforming Recipient:** Receive Inert Information	**Active and Inquiring Co-Creator:** Construct Meaning
Teaching Identity	**Transmitter:** *Convey Pre-Selected Information; Dispenser*	**Mentor:** *Weave Deep and Emergent Understanding;* *Co-Creator*
Learning Information	**Static and Limited:** *Externally Prescribed, Controlled and Perceived as Irrelevant*	**Dynamic and Abundant:** *Externally Responsive, Self-Generated, Accessible and Imbued with Meaning*
Learning Relationships	**Contractual:** *Individualistic, Competitive and Fear-Based*	**Collaborative:** *Inclusive, Interdependent and Trust-Centered*
Learning Processes	**Mechanistic:** *Acquisition-based and Risk-Averse*	**Creative:** *Inquiry-based and Exploratory*
Learning Patterns	**Prescribed and Hierarchical:** Fragmented—Focused on Parts	**Self-Generated and Networked:** Holistic—Focused on the Whole
Learning Structures	**Immutable and Standardized:** *Permanent and Non-Responsive to New Learning*	**Flexible and Adaptive:** *Temporary and Responsive to New Learning*
Quality of Minds	**Reductive:** Shallow, Fragmented, Rigid	**Integral:** Holistic, Connected, Resilient

* Excerpt from the book, ***The Power to Transform: Leadership that Brings Learning and Schooling to Life*** (p. 169)
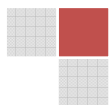
Two Stories of Learning and Schooling

The Current Reductive Story of Learning & Schooling *Prescriptive & Uniform Transaction*	*The New Integral Story of Learning & Schooling* *Generative & Personalized Engagement*
1. **The context and mental model of learning is *scarcity and deficiency***—diagnosing, remediating, and "fixing" the learner's clearly identified and often tenacious limitations. **The focus of learning is *memory***—passively acquiring information and accepting external authority for learning.	1. **The context and mental model of learning is *abundance***—activating, developing and connecting the learner's multiple and indeterminate potentials. **The focus of learning is *meaning***—developing understanding and internal authority for learning.
2. **Competition, threats, sanctions, and fear** are the most powerful external motivations to learning. Learning is shaped and driven by external mandates and sanctions.	2. **Autonomy, meaning, creativity, exploration**, and the quest for novelty are powerful and sustainable **intrinsic motivations** for learning. Learning is shaped and driven by personal purpose.
3. **Intelligence is a singularly defined, immutable, stable, and heredity—determined capacity** distributed along a "normal" bell-shaped curve. Potential is finite and can be precisely determined. Every learner possesses a single general intelligence quotient (IQ) that remains relatively fixed throughout life.	3. **Intelligences are dynamic, multidimensional potentials** for information processing, product creation, and problem-resolution, not-fixed immutable capacities. They are shaped through the dynamic interplay between heredity and environment and can be intentionally activated. Every learner possesses a unique and vibrant constellation of unknowable potentials.
4. **The holistic engagement of the learner's mind, body, emotions and spirit in learning detracts from rigorous inquiry.** Passion, wonder, awe, joy, and the emotional and spiritual dimensions of who we are generally interfere with, detract from, or significantly derail rigorous inquiry, scholarship, and integrative work. Learning is understood as pragmatic compliance.	4. **The holistic engagement of the learner's mind, body, emotions and spirit is essential for rigorous inquiry** and integrated work. Inviting passion, wonder, joy and the emotional and spiritual dimensions of who we are into learning, enables meaning and creativity. Learning is understood as transformative engagement.
5. **Prior knowledge and experience are not relevant** to future learning and are often encumbrances and detractors.	5. **Prior knowledge and experience are essential** foundations for linking and integrating future learning.
6. **Data, information, and knowledge are the same**. A student acquired data and information is presumed to have gained knowledge and understanding. Knowledge is not viewed as co-created meaning. It is detached from the learner.	6. **Data, information and knowledge are profoundly different**. A student who has acquired data and information is not presumed to have developed knowledge and understanding. Knowledge is relational, embedded in context and continuously constructed by the learner, in community.
7. **The more information acquired, the better**. Rapidly acquired information is more important than slowly constructed knowledge and understanding. The capacity for complex and systemic problem-solving rests solely with increased information.	7. **Depth and complexity of understanding are more important** than the quantity of information acquired. Understanding creates meaning, wholeness and integration. Complex and systemic problem-resolution emerges from integral minds—from the capacity to understand the dynamic relationships within systems and to discern and connect patterns.
8. **Learning is grounded in a *detached* epistemology** (ways of knowing). This epistemology honors only one way of knowing—the objectively verifiable, the analytical and the experimental. It views empirical observation as the most important skill, believes knowledge acquisition requires the disengagement of the learners' emotions and that subjectivity and individually constructed meaning endanger the pursuit of objective truth. It asserts that learning is a totally rational process, that there is no relationship between the knower and the known, and that connection to "self" is not essential to learning.	8. **Learning is grounded in a *relational* epistemology** (ways of knowing). This epistemology affirms integral ways of knowing, believes meaning and connections are constructed by the learner, and that the learner's passion and love are essential for deep learning. It asserts that relatedness and engagement are at the heart of learning, that there is a profound connection between the knower and the known, and that connection to one's "self" and a coherent sense of self are essential to learning.
9. **Learning is a detached and inert process**. Learners of the same age are far more alike than they are different and have similar learning needs. Effective and efficient instruction requires whole groups of chronological age peers to learn and advance together in a prescribed sequence.	9. **Learning is inherently relational**. Relationships and interdependence enable us to meaningfully connect and belong in community. Deep learning is more likely when a multi-aged and multigenerational community is purposefully learning, exploring, and co-creating together.
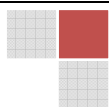
The Current Reductive Story of Learning & Schooling *Prescriptive & Uniform Transaction*	The New Story of Learning & Schooling *Generative & Personalized Engagement*
10**. Learning is primarily a passive, individual and incremental process of acquiring pre-selected, externally controlled and often mandated information** devoid of personal or social context, relationships, experience, or environmental influences. It is the quantitatively measurable result of a stimulus-response process.	10. **Learning is a purposeful, exploratory, and creative process of discovery**. It is a natural goal-directed process of constructing meaning through pattern formulation and active engagement in complex issues and problems.
11. **Individual and collaborative inquiry** and the creative exploration of messy, ill-structured, and interconnected questions and problems relevant and meaningful to the learner **are interferences to prescribed time allocation and established standards** and curriculum and will not prepare students for success on high stakes tests or work.	11. **Individual and collaborative inquiry** and the creative exploration of messy, ill-structured and interconnected questions and problems relevant and meaningful to the learner, **are the processes through which children acquire the knowledge and repertoire of strategies and skills** needed for developing deep understanding and expertise.
12. **Schooling is fundamentally a utilitarian enterprise**. The purpose of schooling is to rapidly acquire information, cover content, memorize and reproduce facts, and decrease variance between students on standardized achievement tests. Developing "practical" wisdom is too illusive and value-laden to be a function of public schooling.	12. **Schooling is fundamentally a moral enterprise**. The purpose of education is to transform minds—to acquire and construct knowledge, develop deep understanding and wisdom and demonstrate learning through discovery, reflection and the exploration and resolution of essential questions that advance the human condition.
13. **Broad curriculum coverage, content segmentation, and incrementalism are the most efficient and effective ways to learn a discipline.** Disciplinary information can best be acquired if we teach a large number of discrete topics independently. Interdisciplinary and transdisciplinary learning are "soft," largely superficial, and distort the rigor of disciplinary boundaries. Discerning and integrating disciplinary knowledge and inquiry patterns are not essential for acquiring information.	13. **Deep understanding gained through pattern recognition and concept integration promotes wholeness and the flow of knowledge within and between domains**. Disciplinary knowledge and understanding can best be encouraged if we teach disciplinary, interdisciplinary and transdisciplinary organizing principles, patterns and concepts in a coherent and integrative context.
14. **Learning is credentialed by the calendar and by the pre-determined amount of time spent (and assumed to be sufficient) acquiring pre-selected information**. Learning time is a fixed commodity and credentialing occurs when the scheduled learning time is finished. Learners are not capable of participating in the assessment of their own learning or that of their peers.	14. **Learning is demonstrated, assessed and credentialed by multiple forms of evidence and by exhibitions and performances of deep understanding, anytime and anywhere**. Learning time is variable. Learning is assessed whenever the learner is ready and is credentialed when learning is demonstrated. Learners actively participate in the assessment of their own and their peers learning.
15. **Rigorous, meaningful, reliable, and legitimate measurement and evaluation of learning can only be objective and external**. Only that which can be quantitatively and objectively measured demonstrates genuine learning. Frequent high-stakes testing is the most effective means to determine student achievement.	15. **Rigorous, meaningful, reliable and legitimate assessment of deep learning is dynamic, flexible and systemic**. It includes both quantitative and qualitative evidence of understanding. It is self-correcting and is demonstrated in authentic contexts and settings that enable complex responses.
16. **It is unnecessary for the curriculum to be connected to the learner's experience**, the community's needs or the world's problems. Most important learning happens in classrooms. Life is not the school's curriculum.	16. **Meaningful curriculum must be connected to the learner's lived experience**, the community's needs and the world's problems. Life must be the school's curriculum.

"I believe that the radical and essential purpose of education is to invite the transformation of minds by reconnecting our children's multiple learning potentials to their lives, their communities and their world. Within our vast and awesome universe, our children need to understand how and where they belong. Our children are hungry for wholeness, meaning, connection and belonging and for mindful challenge. We can nourish them through a radical new story and a generative new landscape of deep and soulful learning." (The Power To Transform: Leadership That Brings Learning and Schooling to Life, 2005).
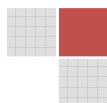
TABLE 3.2. *Reductive and Integral Ways of Knowing Contrasted*

Knowledge Skill	Reductive Thinking	Integral Thinking
Defining and discerning truth	Truth is immutable, and it can be discovered if we disengage from what we are seeking to know. Emotional connections and intuitive insights are impediments to seeking and finding objective truth and to rigorous scholarship and complex thinking. Empirical observation is the most important skill for objective knowing.	"Truth" is neither absolute (immutable) nor relative (individual and idiosyncratic). It is not a fixed state to be achieved or acquired. Rather, it is a communal, continuous, and dynamic process of disciplined and engaged inquiry. The search for truth evokes deeper and deeper questions, not final answers.
Acquiring and generating knowledge	Knowledge is the sum of numerous propositions—bits of factual information that must be dispassionately acquired piece by piece. Subjectivity and individually constructed meaning distort and endanger the pursuit of a discipline's objective truth.	Knowledge is complex and integrative understanding, and its generation and construction require the total engagement of the learner's mind, body, emotions, and spirit. Relatedness, connection, and meaning are at the heart of learning and knowledge acquisition and creation.
Engaging in learning	There is no connection or relationship between the learner and what he or she is learning. Meaning and connection to the self are not essential to learning and are actually detractors and contaminators.	There is a profound connection and relationship between the learner and that which is to be learned. When knowledge is viewed as a subject and not as an object, and when learning is viewed as an engagement and not a transaction, it invites a relationship.
Constructing meaning	Knowledge and truth reside within disciplinary experts and require their explanation for understanding. Students are not yet ready to access or personally engage with the subject itself. This engagement requires an expert interpreter to ascribe meaning. The learner's own construction of meaning is naive and often irrelevant. Objective truth can be accessed only through a hierarchical structure grounded in relationships of power and control.	The "expert" and the "novice" sit together and cocreate meaning by exploring the mysteries and patterns of the subject. The discovery of truths comes through reciprocal engagement. Meaning and understanding are constructed by learners in a community as they mutually seek to understand and cocreate their world.

Stephanie Pace Marshall, Ph.D., The Power to Transform: Leadership that Brings Learning and Schooling to Life (2006), 49.
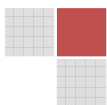
"Messages" the Current Reductive Story of Learning and Schooling Sends to Our Children About Their Learning Potentials

1. **You are born either smart or not so smart. Your intelligence is all in your genes. It is fixed at birth, and you can't do much to change it.** You can try as hard as you can, but your capacities and potentials are limited. You can't change the quality of your mind very much, but you must work hard anyway.

2. **Really smart people are good at all school subjects**—math, science, reading, writing, English, and history. They are also good at taking tests and writing papers. You can be talented in art, music, dancing, poetry, or athletics. You can be really "good" at building or inventing things, figuring things out, or taking things apart and putting them back together. But being good at these things doesn't make you smart in school.

3. **Everyone should learn at the same time and in the same way**. Mostly this means sitting in a classroom and listening to a teacher. If you learn differently—by drawing, making models, creating music, experimenting, exploring, or physically moving—you are probably not as smart as those who learn the way you are expected to in school. You are different and probably not well suited for education beyond high school.

4. **You can tell how smart or intelligent you are by how well you do on tests** (usually standardized and high stakes). If you don't do well on tests, you are probably not very smart. If you get A's, you are smart; if you get C's, you are not smart. You do not need to understand how you learn best. You simply need to do what is expected and what everybody else is doing.

5. **Learning mostly happens in school, and if you are not successful there, you probably won't be very successful in life.** The learning you do outside school really doesn't matter very much.

6. **Competition is essential to success**. You must look out for yourself and not spend too much time trying to help others be successful. If you do, they may achieve a higher grade point average (GPA) than you do. The higher your GPA and class rank, the more competitive you are and the more successful you will be.

7. **Learning is a solitary activity. You must learn and study alone. Learning is not a joyful, creative, exploratory, or collaborative process of making sense of things**, building something, or solving a problem that you, your peers, and your community really care about. If you are learning with others, especially if they are your friends, you will likely get distracted and learn less. Learning is serious and rigorous work, and if you are really engaged and having fun, you are probably not learning what you should. Solving problems that affect your community and perhaps the world is too complex and hard for you now. You'll be ready to work on them when you are older. Just be patient.

8. **What professionals tell you about your intelligence, learning ability, and future is probably true. They can tell whether you are smart or not, capable or not, and likely to be successful or not.** Only they can really interpret the results of the tests and the tests tell the story of how smart you are and how successful you will be.

9. **Your passion, emotions, intuition, and spirit are not welcome or very useful in school.** They distract you from the requirements of the curriculum, generally waste time, and get you, the teacher, and the class off track. Besides, none of that stuff is on a test, so it is not very important.

10. **Your goals and dreams are probably unrealistic, and you will likely outgrow them when you get into the real world**. The real world isn't about dreams. It's about acquiring things, winning, being successful, making money, and doing better than others. One person can't really make a difference or change the world.
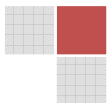
Generative Learning Communities: A Boundless Capacity for Continuous Learning

Generative learning communities teem with the energy and spirit of life. They stimulate exploration, invite newness and deepen our sense of self and other. They enable us to connect to one another, and cocreate the future by bringing forth new relationships and new realities.

Generative learning communities:

- **Invite, develop, and nurture each child's multiple learning potentials** and natural predispositions for continuous learning—for meaning-making, integration, exploration, discovery, invention, creation, and wisdom.
- **Reconnect our children to the natural world**; their communities; the human family; and the unity, wholeness, interdependence, diversity, novelty, and boundless creativity of life.
- **Reengage our children's rich interior lives**—emotion, intuition, imagination, love, experience, and spirit—in learning.
- **Nurture the potential of each child to wisely advance the human condition** and cocreate our future by developing their capacity to discern meaning from patterns, think systemically, take the long view, and act with moral purpose.

"The new story of learning and schooling profoundly changes the context of why, what, when, where, how and with whom we learn. The radical new design of learning and schooling reconnects us to our roots and our capacities to become fully human by reweaving the severed connections of mind, heart, body and spirit in learning. It is not a new technique, strategy or best practice. It is a sustaining context for mind and world-shaping. Our children will more naturally and meaningfully learn when they are free to develop and connect all of who they are in learning. Each of our children is a marvel, and they do not know it. The new story invites them to embrace their gifts with joy and without apology."
Stephanie Pace Marshall

Principles *for the* Design *of* Generative Learning *and* Schooling Ecosystems: Embodying and evoking the wholeness, abundance, interconnectedness, creativity, and diversity of life and learning

- **Ensure learning environments are bioresonant** and rooted in the principles and properties of life and learning—how living systems creatively organize for sustainability and how the human mind learns.
- **Immerse children in meaning, wholeness, connections, and belonging.**
- **Create time and space for deep and slow learning**, problem resolution, and the holistic development of integral ways of knowing, doing, being, and living together.
- **Create learning experiences, materials, and pathways that identify and ignite each learner's unique constellation of learning potentials.**
- **Ensure that authentic information about learning is continuously generated and shared.**
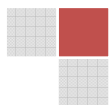
- **Foster personalization and community engagement.** Ensure that learning relationships are inclusive and that the whole system is dynamically connected to and accountable for its shared learning purposes.
- **Immerse learners of all ages in creative inquiry, exploration, and discovery.** Embed individual and collaborative opportunities for meaning-making and invention in the system's learning processes and structures.
- **Ensure learning structures are flexible, temporary, and adaptive**, and embody the principles and properties of life and learning.
- **Understand the profound connection between mind-shaping and world-shaping.** Ensure learning and schooling environments and experiences are designed to engage children in wise and sustainable world-shaping.
- **Surround the system in meaning, wonder, joy, and love.** Liberate human goodness and genius, and ignite and nurture the power and creativity of the human spirit for the world.

These "naturally right" design principles are not static constructs. They are fundamental relationships and patterns that sustain system creativity, vitality, and continuous learning. They enable us to intentionally link learning to life and schooling to living systems.


Aspen Grove Center for Inquiry and Imagination
An aspen grove looks like a forest of individual trees.
It is actually a single organism connected by a common root system.

Just Imagine…
- What might it feel like to learn in the midst of this generative learning landscape?
- What might our children experience within vibrant networks of learning designed to embody the dynamics and animating context of life?
- What kind of learners might our children become if learning was seen as a joyful and mentored odyssey?
- What kind of mind might they invent, and
- What kind of world might they shape if they see learning as a transformative relationship, a live encounter with great questions and great ideas, and a lifelong process of exploration and discovery?
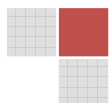
Principles for the Design of Generative Learning Landscapes for Inquiry and Imagination

1. **LEARNING PRINCIPLE** **Learning is driven by questions and engagement in personal purpose; it is a natural, goal-directed and exploratory process of constructing knowledge and meaning from information and experience. Children learn to do what they want to do. The locus of control of learning resides with them**
LEARNING EXPERIENCE DESIGN: Learning is personalized and self-directed; personal learning and assessment plans are co-created with parents, teachers, mentors and peers; plans include multiple strategies and pathways (such as independent study, mentorships, internships, and apprenticeships) for mastery of core learning inquiries and curriculum concepts and personal learning outcomes based on interest; learners use multi-media tools to create electronic learning portfolios; mastery is demonstrated in multiple ways such as public presentations, multi-media projects and research; teachers (including practicing scientists, artists, etc.,) serve as coaches and collaborators.

2. **LEARNING PRINCIPLE** **Every child has a unique constellation of multiple intelligences and potentials that must be identified, activated, nurtured and connected. Purpose-driven, meaning-filled, and life-long learning emerges when the learner's talents (what they are good at) and passion (what they love) are connected.**
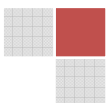*LEARNING EXPERIENCE DESIGN:* Habits of mind, and ways of knowing are shaped through immersion, experience, and practice. Authentic learning develops "both/and" minds that are integrative and wise. Such thinking integrates and validates the power of: the intellect *and* the imagination; information *and* relationships; research, hypothesis, testing, and experimental design, *and* prototyping, simulation, problem-solving and story telling; observation and evidence-based truth *and* improvisation and experiential truth; analytical measurement *and* aesthetic insight; observation *and* intuition; reason *and* empathy; curiosity and skepticism, *and* wonder and awe; and expertise *and* wisdom.

3. **LEARNING PRINCIPLE** **What we learn and how much we learn are influenced by our motivation. Autonomy, choice, curiosity**, novelty, challenge and surprise are powerful intrinsic motivators for learning.
LEARNING EXPERIENCE DESIGN: Our children's inventive genius can flourish when emotional engagement is high and when mind and practice fields are rooted in: meaningful play, uncertainty, balanced challenge, choice, immediate and continuous feedback, risk-taking, acceptance of failure, complex problem-solving, and trust.

4. **LEARNING PRINCIPLE**   **The holistic engagement of the learner's mind, body, heart and spirit is essential for learning.   Authentic learning develops the whole child and honors all the ways we come to know.**
   LEARNING EXPERIENCE DESIGN: Children are invited to develop and connect all of who they are in learning – in learning to know, learning to do, learning to be, and learning to live together (UNESCO).

5. **LEARNING PRINCIPLE**   **Learning is a live and creative encounter; it is a curiosity and imagination-driven, inquiry-based and experiential process of exploration and discovery. Creativity and innovation flourish in agile, improvisational, collaborative, future-oriented and applications-focused learning environments.**
   LEARNING EXPERIENCE DESIGN: Problem-centered learning is a core learning pillar. The exploration of messy, ill-structured problems relevant to the learner, enable the acquisition of knowledge and skills and a broad repertoire of strategies essential for deep understanding, innovation and the development of expertise. Curriculum is: inquiry and curiosity driven, concept and competency-based; problem-centered, experiential and integrated. Instruction is: inquiry-based, personalized, collaborative, and technologically-assisted. Assessment is: authentic and generative, understanding and performance-based, multi-dimensional, ongoing and public.   Tinkering, experimentation and following questions wherever they might lead, are encouraged.

6. **LEARNING PRINCIPLE**   **Learning is inherently relational and embedded in social context and the human experience. Knowledge, understanding, and meaning are situated in context and continually constructed by the learner, in community. There is a profound connection between the knower and the known.**
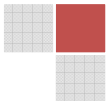   *LEARNING EXPERIENCE DESIGN:* Learning environments are safe, honoring, inclusive, collaborative and trust-centered; every child is invited and welcome and knows she/he belongs. Children are immersed in meaning, wholeness and connections.   Peer to peer collaboration, problem-solving, and learning and innovation networks are pervasive.

7. **LEARNING PRINCIPLE**   **Learning is "on demand" and happens anytime, anywhere, any way, and with anyone.**
   LEARNING EXPERIENCE DESIGN: Expertise is distributed, problem-solving is collaborative, and learning and knowledge networks are global ensuing the intelligence, innovation and altruism of the global commons is accessible. Technology hubs are integrated throughout the environment; design studios, conference rooms, etc., have wireless tablets, internet access, digital authoring tools and cameras, video conferencing technology and visualization and game design software.

8. **LEARNING PRINCIPLE: The design of learning environments is congruent with research on how we learn.**
    LEARNING EXPERIENCE DESIGN: Learning experiences, time, structures, and locations are driven by the needs of the learner; the physical environment is dynamic, adaptive and technologically generative.

    LEARNING SPACE: Open, playful, collaborative, flexible (reconfigurable) and alive; multiple learning spaces (pods) look and feel like: science, research and engineering laboratories, design, performance, and production studios, innovation incubators, hands on interactive museums, and retreat centers; the campus is green, plants are pervasive, and there are lots of windows for natural light; washable walls enable ideas, questions, and learning to be made visible.

    LEARNING TIME: Learning calendar and learning time are flexible, adaptive and driven by the nature and complexity of the student's work and personal learning goals. There are no bells to signal the beginning or end of classes.

    LEARNING STRUCTURES: Age and grade level distinctions are blurred. Learners are not segregated by traditional age cohorts or grades; multi-age clusters of students as well as coaches, mentors, community members and on-line partners are working, learning, and solving problems together. Intergenerational learning is pervasive.

    . . . .

9. **LEARNING PRINCIPLE: Surround the system in meaning, wonder, joy, love and possibility.**
    LEARNING EXPERIENCE DESIGN: Connect learning to the wonder and awe of nature and the natural world; provide space for solitude and reflection.

    . . . .

"The biggest thing children today need is reconnection with nature…[We live] in a world that is made up of other human beings with a few plants and animals we keep as pets and a few pests we can't get rid of.

I loved insects when I was a boy. It hurts me when I see a kid come in with grasshoppers or ants and the parent's message is: "Take that out of here!" We teach our children to be afraid of or to hate nature…

To me the most important lessons you learn is that there isn't the environment out there and me in here. The environment is all around us; it's in us. Sixty percent of our body is water; when you drink water it's come from all over the world. You need food, you take another living creature and make it into your own body.

These are very simple lessons, but very profound messages."

<div align="right">(David Suzuki. The Third Teacher. "Reconnecting Schools and Nature:140-1)</div>
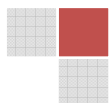
Generative learning environment(s) for inquiry and imagination enable students to develop "hybrid" and blended competencies needed for:
1. **Knowledge Creation, Integration and Application** (disciplinary, interdisciplinary, transdisciplinary, and inquiry-based thinking);
2. **Radical Innovation and Invention and Imaginative Human-Centered Design** (innovation and design-based thinking);
3. **Ethical and Wise Leadership and Sustainable Whole Systems Change** (systems-based thinking).

Every learning environment must be a place of inquiry, imagination and innovation. **We get what we design for.** Mind-shaping is world-shaping and wise world-shaping requires that our students think, question, imagine, design, invent and creatively resolve problems in *decidedly different* ways.

Schooling has become a spectator sport. Learning is a live encounter.

We shape the world from the inside-out. The nature and quality of our thinking shape who we become and who we become shapes the world.

. . . .

Learning In a Digital World
Our students live and learn in a digital world of global connections, intelligent machines, immersive technologies, multi-user virtual environments and social networks. In this world:

- learning is experiential, purposeful, self-directed and on-demand;
- expertise is multi-generational and distributed;
- thinking is shared;
- problem-solving is collaborative;
- knowledge is co-constructed;
- boundaries are intentionally blurred;
- learning, social relationships and play seamlessly converge; and
- learning is joyful.

"To develop the innovators our nations and world require, we must design conditions that engage students' minds and hearts and nurture their sense of wonder, infinite possibility, contribution & stewardship."
– Stephanie Pace Marshall

Learning is about provocation and engagement, and it is rooted in **discovery**, not directives; **reflection**, not regulations; **possibilities**, not prescriptions; **creativity**, not compliance; **improvisation**, not imposition; **meaning**, not mandates; and **curiosity**, not certainty.

Transforming learning and schooling is not about technique. It is about the design and creation of generative and personalized environments that develop individual talents, engage students' minds and hearts, nurture their sense of wonder and possibility, and enable their imaginative genius to flourish.
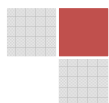
Gaming as a Dynamic, Interactive & Possibility-Abundant Learning Ecosystem

"Principles" of Game Design

- Situated learning
- Meaningful play; high levels of internal motivation and emotional engagement
- Uncertainty; game responses are not predetermined; system is emergent
- Holistic connection of players' actions and system responses
- Immediate and continuous feedback
- Choice and competition
- Balanced challenge, not threat
- Reflective action—thinking
- Agency—experimentation with identity and point of view
- Distributed knowledge, intelligence and expertise; co-creation
- Proactive participation and production (ownership and investment; players have a stake)
- Learning in community (collaboration, peer-to-peer, communities of practice, cross- functional teams, multi-generational)

As a learning system, gaming fosters: risk-taking, hypothesis testing, possibility thinking, pattern discernment, acceptance of failure, emotional engagement, personal efficacy and agency, focused attention, complex problem-solving, shared decision-making and knowledge construction, reflective experimentation and trust. Paradoxically, the learning environment of gaming although simulated, is actually more real to the learner than school learning.

> *"These moments point to one of the most basic reasons that games are recognized, without reservation, by players as learning systems—trust. Players trust that the game system will teach them everything they need to know in order to play. When games don't do this, players walk away."* (Katie Salem. The Ecology of Games: Connecting Youth, Games and Learning, p. 11-13)


How Did you Learn in School Today?

Habits of mind, mental models and patterns of thinking and behavior are shaped through immersion, experience and practice. When children:

- engage in deep disciplinary, interdisciplinary and transdisciplinary research, investigation, and experimentation, they learn to inquire, explore, discover and invent;
- creatively practice identifying, framing and solving messy and challenging global problems, they learn to innovatively resolve complexity;
- collaboratively wrestle with moral and ethical dilemmas, they learn to wisely grapple with issues of social, economic, political and environmental justice.

They become more agile, autonomous, failure-resilient, improvisational, and metacognitively aware and in control of their own minds and behavior; the locus of control for learning shifts to them and they assume responsibility for shaping the nature and quality of their thinking and manifesting it in action.
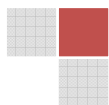
By design, we can inspire, ignite and nurture our children's inventive genius and enable it to flourish by immersing them in mind and practice fields rooted in:

- **purpose**, not prescription;
- **meaning**, not memory;
- **engagement**, not transmission;
- **inquiry**, not compliance;
- **questions,** not answers;
- **exploration**, not acquisition;
- **personalization**, not uniformity;
- **interdependence**, not individualism;
- **collaboration**, not competition;
- **challenge**, not threat and
- **trust and joy**, not fear.

Such "mind-fields" are part of a vibrant learning and innovation ecosystem that invites experimentation, rewards design and invention, and encourages intuitive forays and the passionate pursuit of questions.

"Every way of knowing becomes a way of living. Every epistemology becomes an ethic…Every mode of education, No matter what its name, is a mode of soul-making." (Parker Palmer)

There is a growing chasm between the collaborative, exploratory, future-oriented and applications-focused ethos and environment essential for nurturing inquiry, imagination, and innovation and the constrained, prescriptive and risk-averse culture and conditions of schooling—especially in science.

· ·

Currently, for most United States students, "school science" is experienced as:

- passive acquisition of excessive amounts of often unconnected and topical content presented in disciplinary silos;
- devoid of emotion, joy, and wonder;
- isolated from its social context and detached from the human experience;
- compliant and disengaged observation;
- inert information unconnected to the real world—their needs, interests, curiosities or questions;
- de-contextualized and prescribed content with little time for exploratory forays or following intriguing questions;
- rote adherence to the prescribed "steps" of the "scientific" method;
- getting right answers, and memorizing taxonomies and unalterable algorithms;
- an individual endeavor.

"School science" completely distorts and misrepresents the nature of the scientific enterprise and its contributions to the human future.

"We must stop tolerating the rejection and distortion of science" (Al Gore, *The Assault on Reason*:10)

Every school must become a center of inquiry, imagination, innovation and wisdom.

We get what we design for.
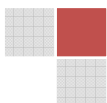
Creating a Dynamic Learning Landscape: Curriculum, Instruction and Assessment Design

Curriculum Design: Inquiry and Curiosity-Driven, Concept and Competency-Based, Problem-Centered and Experiential:

1. Driven by personal inquiry, the curriculum is designed around essential disciplinary knowledge, skills, habits of mind and questions that frame each domain and are embedded in the human experience.
2. It is Integrative and linked, linking new knowledge to previous knowledge and linking principles and concepts within, across, between, and beyond disciplinary domains.
3. It is competency-driven and focused on developing deep understanding, and meaning, not coverage; Students develop the habits of mind demonstrated by thoughtful practitioners.
4. The curriculum is centered on real-world problems and applications framed by the learner's prior knowledge, lived experiences and the world's and community's "real" needs.
5. The curriculum honors and activates the unique talents and multiple intelligences of each child.

Instructional Design: Inquiry-Based, Personalized, Co-creative and Technologically Generative:

1. Teaching is understood as a personal, relational, communal, and transformative process of cocreation between teachers and learners.
2. It is focused on ensuring that each student acquires knowledge, develops an understanding of disciplinary and interdisciplinary concepts and knowledge structures, and learns a broad repertoire of critical and creative thinking, reasoning, inquiry, and metacognitive strategies.
3. Instruction is personalized and grounded in fostering each learner's construction of meaning;
4. It is centered on the personal and collective exploration of great questions and the creative framing and resolution of complex and ill-structured problems relevant and meaningful to the learner.
5. Personalized instruction develops each student's confidence, locus of control, and internal authority for lifelong learning by creating expectations and norms that ensure students experience success.

Assessment Design: Generative, Understanding and Performance-Based and Multidimensional:

1. Diagnostic, continuous and systemic assessment for deep learning includes objective and quantitative assessment and personal and qualitative evidence of understanding.
2. Students are actively engaged in monitoring, regulating and assessing their own learning.
3. Assessment is coherently aligned and integrated within curriculum and instruction.
4. Learners demonstrate proficiency and understanding through multiple forms of evidence that encourage knowledge integration and creative application across disciplines.
5. Assessment is meaningful, reliable, valid, fair and transparent to the learner.

> "Advances in cognitive neuroscience and digital technologies are changing the "story" of the mind/brain and how we learn. So we must change the map and the landscape of learning and schooling."
> Stephanie Pace Marshall
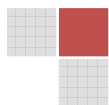
"Messages" the Generative New Story of Learning and Schooling Sends to Our Children About Their Learning Potentials
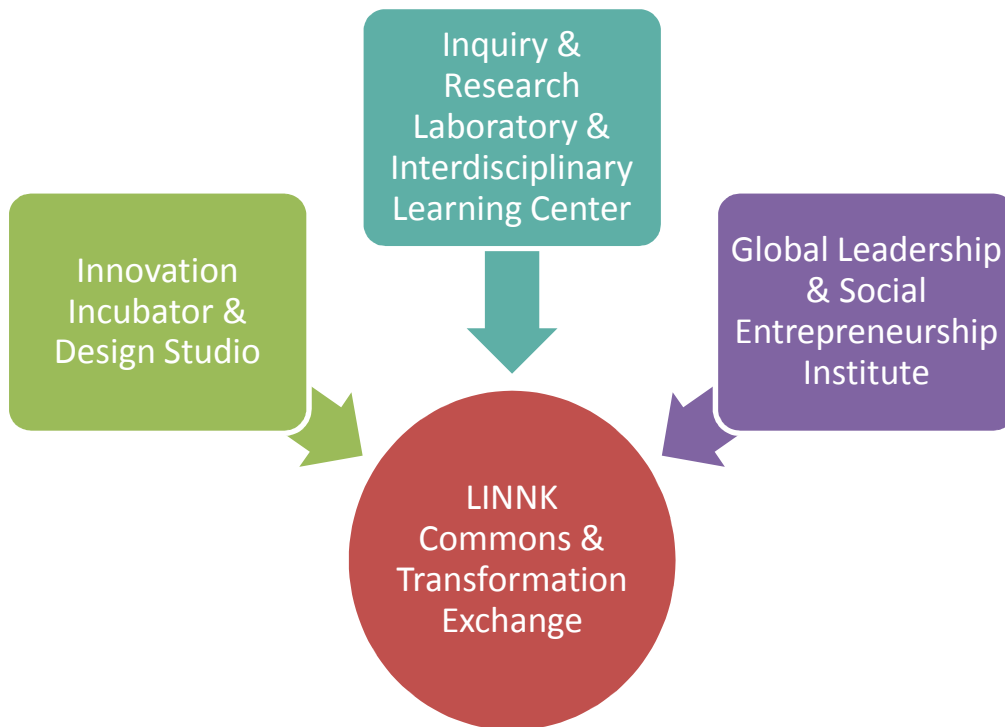
1. **Your brain can actually grow when it is challenged**. Our brains don't actually get bigger, but our brain's remarkable networks of connections become denser and more intricate because more connections grow as we learn, explore, create, and ask questions. We can actually increase the number of connections in our brain through learning, even as we get older. Your brain is unique from everyone else's. The human brain is amazingly flexible, adaptive, creative, and exploratory. We never stop learning, so continue to challenge yourself.

2. **Intelligence is not a single capacity and is not fixed at birth**. Just like a diamond, intelligence has many facets, and each of us possesses many different types of intelligence. But they will remain dormant or hidden if we do not actively use them. The nature and quality of our learning experiences are major factors in what and how we learn, and they are created by the decisions of teachers, families, friends, communities, and, most important, you.

3. **You are ultimately responsible for your own learning and for shaping your own mind**. You must decide what your learning questions and goals are and what you want and need to learn in order to develop your mind well. So do not limit yourself, and do not take the easy way out. Creating your own mind and authoring your own life is the greatest gift you can give yourself and the world, and learning is your pathway to get there.

4. **Schools are currently designed to teach and reward primarily two of your potentials. It is these logical-mathematical and linguistic or language intelligences that have largely defined whether you are smart in school**. But each of us has a unique combination of many intelligences, including language and mathematics. So do not wonder *if* you are smart. Instead, find out *how* you are smart.

5. **Learning is a naturally social and collaborative activity**. As humans, we naturally seek cooperation, not competition. Despite all the messages to the contrary, independence and competition are cultural choices, not innate biological ones. You will learn more deeply if you learn with others.

6. **Understanding concepts, patterns and "big ideas," pursuing questions that matter to you, and creatively solving meaningful problems are what learning is all about. Doing well on standardized tests does not define or determine your intelligence**; tests are important, but they provide only one piece of information about your achievement in school, not your potential for success and contributions in life. We need you to understand and help us resolve the problems in our community and our world now. You do not need to wait, and we will not ask you to.

7. **You are a unique learner**. There is no one else in the world exactly like you. You must learn in your own way and in your own time. Making mistakes, taking risks, exploring, failing, and asking for help are essential to learning. Discover what you love, and pursue it with passion.

   We are all works in progress. Never lose sight of your dreams; they are as possible as anyone else's. Pursue them with knowledge, courage, and determination, and don't be afraid to bring your passion, your heart, and your spirit to learning. Learning, exploring, discovering, and creating are the most joyful things we can do, but they take focus, persistence, and commitment. Never short-change your life by deciding to stop wondering and learning.
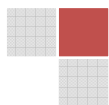
The Conceptual Learning Design: A New Paradigm and Ecology for Developing "Decidedly Different" Scientific Minds

To develop the next generation of STEM Innovators, the program of studies and curriculum are reconceived within the context of **four differentiated, yet dynamically integrated core learning and teaching "complexes." These unique learning habitats are designed to immerse and engage students in the real work and modes of inquiry, problem-solving, knowledge creation and application, that distinguish four fundamental STEM learning cultures and communities**, each designed to develop high levels of understanding and knowledge application.

Inquiry & Research Laboratory & Interdisciplinary Learning Center

Innovation Incubator & Design Studio

Global Leadership & Social Entrepreneurship Institute

LINNK Commons & Transformation Exchange

1. **Inquiry & Research Laboratory & Interdisciplinary Learning Center focuses on knowledge and meaning construction and developing advanced levels of competence and expertise in all disciplinary domains**, through self and mentor-guided inquiry, extended internships and apprenticeships, intensive research and investigation, and experimentation and problem-solving.

    The emphasis is on high levels of knowledge and skill acquisition, integration and use, research and scholarly production, and creative knowledge generation valued and evaluated by experts and practitioners in the domain.

    Focus is on developing disciplinary, interdisciplinary and inquiry-based thinking.
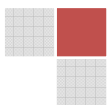
A Learning Snapshot *within the Inquiry & Research Laboratory & Interdisciplinary Learning Center*

- A team is working with a renowned paleontologist on their year-long museum mentorship project, catalyzed by his discovery of several intact dinosaur fossils found together in Niger. They will accompany his team on a three month dig the following year.
- In a weekly seminar, students are exploring the social, ethical, and economic policy implications of their artificial intelligence research with a social science and ethics instructor framing questions to be discussed the following week with an invited panel of clergy, ethicists, and geneticists.
- At the request of the mayor, chief of police and city council, a team of students is working on an international mathematical modeling competition problem involving curbing violence. They have data on: incidents of violence, homicides, assaults, regional population census data, unemployment and unemployment rates, high school enrollment and dropouts and dropout rates, graduation rates, prison population, parole releases, parole violations, juvenile inmates. They are asked to analyze and model these data to give the city a plan to reduce violence and to prepare a news release for the mayor. (2010 HiMCM Challenge)

2. **Innovation Incubator and Design Studio focuses on creative ideation, production and the application of science, mathematics, engineering and technology expertise to serve more tangible and pragmatic human needs**; focus is on imaginative, improvisational and creative design; igniting, seeding, "hatching," accelerating, and scaling promising prototypes and innovations in products, services, processes and systems; emphasis is on generating disruptive (Christensen, Horn, & Johnson, 2008) new ideas and connecting current ideas in new ways to create useful solutions valuable to others.

Students use brainstorming, innovative scanning, modeling, storytelling, rapid prototyping, mindmaps, simulations, and multiple innovation platforms; the incubator serves as a magnet, disruption amplifier, innovation and design accelerator.

Focus is on developing innovation and design-based thinking.

A Learning Snapshot *within the Innovation Incubator and Design Studio*
Multiple student teams are constructing a bridge prototype in response to a challenge by math and social science faculty, local engineers and architects.

The bridge is essential for an indigenous tribe in a remote Ecuadorian village to access the fertile farmland on the other side of an impassable river from their home. Agriculture is essential to the sustainability of their culture.

The bridge must be able to be built by the tribesmen with local materials. An additional challenge is the cultural taboo against crossing a river. Prototypes were designed online using advanced design software. When the design is chosen and the prototype completed, it will be judged by an expert panel of engineers, designers, social scientists and cultural anthropologists.
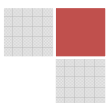
A team of students and faculty, their international collaborators, advisors from Games for Change, and experts in the global water shortage crisis are engaged in a video work session reviewing and modifying potential design specifications for an interactive video game for middle school students to engage them in understanding and creating solutions to the global water crisis in multiple geographic regions.

. . . .

3. **Global Leadership and Social Entrepreneurship Institute focuses on developing the knowledge and skills necessary to be a "citizen in service" (Clinton, 2009) and to proactively work in areas of social justice, fostering meaningful change in principle, policy or practice, generating changes in thinking and behavior, and creating innovative solutions (new processes and systems) for real world problems** in areas of compelling social need; nurtures high levels of knowledge and competence in complex and adaptive systems thinking, conflict resolution, social and organizational change, and public influence and advocacy; fosters proactive global citizenship, empathy, and diversity of perspective; serves as a leadership catalyst, change accelerator, and movement generator for social change.

   Focus is on developing change leadership and systems-based thinking.

   > **A Learning Snapshot** *within the Global Leadership and Social Entrepreneurship Institute*
   > A student leadership team is meeting with community activists, the Counsel General from Kenya and philanthropic investors with an expressed interest in supporting their project to help build and equip a residential high school for girls in Kenya.
   >
   > The students will also help to design its curriculum, secure the computers, and research and secure the technology infrastructure necessary to insure computer access.

   . . . .

4. **LINNK (Leadership, INNovation, Knowledge) Commons and Transformation Exchange:**
   As an integrative hub, LINKK acts as a global commons and facilitates idea and problem exchanges between individuals, initiatives, or multinational projects that often have their genesis in the work created in the learning cores. Its purposes are to: (a) **integrate, synthesize and share the knowledge, ideas, questions, designs, and innovations** being studied, prototyped and tested in each of the three cores; (b) engage, connect, distribute and **accelerate the collective intelligence, imagination, and creative capacity** of the community and their innovation networks; (c) identify, generate, and solve **shared problems** of mutual interest; (d) invite and catalyze **new conversations**; (e) create opportunities for **new thinking**; (f) activate the creation of **new partnerships and networks** for fluid global knowledge construction, sharing, and collaborative work; (g) seed, connect, accelerate, and support the design, development, and scaling of **research, innovation, and social entrepreneurial initiatives**; (h) **stimulate the emergence of local, national and global STEM innovation networks**; (i) attract, generate, and sustain intellectual, technological, and financial **resources**; and (j) connect **prototypes and innovations into a dynamic learning exchange network** (Marshall, Stephanie Pace, "Re-Imagining Specialized STEM Academies: Igniting and Nurturing 'Decidedly Different Minds,' by Design." *Roeper Review: A Journal On Gifted Education.* 32.1. (7 Jan 2010):48-60).
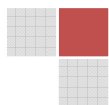
A Learning Snapshot *within the LINNK Commons and Transformation Exchange*
As part of their personal learning plan, a multi-age group of students are holding a video conference with peers from the Netherlands and Capetown. Also in the conference are members of the Chicago Council of Global Affairs.
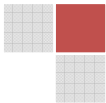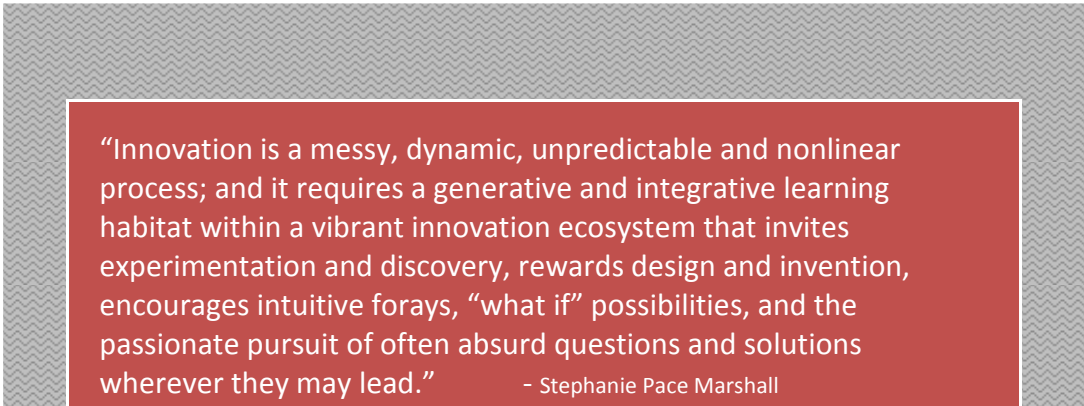
They are discussing the concept of a global Educational Bill of Rights for universal primary education (K-8) for all students in the world.

They are also designing a conference to be held on Second Life which will help craft the questions they need to answer and the research they need to conduct to make their case to the United Nations.

Prior to this video conference, they had reviewed past conference conversations on LINNK's searchable data base, and they had been engaged in multiple online forums, beginning to generate concepts for the Educational Bill of Rights.

Together these four learning complexes create a dynamic and self-organizing learning and innovation system and network with the work in each core able to access, "feed upon," integrate and build the capacities of the others.

It is my belief that our unique opportunity and potential for transformative contributions lie at the convergence of these four discrete, yet interdependent learning cores and modes of thinking.

> "Innovation is a messy, dynamic, unpredictable and nonlinear process; and it requires a generative and integrative learning habitat within a vibrant innovation ecosystem that invites experimentation and discovery, rewards design and invention, encourages intuitive forays, "what if" possibilities, and the passionate pursuit of often absurd questions and solutions wherever they may lead."   – Stephanie Pace Marshall

NOT ACTING ON WHAT WE KNOW

The paradox is that we know what it takes to develop talent and sustain the creative imagination, *but we do not act on what we know*. There is a growing chasm between the dazzling advances now emerging from the learning sciences, the collaborative, exploratory, future- and applications-focused ethos and environments essential for developing integral and innovative minds, and the constrained, standardized, risk-averse and prescriptive culture and conditions of formal schooling, at almost every level.

Conceived and framed within a context of scarcity, deficiency, and fragmentation, our current patterns, processes, and structures of schooling are not designed or structured to ignite our children's joy, intellectual energy, and imagination, and invite and nurture the scientific minds needed to create a sustainable future.

They are not dynamic or integrative enough to enable our children to analyze and solve complex, messy problems and to engage with passion in exploring their real questions about life. And they are not experiential enough to encourage our children to access and experience the mystery and enchantment of their rich interior lives, understand how they belong to the world and one another, and embrace and celebrate their remarkable capacity to sense an emergent future and evoke its creation.

They are quite simply irreconcilable with the principles of life and learning. **As a result, many of our children have become schooling disabled in a learning-abundant universe.**

This "current narrative of schooling" is an insidious and tenacious one—and the consequences for individual children, our nations, and our global community are enormous.

Immersion in this kind of **reductive, disengaged, and sterile landscape leads to entrenched, risk averse and uncurious minds, lacking the conceptual scaffolding and maps to conceive, design or even navigate new or novel terrain—**
- ✓ Unaware of the breakthroughs that happen at the edges and intersections of disciplines,
- ✓ Unable to ask and explore powerful questions and solve complex interdependent problems,
- ✓ **And holding a sense of detachment from science and the arts, as ways of deeply understanding the human experience, as well as their own.**
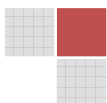
Commencement Address by Paul Hawkens at the University of Portland on May 3, 2008
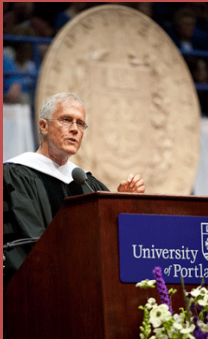
Hey, Class of 2009!

You are going to have to figure out what it means to be a human being on earth at a time when every living system is declining, and the rate of decline is accelerating…

Basically, the earth needs a new operating system, you are the programmers, and we need it within a few decades…

There is invisible writing on the back of the diploma you will receive… I can tell you what it says: YOU ARE BRILLIANT, AND THE EARTH IS HIRING.

Take the hint. And here's the deal:

Forget that this task of planet-saving is not possible in the time required.

Don't be put off by people who know what is not possible. Do what needs to be done, and check to see if it was impossible only after you are done…

Humanity is coalescing. It is reconstituting the world… You join a multitude of caring people. This is the largest movement the world has ever seen.

Rather than control, it seeks connection.

Rather than dominance, it strives to disperse concentrations of power…You are graduating to the most amazing, challenging, stupefying challenge ever bequested to any generation.

The generations before you failed… They got distracted and lost sight of the fact that life is a miracle…

Nature beckons you to be on her side. You couldn't ask for a better boss.   This is your century…
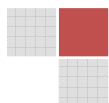
Imagine

Imagine as Maria Montessori once did, schools without conceptual walls and barriers to imagination.

Imagine schools powered entirely by sunlight that also purifies waste water that irrigates gardens that grow food and teach biology.

Imagine schools as incubators for a new generation of designers that will remake the human presence on Earth in ways that generate ecologies and create the foundation for a fair, decent and prosperous post-carbon economy.

Imagine schools that foster the kind of thinking that bridges the chasms of ethnicity, nationality, religious, species and time.

Imagine a world made sustainable because we first taught every child to overcome hatred and fear and educated them to be ecologically competent.

Imagine schools that draw forth the very best from each child

(David. W. Orr, The Third Teacher:15)
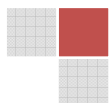
THE "CAPETOWN" CHALLENGE
"L'Ecole du Soleil" for the Third Millenium!

THE CASE   Our children live and learn in a boundary less global commons and in a time of unprecedented connectivity that offers both dazzling possibilities and vexing challenges. Creatively and confidently exploring these possibilities, collaboratively solving these complex challenges and wisely engaging in pioneering research, human-centered design, and transformative global change, requires **"decidedly different scientific habits of mind"—whole and integrated ways of knowing, inquiring, creating and problem-solving not capable of being developed in our current reductive system of schooling and teaching science.**

Dominated by false beliefs and erroneous assumptions about learning, and conceived within a 19th Century industrial and economic context of standardization and prescribed and uniform transaction, our "factory model" of education is incapable of igniting and nurturing the intellectual energy, scientific habits of mind, and inventive genius of our children toward creating a just, sustainable and prosperous future.

Immersing children in this fragmented, emotionally sanitized and competitive learning environment characterized by: "siloed" subjects, teachers, and classrooms; uniform and prescribed textbooks, curriculum, learning time and space; didactic "stand and deliver" instruction; age and grade level placement and learning progression; singular high stakes standardized tests and constrained physical surroundings, cannot develop the creative, inquiry, design and system-based thinking essential for wise innovation and complex problem-solving. It is also not how our children learn, connect, create and solve problems outside of school, in the ubiquitous real and virtual global commons in which they are a co-creator.

The purpose of schooling is to transform minds, to liberate the goodness and genius of all children and to ignite and nurture the power and creativity of the human spirit to wisely advance the human condition.

Learning is not a spectator sport; it is a live encounter, driven by meaning and personal purpose and grounded in questions, engagement and challenge. The context and conditions of schooling must develop our children's multiple intelligences and enable them to flourish. Every "school" must become a catalyst and center for inquiry, innovation, imagination and part of a dynamic learning and innovation ecosystem. We get what we design for.

YOUR DEEP DESIGN CHALLENGE   Design a new learning and innovation ecosystem for the 21st Century scientific mind that develops "decidedly different" "both/and" ways of knowing. Create its new language and lexicon to describe this new system and enable the conversation that will help bring it to life.

> "The world we have made as a result of the level of thinking we have done thus far, created problems we cannot solve at the same level of thinking we used, when we created them." -Einstein

> "Thus the task is not so much to see what no one yet has seen, but to think what nobody yet has thought about that which everybody sees" -Schopenhauer

Illuminate how it works from the perspective of the learner, teacher, parent, mentor, on-line global peer collaborator, and community leader. Create stories to describe what it looks and feels like—the new learning map and landscape for the Third Millenium, for building the new scientific mind.

▪   ▪

Our Time of Kairos

Mind-shaping is world-shaping and wise world-shaping requires that our students think, question, imagine, design, invent and creatively resolve problems in *decidedly different* ways.

We shape the world from the inside-out. The nature and quality of our thinking shape who we become and who we become shapes the world. The future well-being, prosperity and sustainability of our nation, our global community and our planet, reside in igniting and nurturing creative, integrative and wise global minds.

"Sometimes there are moments in human history that seem to beckon awakenings. They perturb us to reevaluate our beliefs, assumptions, and reigning cultural stories. They challenge us to synthesize and integrate seemingly disparate forms of knowledge into new relationships, new patterns, and new theories. They invite us to invent new language, new rules, and new structures. They call us to create and live into new stories of possibility.

The ancient Greeks called this time kairos, the "right moment." It is a time of awakening. It is a time of radical changes in perceptions, imagery, and stories. It is a time when reality embraces possibility.

"I believe we are in such a moment and it is time to decide whether we love the world and our children enough—Love them enough to design a radical new story, map and landscape of learning that will ignite and nurture "decidedly different," integral and wise minds for a future yearning to be born."
Stephanie Pace Marshall