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# STEM Talent: Moving Beyond Traditional Boundaries

Stephanie Pace Marshall

*Illinois Mathematics and Science Academy, marshall@imsa.edu*

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## STEM TALENT: MOVING BEYOND TRADITIONAL BOUNDARIES

By Stephanie Pace Marshall

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Stephanie Pace Marshall

"The nature and quality of our thinking shape who we become."

Photography by Feltes

Our future belongs to a new breed of science, technology, engineering and math talent — decidedly different minds that will use the transformative power of science and technology to advance the human condition.

In this age of escalating global challenges and accelerating technologies, how our children think is the new “currency” for innovation, research and transformative global change. Shaping these habits of mind are experience and practice. When children engage in research, they learn to explore and inquire. When they identify innovative solutions to vexing global problems, they learn to ethically resolve complexity. And when they wrestle with moral dilemmas, they learn to grapple with issues of social, economic and environmental justice. They become more agile, autonomous, improvisational, failure-resilient and in control of their own minds and behavior. They assume responsibility for shaping the nature and quality of their thinking and manifesting it in action.

We know what it takes to develop expertise and to sustain the creative imagination. Yet a chasm is growing between the collaborative, exploratory, inquiry-based and problem-centered environments essential for nurturing STEM talent, and the risk-averse and prescriptive culture and conditions of schooling. Innovation happens at the edges and intersections of disciplines. It happens when irreverent questions are asked, conventional wisdom is challenged, disruptive hypotheses are explored and possibilities of “what if” capture the imagination. Innovation also happens when it’s safe to risk, tinker and venture into unexplored territory. It is a messy, unpredictable process and it requires a learning habitat that invites experimentation and discovery, rewards invention, and encourages the often playful pursuit of often absurd questions wherever they may lead.

Our students live and learn in a digital world of global networks, intelligent machines, immersive technologies and multiuser virtual environments. In this world, learning is experiential, purposeful, self-directed and on-demand.

Expertise is multigenerational; problem-solving is collaborative; knowledge is coconstructed; boundaries are often blurred; and learning, social relationships and play converge.

In a world of unprecedented connectivity and interdependence, our nation must transform STEM education and talent development to nurture a more blended generation of STEM talent, innovation and entrepreneurial leadership. This new breed of STEM innovator fluidly integrates and navigates with-in a broad spectrum of STEM disciplines, seeds and cross-pollinates ideas, and represents a synthesis of multiple STEM domains: creative scientists and researchers, innovative engineers and inventors, designers and technology creators, and social entrepreneurs and policy strategists. To develop this next generation, the learning environment and curriculum must engage students in the modes of inquiry, problem-solving, knowledge generation and application that distinguish three fundamental STEM learning communities and ways of thinking: Disciplinary and Interdisciplinary Inquiry and Research, which develops disciplinary, interdisciplinary and inquiry-based thinking; Innovation and Design, which ignites innovation and design-based thinking; and Global Leadership and Social Entrepreneurship, which nurtures change leadership and systems-based thinking.

This integrative design moves far beyond the traditional boundaries of STEM education and situates learning in diverse locations: schools, museums, universities, NGOs, research laboratories, design and production studios, and online pavilions. It engages practitioners, scientists, researchers, designers, inventors and social entrepreneurs as colearners and teachers.

Immersing students in the real work of STEM research and inquiry, innovation and global change leadership enables them to experience what is required to be successful in each domain. Simulating a medical residency model, students spend dedicated time in each core. When ready, they focus on expanding and deepening their knowledge and practice within their preferred field of study. What is essential is that their engagement in each learning core enables them to experience and explore a range of options for contributions in STEM, and to discover what they love.

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, the global community and our planet resides in igniting and nurturing decidedly different STEM minds that can advance both the new STEM frontier and the human future. By design, we can ignite and nurture our children's inventive genius and enable it to flourish.

*Stephanie Pace Marshall is founding President and President Emerita, Illinois Mathematics and Science Academy and the founding President of the National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology. She also serves on Society for Science & the Public's Board of*

*Trustees. For more information visit [www.imsa.edu](http://www.imsa.edu).*