

“I simplify and condense.”

**Greg Bear
“Blood Music”**

Creating a Nation of Innovators

A Brief Report

Preparing 21st Century Minds:

Using brain research to enhance cognitive skills for the future

**Learning & Brain Conference
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Abstract

The Learning and Brain Conference for 2011 featured talks on a handful of themes including creativity, technology, education tomorrow, five minds for the future and innovation. Of these, innovation takes center stage. Tony Wagner's opening plenary session became the conference prologue, examining innovation from several perspectives including seven skills that prepare students for the 21st Century. Though not present at the conference, Steven Johnson's work on the natural history of innovation provided a provocative definition and created a scene for Mind Brain Education Science, a new discipline embodying innovation itself in a digital age. Thus, this brief report on the conference examines innovation in depth.

“How might we create a nation of innovators?”

That is the question Tony Wagner posed at the opening plenary session for the Learning & Brain conference participants. About one thousand educators in the main ballroom of the Westin Waterfront, Boston, Massachusetts, then heard him argue that innovators can't be outsourced. In a flat world creating the new can't be automated or shipped overseas.

Key to Wagner's talk, however, was not the argument about fostering innovators. Rather he provided a response to futurist Alvin Toffler who said in the 1970s “all education springs from some image of the future.” Wagner claimed that seven skills were what innovators of tomorrow needed to develop. Additionally, schools had to redefine rigor in teaching and learning. Both the seven skills and redefined, 21st Century curriculum imagine a future of high knowledge jobs in abundance and non specialized jobs shrinking.

Skills to nurture innovators	Commentary
Critical thinking and problem solving	Though still under the foot of No Child Left behind, most public school educators in the US recognize that teaching for the test does not foster the deeper thinking needed for 21st Century citizens. Widespread attention to critical thinking and problem solving, however holds promise for jobs yet invented in a world of “future shock.”
Collaboration across networks and leading by influence	Peter Senge et al recognize that as institutions become learning organizations, team learning exceeds the knowledgeable individual. Also, the individual in a network can lead by influence with or without a title.
Agility and adaptability	The <i>New York Times</i> faced decreased circulation like most of the print media. Adding Internet options for delivery as well as applications for the tablet world regained readers.
Initiative and entrepreneurship	Successful large corporations thrive, in part, by encouraging entrepreneurs within the company. And the fastest growing sector of the US economy remains small businesses.
Effective oral and written communication	Learning to speak and write well is obvious for 21 st Century schools. Yet, the long held belief that only the elite needed these higher order skills combined with demands of standardized test to decrease the time spent on developing speakers and writers in schools must end. Put positively, as the National Writing Project recognized more broadly, writing, reading, speaking, listening and thinking must become prominent in K-16 education across the curriculum.
Accessing and analyzing information	Here Wagner agreed with the American Library 1989 presidential report discussing “information literacy. The report said we needed to develop national information literate people. Such information literate people could locate, evaluate and create information. What Wagner failed to add that the process of creating information requires more than analysis. It demands synthesis.
Curiosity and imagination	As the World Future Society once put it: “Imagination is the only renewable fuel.” Developing curiosity and imagination are surprise keys for teaching innovation today.

Fostering innovators has another side beyond a skill set in Wagner's view. What counted as rigorous teaching and learning in hunter gatherer, farmer, and factory worker driven societies no longer works in our knowledge driven society. That, in a nutshell, is another one of Wagner's arguments. But what Wagner missed remains as interesting as what he said. Learning and the Brain conference talks on creativity, technology, education tomorrow and five minds for the future aside, one deep discussion of innovation is Steven Johnson's exploration. His book, *Where good ideas come from: The natural history of innovation*, connects evolution, biology, city planning, and computer science in a polymath exploration of innovation over the past 500 years. For him seven patterns explain innovation from the coral reef to the city, from the city to the web. But it is in his discussion of technology that a working definition of innovation stands out.

There are many ways to measure innovation, but perhaps the most elemental yardstick, at least where technology is concerned, revolves around the *job* that the technology in question lets you do. All other things being equal, a breakthrough that lets you execute two jobs that were impossible before is twice as innovative as a breakthrough that lets you do only one new thing. By that measure, YouTube was significantly more innovative than HDTV, despite the fact that HDTV was a more complicated technical problem. YouTube let you publish, share, rate, discuss, and watch videos more efficiently than ever before. HDTV let you watch more pixels than ever before. (Johnson, 2010, P16)

Johnson's measure of innovation might prove useful when comparing innovations in teaching and learning. For example, which lets us do more jobs: a conventional measure of IQ or one of a handful of breakthrough theories of intelligence: Gardner's MI theory (1983), Sternberg's triarchic theory of intelligence (1985), Langer's mindfulness

theory, (1989), Perkins's learnable intelligence theory (1995) and newer theories of intelligence emerging from MBE science such as Levine's neurodevelopment theory (2004)? Which does more for innovative teaching and learning: Skinnerian theory from an older discipline or mind brain education science as a new discipline? The last is a trick question. It compares a four foot power forward to six foot eight Brittany Griner. Brittany does more jobs on the basketball court.

Likewise, MBE science combines the best research in psychology, education and neuroscience to give the world a new discipline—one capable of linking research and practice, teaching and learning as never before in human history. Examine a summary of Tracey Tokuhama Espinosa's landmark book *Mind Brain Education Science: A Comprehensive Guide to Brain Based Education*.

One useful synthesis of core ideas in the discipline rests in Tracey Tokuhama-Espinosa's landmark book. *Mind, Brain, and Education Science: A comprehensive guide to the new brain based teaching* explores the emerging discipline with four themes. Firstly, she defines mind, brain, education (MBE) science. A discipline born in 2004, MBE science derived from three parent disciplines, psychology, education and neuroscience. Each discipline had stood alone. But together, they formed a whole that was not only greater than the sum of its parts, but gave scientific depth about human learning as an emergent property. For example, her extended definition of MBE science, as a theme, served as one of those emergent properties. Secondly, she connected the dots in the history of learning theory plus suggested goals and standards needed for the future of the discipline. Thirdly, she examined the concept "scientifically substantiated art of teaching" from the perspectives of "lessons from research" and human survival skills. Finally, Tokuhama-Espinosa illustrated how MBE science research had examined problems in selected subject areas such as reading, writing, mathematics and music. She used the research based insights collected in MBE science to describe characteristics of "great teachers." In all, her themes (definition, history, new concept of teaching and applications to research and practice) provided four emergent properties of the discipline. Her ideas spark great teaching. Yet, as an answer to President Obama's call for a world class, national public system by 2020, MBE science is still a toddler.

With the emergence of MBE science, advent of new neuroscience works such as The Human Connectome Project and recent release of Sabastian Seung's *Connectome*, a challenge can be made. Create a nation of great teachers and learners for a digital age.

Working Bibliography

- Armstrong-West, S. and Fluellen, J. (2012). Comprehensive Report on the 2011 Learning and Brain Conference (in progress).**
- Blueprint for Reform: Reauthorization of the Elementary and Secondary Schools Act (2009). Retrieved from www.whitehouse.gov June 1, 2010.**
- Fisher, K et al. (2011). Why mind brain education? Why now? Retrieved from Google March 1, 2011.**
- Fluellen, J. (2010) Power Teaching: New Paradigm Education. (Education Summit Featured Talk) Boston, Massachusetts: Westin Riverfront Hotel July 8, 2010: World Future Society.**
- Friedman, T. (2005). The world is flat: A brief history of the 21st Century. New York: Farrar, Straus and Giroux**
- Gardner, H. (2006). *Five minds for the future*. Boston, Massachusetts: Harvard Business School Press.**
- Gardner, H. (2010). Five minds for the future (Plenary Session One) Future of Learning Summer Institute. Cambridge, Massachusetts: Harvard Graduate School of Education.**
- Johnson, S. (2010). *Where great ideas come from: A natural history of innovation*. New York: Riverhead Books.**
- Johnson, S. (2011) Where good ideas come from? Retrieved from Youtube March 1, 2011.**
- Seung, S. (2012). Connectome: How the brain's wiring makes us who we are. Boston: Houghton Mifflin Harcourt.**
- Tokuhama-Espinosa, T. (2010) *Mind, brain, and education science: A comprehensive guide to the new brain based teaching*. New York: W. W. Norton & Company.**
- Wagner, T. (2011). Preparing for the 21st Century. Learning and Brain Conference: Westin Riverfront Hotel, Boston, Massachusetts.**