

# NEUROCENTRIC LEARNING: THE NEW PEDAGOGY

when everything is  
**programmable:**  
LIFE IN A COMPUTATIONAL AGE

The process of learning involves persistent changes to the way synapses fire and connect in the brains of individuals. For centuries we have attempted to create these synaptic changes through teaching formal systems (like reading and math). Now, deeper understanding of neural plasticity is showing us how learning actually takes place in the brain, and how people learn differently and more effectively. Neurocentric learning will use the knowledge and technologies from neuroscience to customize the pedagogic process around the actual and distinct capacities of the mind.

## REINVENTION OF EDUCATION AS NEUROEDUCATION

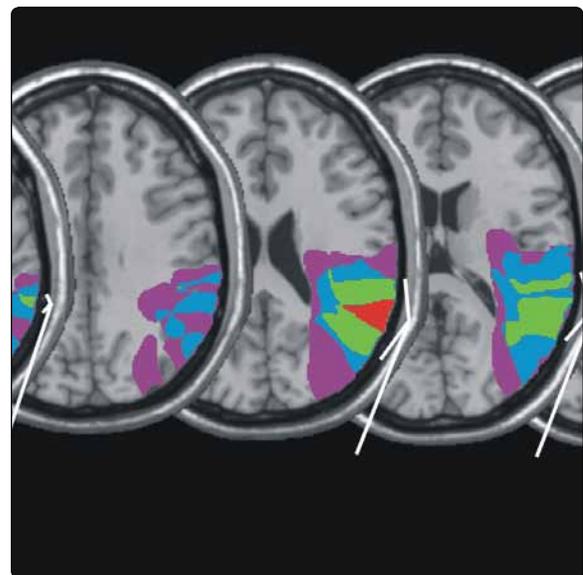
“Neuroeducation” is an interdisciplinary field that combines neuroscience, psychology, and education to create improved teaching methods and curricula. The field is rapidly evolving as researchers gain a more sophisticated understanding of how young minds develop and learn. New research programs in neuroeducation have been established at Harvard, Johns Hopkins, and the University of Texas. Many academic departments around the country are looking to recruit faculty in the area. Ken Kosik, a professor of neuroscience at the University of California, Santa Barbara, says, “We need neuroscientists in schools. Just like we have teaching hospitals, we need teaching schools.” As the field grows, it will re-invent our educational institutions and practices around new discoveries emerging from neuroscience.

## THE EVIDENCE-BASED LEARNING REVOLUTION

Advances in neuroscience and new tools for direct observation of brain activities in various types of learning settings are likely to revolutionize education. With brain imaging and genetic studies complementing psychology research, new findings will inform teachers about the conditions under which brains learn best. Many “neuromyths” that have become a part of the educational vernacular will be thrown out, such as the idea that we use only 10% of our brain (brain imaging suggests that all parts of the brain are active), the notion of multiple types of intelligence resulting in differential IQs, and the notion that people can be right- or left-brained (each side has different functions, but there is little evidence that these reflect thinking styles).

## NEW LEARNING METHODOLOGIES, TOOLS, AND HACKS

A whole new suite of tools and processes for amplifying learning will emerge from neuroscience, and many will fly in the face of existing educational structures and timetables. For example, recent research from the University of Ulm in Germany has shown that executive function—the ability to focus and avoid distraction—improved after 30 minutes of aerobic exercise. These researchers recommend that schools schedule physical education before important subjects like mathematics and before the first lesson, not at the end of the school day, as is often the case. With many cuts to “nonessential” programs such as physical education and arts, this will be a tough sell in schools.



Neuroimage of a brain learning



# ENABLING TECHNOLOGIES



## Sensors and Sensor Networks:

Everything in its right place

## Neuroimaging:

Peering into the open mind

## Neuromodulation:

The new mind control

## Bioinformatics:

Life as data

## Sensory Data Interfaces:

Re-routing perception

## Ubiquitous Displays:

Every surface is alive

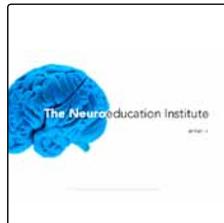
## Parallel Programming:

Applications for a multi-threaded world

## Signals:

### NEUROEDUCATION AT HARVARD AND JOHNS HOPKINS

(REINVENTION OF EDUCATION AS NEUROEDUCATION)

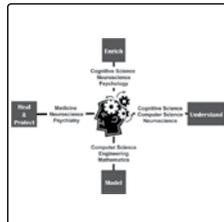


The number of neuroeducation research programs and conferences is growing. Recent entrants include Harvard's Mind, Brain, and Education (MBE) master's degree program and the Johns Hopkins Neuro education Initiative and graduate certificate in Mind, Brain, and Teaching. Kurt Fischer, director of the MBE program at Harvard, says the program's broadest mission is "to create a new field of mind, brain, and education, with educators and researchers who expertly join biology, cognitive science, and education

Source: <http://www.kiptondesign.com/>.

### DECADE OF THE MIND SYMPOSIUM

(THE EVIDENCE-BASED LEARNING REVOLUTION)



A September 2009 symposium in Berlin, Germany, titled Decade of the Mind (DOM), postulated that neuroscience could do for schools what biomedical research has done for health care. "In medicine, we have an excellent system in place to go from basic research to clinical practice, while in neuroscience, we have the basic understanding of how the brain learns but still need to figure out how to translate this into the classroom," according to Manfred Spitzer of the University of Ulm in Germany, one of the conference organizers.

Source: <http://www.newscientist.com/article/mg20327265.800-brain-science-to-help-teachers-get-into-kids-heads.html> (part of neuromyths)

### ARTS AND COGNITION CONSORTIUM

(NEW LEARNING METHODOLOGIES, TOOLS, AND HACKS)



The Dana Foundation's 2004 Arts and Cognition Consortium brought together cognitive neuroscientists from seven universities across the United States to grapple with the question of why arts training has been associated with higher academic performance. One finding, for example, is that dance training can enable students to become highly successful observers.

Source: <http://www.dana.org/news/cerebrum/detail.aspx?id=23500>



### What difference does this make?

Discoveries in neuroscience will usher in a whole panoply of new tools and methodologies for learning, training, and education.

#### SCIENTIFICATION OF EDUCATION AND LEARNING

Advances in neuroscience and neuro-technologies will impact not only educational methodology but will also enter workplaces. They will impact how new skills are being taught, what the best settings and environments for learning are, and identify optimal conditions including physical settings for creativity, collaboration, or writing. The “soft” science of human resources will be re-defined to incorporate new language and sets of tools.

#### EXPLOSION OF BRAIN-BASED TRAINING TOOLS

As we decode the workings of the brain and the scientific underpinnings of learning, we will increasingly see our mental functions as something to work on and improve upon. Remember the Baby Einstein programs designed to make your babies smarter? Expect a new army of products and services that claim to improve memory, recall, analytical thinking, etc., to enter homes and workplaces.

#### NEW WAYS OF MEASURING APTITUDES AND SKILLS AND HIRING

Most people are familiar with Meyers-Briggs and various other personality tests which are widely used in organizations to unearth employees’ strengths and weaknesses. In the next 10 years, these are likely to be supplemented or replaced by newer metrics that involve direct measurements of brain functions. The next generation of tools are likely to involve EEG’s, fMRI’s, and other tools that measure everything from cognitive load while performing various tasks, to which parts of the brain “light up” when confronted with challenges.



### What to do differently?

**You don't need to become a neuroscientist but you had better become familiar with the language and basic concepts of neuroscience.**

#### TRACK DISCOVERIES IN NEUROSCIENCE

Advances in neuroscience are being reported daily, and are increasingly a part of mainstream media. Whether you read *Science* magazine, *The New York Times*, or *USA Today*, the fields of neuroscience and brain research are the most exciting and fertile areas for insights about individual behavior, group dynamics, and many other aspects of behavior that have direct implications for organizations. Any organization can benefit from tracking neuroscience and sharing new research internally.

#### ESTABLISH RELATIONSHIPS WITH LEADERS IN NEUROEDUCATION

Exciting new organizations such as the Johns Hopkins Neuro-Education Initiative and the Neuroeducation Institute, are becoming centers for knowledge on the application of neuroscience to education and learning. In the 1990s, many organizations rushed to establish relationships with centers of technology, such as the MIT Media Center. In this century, organizations will need to establish relationships with centers that are at the forefront of research in the neurosciences, which will become the technology frontier defining scientific discovery in the next several decades.

#### RE-DESIGN EXISTING WORKPLACES/WORKSPACES TO ENHANCE LEARNING AND PRODUCTIVITY

Many of the findings coming out of neuroscience research are easy to implement in organizations, and yet can have enormous positive impacts in terms of employee productivity and work satisfaction. Bringing in natural light, encouraging employees and students to take frequent breaks that incorporate physical activity (walks or simple stretches), designing spaces to encourage spontaneous collaboration—all of these are cheap and yet quite effective ways to improve work lives and organizational productivity that can be implemented at very little cost.



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