

## Frontiers of brain research

*Neuroscience is shaping classroom practice*

Meris Stansbury  
Associate Editor

As technology advances, new discoveries based on brain mapping are helping researchers understand how students learn. And those discoveries, in turn, are enriching and informing classroom practices in a growing number of schools.

Thanks to functional Magnetic Resonance Imaging (fMRI)—a type of non-invasive, low-radiation brain scan that measures neural activity in response to certain stimuli, and the most recently developed forms of neuroimaging—researchers are learning more about how we learn than many thought possible.

For example, perhaps the most shocking revelation in neuroscience is that the brain's structure is more flexible than previously thought—a concept called neuroplasticity, meaning that the brain can still learn new concepts after various ages, and that every student can be taught many different ways. In a sense, the brain can be rewired.

Other studies have begun to measure reading aptitudes, the causes of and workings of attention-deficit disorder, and the way the brain processes mathematics.

Yet, with all this new research, it's important to remember that a single study alone is not definitive—and the best research is tied to classroom practice.

Michael Atherton, a researcher in the Department of Educational Psychology at the University of Minnesota, believes educators should look only at specific types of studies when considering implementation strategies.

"Education is an applied field, like engineering," said Atherton. "If there's no connection to practice, then that research is best left to basic researchers in the cognitive neurosciences."

In Atherton's report titled "Education and fMRI: Promise and Cautions," he describes detailed research techniques used in fMRI studies as the foundation for a methodological framework that can be used by educators to assess how applicable a study might be for classroom implementation.

This framework has three progressive stages:

- **Discovery.** This type of study is a good foundational study, but it's too broad at its current stage to have any direct implications for education. These

**See Research, page 24**



DENNIS BRACK

**Storming Capitol Hill** – Hordes of educators bring the ed-tech message to lawmakers during NECC 2009 – **Page 27**

## Jobless teachers go online

*Virtual schools become refuge in hard times*

Laura Devaney  
Senior Editor

In what could be a result of widespread teacher layoffs, some virtual schools and online learning providers are reporting huge increases in teaching applications for the coming school year.

"We have seen at least a 50-percent increase in the number of applications we've

received versus this time last year," said Annie Middlestadt, senior director of human resources for Connections Academy, an operator of virtual K-12 public charter schools.

"In the states where we operate schools, the number of phone calls and eMails we're receiving from applicants coming from brick-and-mortar schools has increased," she added.

**See Layoffs, page 25**

## ED: Use data to improve schools

*Longitudinal data systems a condition for stimulus funding*

Laura Devaney  
Senior Editor

Backed by a strong and unprecedented federal investment in education, the Obama administration has identified multiple objectives intended to help revamp the nation's education system—and a persistent use of student data to improve instruction is one of those objectives.

President Obama and U.S. Secretary of Education Arne Duncan have emphasized the need for all states to implement longitudinal data systems to track the progress of students from kindergarten through college and the workforce. Those data systems also should link students to their respective teachers and help school leaders identify strengths and weaknesses within their districts.

A portion of the U.S. Department of Education's (ED's) stimulus funding is intended to help states create comprehensive, longitudinal data systems to track the academic progress of individual students from kindergarten through college and the workforce.

Creating such systems will help states gen-

**See Data, page 25**

### IMPORTANT NOTICE FOR READERS

eSCHOOL NEWS  
[www.eschoolnews.com](http://www.eschoolnews.com)

Time to renew your **FREE** subscription to eSchool News

**YES**, I want to receive (continue to receive) eSchool News  
 **No**, I do not want to receive eSchool News.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

eMail: \_\_\_\_\_

#### PLEASE FILL OUT

Name: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

#### 1 WHERE DO YOU WORK?

School District (A)  Higher Education (C)

School Building (B)  Federal/State (D)

Other: (E) \_\_\_\_\_

#### PLEASE FAX OR MAIL TO

**3** FAX: 301-913-0119

or

**4** MAIL: eSchool News, Circulation  
7920 Norfolk Ave., #900  
Bethesda, MD 20814

QUESTIONS CALL: 800-394-0115 X199

#### 2 YOUR POSITION/TITLE (check only one)

- |   |   |
|---|---|
| <input type="checkbox"/> Administrative Support Staff (h)         | <input type="checkbox"/> MIS/IT Director (D)                      |
| <input type="checkbox"/> College/University Official (O)          | <input type="checkbox"/> Non-Educator/Parent (c)                  |
| <input type="checkbox"/> Curriculum Director (C)                  | <input type="checkbox"/> Principal/ Assistant Principal (H)       |
| <input type="checkbox"/> Deputy/Assistant/Area Superintendent (T) | <input type="checkbox"/> Safety/Security Director (S)             |
| <input type="checkbox"/> District Admin (R)                       | <input type="checkbox"/> School Board Member (V)                  |
| <input type="checkbox"/> Educational Services Agency Director (P) | <input type="checkbox"/> School Business Official (e)             |
| <input type="checkbox"/> Federal Official (Q)                     | <input type="checkbox"/> State School Official (K)                |
| <input type="checkbox"/> Federal/State Program Admin (I)          | <input type="checkbox"/> Superintendent (General) (A)             |
| <input type="checkbox"/> Governor's Office Staff Member (Z)       | <input type="checkbox"/> Teacher (W)                              |
| <input type="checkbox"/> Legislative Staff Member (b)             | <input type="checkbox"/> Technology Coordinator, School-Level (L) |
| <input type="checkbox"/> Librarian/Media Specialist (J)           | <input type="checkbox"/> Technology Director, District-Level (U)  |
| <input type="checkbox"/> Library Services Director (G)            | <input type="checkbox"/> Vendor (g)                               |

## Research...

continued from page 1

studies typically focus on one area of the brain in relation to a specific cognitive function. For example, general intelligence seems to be localized in the lateral front cortex.

- **Functional analysis.** This type of study moves from a generalization to a more focused study of brain activations. For example, if a discovery study researched which parts of the brain were stimulated while playing chess, the functional analysis study would now investigate how these parts of the brain function differently when someone is a novice or an expert. Atherton says educators can derive good understanding from these studies, but they still should be cautious.
- **Pedagogical evaluation.** If studies have shown which activations are associated with high levels of performance, the next phase asks: "Which pedagogical method results in students achieving higher levels of performance?" Studies that can answer this question can be used to guide instructional design, Atherton believes.

### Emotions count

Mary Helen Immordino-Yang, assistant professor of education at the Rossier School of Education and assistant professor of psychology at the Brain and Creativity Institute at the University of Southern California, is a cognitive neuroscientist and educational psychologist who studies the brain bases of emotion, social interaction, and culture and their implications for student development.

She also helps educators understand current research studies and practices.

Thanks to her exploratory, yet detailed, work, she is helping spread the word about how the brain affects social interactions—and policy makers are listening.

In her study, "Neural correlates of admiration and compassion," Immordino-Yang discovered, through fMRI scans, that when the emotion of admiration is evoked, the entire body is stimulated in response.

"Basically, when you feel admiration, the brain has a heightened self-awareness. This affects the body's basic performances in a positive way, leading to better overall performance. It's a startling discovery with many educational implications," she said.

Immordino-Yang believes this study is important not because it reveals how the brain works, but because it exposes a basic nature that can't be learned in the classroom alone. "Some things are just below the level of consciousness, so you can't just ask kids why they perform better at some times and some times they perform worse," she said.

She also believes her study leads to a basic conclusion that could change traditional educational practices.

"Students are taught that rational decision-making is devoid of all emotions. This is clearly not true," she said. "If you try to dissociate from your emotions, the worse your decision-making will be. This could be a useful lesson for standardized tests and curriculum makers. Educators should try and help kids analyze their emotions during tests, not put them aside."

Immordino-Yang notes that her study is not speculation. She tested many different groups of students—a process that took two years and still continues.

Recently, Immordino-Yang visited a University of Texas council that advises governors, and she was a keynote speaker



ASSOCIATED PRESS

Brain mapping research may help reveal how students learn.

at this year's Harvard Institute convention, "Connecting the Mind, Brain, and Education," which ran June 29 to July 3.

### Neuro-Education Initiative

Another source for neuroscience and education information is the recently developed Johns Hopkins School of Education's Neuro-Education Initiative, a program supported by the Johns Hopkins University Brain Science Institute.

In partnership with the School of Medicine and the Kennedy-Krieger Institute, the program's mission is to foster dialogue among educators and brain science researchers to develop joint research projects.

Mariele Hardiman, co-director of the initiative and assistant dean and chair of the Department of Interdisciplinary Studies, is a former teacher and school principal who realized there wasn't enough information available to educators on how to successfully process neuroscience research for the classroom.

After publishing her book, *Connecting Brain-Research with Effective Teaching: Brain Targeted Teaching Model*, she decided to try and connect the hundreds of researchers at Johns Hopkins to the many professors on campus.

"I thought to myself: How can we help these educators, and what new research can be done on their behalf? Wouldn't it be nice to have educators suggest what they're interested in, what they've noticed, hear their input, and then start constructing research projects? We need to focus on what educators need," she said.

One of the biggest areas of research the initiative is exploring in more depth is brain plasticity. Hardiman believes this research can have a big impact on teaching, because if teachers know "how the brain works, and how it can adapt, they will begin to look differently at their students," she said. "Whether they're older kids, lower-income kids, et cetera, the teachers will know that they don't have to treat these kids differently. [The students] can adapt and learn just like everyone else."

The initiative, which began last year, started with a think tank lunch between educators and researchers and has grown into a full conference that launched this past spring.

The inaugural summit was called "Learning, Arts, and the Brain," and researchers presented findings on how arts training has been associated with higher academic performance. For example, specific links exist between high levels of music training and the ability to manipulate in-

formation in both working and long-term memory; these links extend beyond the domain of music training. Also, in children, there appear to be specific links between the practice of music and skills in geometrical representation, though not in other forms of numerical representation.

Researchers say these findings now allow for a deeper understanding of how to define and evaluate the possible causal relationships between arts training and the ability of the brain to learn in other cognitive domains.

The Neuro-Education Initiative also offers educators a Mind, Brain, and Teaching Certificate. This 15-credit graduate certificate is designed for K-12 teachers, administrators, and student-support personnel who seek to explore how neuroscience research informs educational practice. The certificate program started this summer, and online courses will be available in 2010.

### Brain plasticity and reading acquisition

One area where the notion of brain plasticity already is having a profound effect on learning is reading acquisition—and one of the many reading software companies that specializes in implementing neuroscience concepts is Scientific Learning Corp.

The origins of the company go back more than 30 years to the work conducted by research scientists Michael Merzenich and Bill Jenkins at the University of California, San Francisco, and Paula Tallal and Steven Miller at Rutgers University.

Their research collaboration established several key findings: (1) The core cognitive and linguistic attributes that allow a student to learn can be improved through intensive intervention; (2) acoustically modified speech technology can help build a wide range of critical language and reading skills; and (3) computers can be used to create interactive, adaptive learning interventions based on a neuroscience foundation that yield years of growth in as little as a few weeks.

Based on this research, the Fast ForWord family of reading intervention products was created.

In March 1997, after an extensive field trial with 500 children at 35 sites, the first Fast ForWord product, Fast ForWord Language, was launched. Later that year, a second field trial replicated earlier results, showing gains, on average, of one to two years in as little as eight to 12 weeks.

"We know that what works in the lab doesn't necessarily lend itself well to the classroom. Even after clinical trials, some-

times it just doesn't work," said Jenkins. "That's why it's taken over 30 years from the research to get this to an actual product, but the results we've seen have been worth it."

According to the company, there are basics to how the brain learns:

- Critical tasks must be practiced at an appropriate frequency and intensity;
- Practice must take place at the right skill level for the individual student—a skill level that continuously adapts to keep the student challenged, but not frustrated;
- Multiple skills must be "cross-trained" at the same time for lasting improvement;
- Rewards must build as a student progresses, maximizing motivation;
- The learning environment must feel "safe," so students are encouraged to take risks; and
- The content must be age-appropriate and engaging.

So far, around 1,000 districts are using Scientific Learning's products.

### Using spatial reasoning to understand math

The nonprofit MIND Research Institute also develops educational software based on the latest neuroscience research—in this case, software that takes a visual approach to learning math.

MIND's software engages the learner's spatial temporal reasoning abilities to explain, understand, and solve multi-step problems, the organization says.

When students make mistakes, the software illustrates the mathematical consequences of those mistakes visually to provide insight into why the action was incorrect. MIND says its software was developed this way because research has shown that basic facts of arithmetic are more effectively learned and retained if the student first understands the conceptual meaning behind the procedures and facts.

Currently, 450 schools across the United States are using MIND's math software.

Each year, the MIND Research Institute evaluates its entire customer database, and a consistent pattern has emerged: Schools that implement more than 50 percent of the program have fewer students at the lowest performance levels. Schools with student populations below 50 percent proficiency in math to begin with have averaged 15- to 20-point gains in proficiency within two years.

"We believe that neuroscience findings can play a part in the design of educational products and practices, but they shouldn't be the only basis," said Matthew R. Peterson, co-founder of the MIND Research Institute and author of MIND's curriculum. "One needs to conduct lots and lots of field studies of any program with actual teachers and students."

He added: "From our perspective, it's an iterative process. We design something. We go out and test it with actual teachers and students. Some of it works, some of it doesn't work. Sometimes there are gaps that need to be filled. We fix the stuff that doesn't work and go out and test it again."

ESN

For More Research News Go to...

<http://www.eschoolnews.com/Research/>

Recent Research Headlines:

- Web site recreates Apollo 11 mission in real time
- High-tech cheating? Students see it differently
- NCTI funds research on assistive technologies

Get the NEW eSchool News Widget!

<http://www.eschoolnews.com/content-exchange-rss/widget/>

For Reprint Info call Nancy at 1.800.394.0115