

EDUCATION WEEK

SPOTLIGHT

On Deeper Learning

EDITOR'S
NOTE

Today's children are growing up in a world very different from that of their parents, let alone their grandparents. Building a successful adult life in the 21st century will require students to acquire a combination of content knowledge, cognitive strategies, and behaviors that reflect deeper and more authentic forms of learning. These demands pose significant challenges for traditional forms of schooling. Yet, a number of promising models and strategies have begun to emerge in K-12 education. States are exploring the use of creativity indexes to measure innovation in schools. Preschoolers are enrolled in immersion programs to learn and speak multiple languages. And, school districts are applying brain science and studies to assist students with specific learning disabilities.

The Spotlight features a collection of Education Week articles made possible in part by a grant from the William and Flora Hewlett Foundation, which supports coverage of deeper learning that will provide students with the skills and knowledge to succeed in a rapidly changing world. More at www.hewlett.org.

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Michael Stravato for Education Week

After reading a story about a Mexican hat dance, 1st grader Ethan Wheeler tries out the dance himself at the Wharton K-8 Dual Language Academy in Houston, one of the oldest schoolwide dual-language programs in the country.

Published March 28, 2012, in Education Week

'Dual' Classes See Growth in Popularity

By Lesli A. Maxwell

San Jose, Calif.

In a preschool class at Gardner Academy, a public elementary school near downtown San Jose, teacher Rosemary Zavala sketched a tree as she fired off questions about what plants need to grow. “¿Qué necesitan las plantas?” she asked her 4-year-old charges in Spanish.

“Las flores toman agua” was the exuberant answer from one girl, who said that

flowers drink water. A boy answered in English: “I saw a tree in my yard.”

The next day, Ms. Zavala’s questions about plants would continue—but in English.

This classroom, with its steady stream of lively, vocabulary-laden conversations in Spanish and in English, is what many educators and advocates hope represents the future of language instruction in the United States for both English-language learners and native English-speakers.

The numbers of dual-language-immersion programs like this one have been steadily growing in public schools over the past decade or so, rising to more than 2,000 in 2011-12, according to estimates from national experts.

That growth has come even as the numbers of transitional-bilingual-education programs shrank in the aftermath of heated, politically charged ballot initiatives pushing English immersion in states like Arizona, Massachusetts, and here in California.

Experts say the interest in dual-language programs now is driven by an increased demand for bilingual and biliterate workers and by educators who see positive impacts on academic achievement for both English-learners and students already fluent in English.

In California—home to more than 1 million ELL students and some of the fiercest battles over bilingual education—the earlier controversies are showing signs of ebbing.

While the state’s Proposition 227 ballot initiative, approved by voters in 1998, pushed districts to replace many bilingual education programs with English-immersion for English-learners, the state is now taking steps to encourage bilingualism for all students: Graduating seniors can earn a “seal of biliteracy” on their high school transcripts and diplomas, which signifies they have reached fluency in English and a second language. Last year, 6,000 graduates in the state earned the seal.

“The momentum behind these programs is really amazing,” said Virginia P. Collier, a professor emeritus of education at George Mason University, in Virginia, who has studied dual-language programs extensively.

“And we are not talking about a remedial, separate program for English-learners or foreign-language programs just for students with picky parents,” she said. “These are now mainstream programs where we’re seeing a lot of integration of native speakers of the second language with students who are native English-speakers.”

‘An Asset’

Part of the 33,000-student San Jose Unified School District, Gardner Academy offers a two-way immersion program, in which native speakers of English and native speakers of Spanish learn both languages in the same

classroom. Generally, to be considered a two-way program, at least one-third of the students must be native speakers of the second language.

Many of Ms. Zavala’s 4-year-olds will continue to receive at least half their instruction in Spanish as they move into kindergarten, 1st grade, and beyond. The goal is to establish strong literacy skills in English and Spanish in the early grades, and to produce fully bilingual, biliterate students by the end of elementary school. Because of the state’s Proposition 227 law, parents must “opt” for their children to enroll in the two-way program.

In one-way immersion, another form of dual-language learning, either native English-speakers or native speakers of the second language make up all or most of the students enrolled and instruction takes place in two languages.

The number of one-way and two-way programs is roughly equal, according to Leonides Gómez, an education professor at the University of Texas-Pan American in Edinburg, Texas, who developed a two-way-immersion model that is widely used in the state’s public schools.

There are variations in how dual-language programs work, but all of them share a few hallmark features.

At least half the instructional time is spent in the second language, although in the early grades, it may take up as much as 90 percent. There must also be distinct separation of the two languages, unlike in transitional bilingual education, in which teachers and students alike mix their use of both languages.

Spanish is by far the most prevalent second language taught in dual programs, followed by Mandarin Chinese and French, according to national language experts.

For English-language learners, the dual-immersion experience is dramatically different from that in most other bilingual education programs, in which teachers use the native language to help teach English with the goal of moving students into regular classes as quickly as possible, said Mr. Gómez, who serves on the board of the National Association for Bilingual Education, or NABE.

“The goal isn’t to run away from one language or another, but to really educate the child in both and to use the native language as a resource and an asset,” said Mr. Gómez. “Content is content, and skills are skills. When you learn both in two or more languages, it moves you to a different level of comprehension, capacity, and brain elasticity.”

Role of Motivation

Research examining the effects of dual-language programs has shown some promising results for years, although there is not con-



I’m excited that I can count on being bilingual and biliterate as I go to college, and I know it’s going to be an advantage for me even though I don’t know yet what I want to do for my career. It’s hard work, but it’s worth it.”

AMBER SEVILLA

Student, Abraham Lincoln High School, San Francisco, Calif.

sensus that it’s the best method for teaching English-language learners. One problem with discerning the effect of dual-language methods is determining how much self-selection is a factor. All such programs are programs of choice, with students and their families having the motivation to opt for the dual-language route.

Another factor is the great variability among dual-language programs.

“I think many of the new programs aren’t able to achieve the ideal conditions for them to truly work, especially for English-learners,” said Don Soifer, the executive vice president of the Lexington Institute, a think tank in Arlington, Va., that generally supports English immersion for the teaching of English-learners.

For starters, Mr. Soifer said, finding teachers is a major challenge because they need strong skills in two languages, as well as subject-matter competence. He said it’s also necessary for two-way programs to have an even balance of native English-speakers, a feature that he says is difficult to achieve in some districts.

Still, several studies in recent years have demonstrated that ELL students and other frequently low-performing groups, such as African-American students, do well in dual-language programs.

Ms. Collier and her research partner, Wayne P. Thomas, found in a 2002 study that ELLs in dual-language programs were able to close the achievement gap with their na-

tive English-speaking peers, and that the programs achieved important intangible goals, such as increased parental involvement. The study examined 20 years of data on ELLs in 15 states who were enrolled in dual-language, transitional-bilingual-education, and English-only programs.

Ms. Collier and Mr. Thomas are also conducting an ongoing study of students in two-way dual-language programs, most of them in Spanish and English, in North Carolina. The researchers have found so far that gaps in reading and math achievement between English-learners enrolled in dual-language classes and their white peers who are native English-speakers are smaller than gaps between ELLs who are not in such classes and white students.

The data are also showing that English-speaking African-American students who are in dual-language programs are outscoring black peers who are in non-dual classrooms, Ms. Collier said.

Leading the Nation

Texas has more dual-language immersion programs than any other state—with between 700 and 800 of them in schools—including some of the most mature, according to several experts.

One district in the state's Rio Grande Valley along the Mexican border—the Pharr-San Juan-Alamo Independent School District—is likely to become the nation's first to have dual-language programs in all its schools, including middle and high school, Mr. Gómez said. In June, the fourth cohort of students who have been in dual language since kindergarten will graduate from the district's four high schools.

In Utah, a statewide dual-language-immersion initiative funded through the legislature—the first such broad-scale effort in the United States, according to experts—is now in its third year, said Gregg Roberts, a specialist in world languages and dual-language immersion for the state office of education.

By next fall, public elementary schools across Utah will offer 80 programs under the state initiative, with roughly 15,000 students enrolled in Spanish, Mandarin, French, and Portuguese. The goal is to have 30,000 students enrolled in 100 programs by 2014, Mr. Roberts said.

“Utah is a small state and, for our future economic development and the national security of our country, we have to educate students who are multilingual,” he said. “There is broad agreement in our state about that. It's not a red or a blue issue here.”

Many of Utah's programs so far are two-way Spanish-English immersion, drawing on the state's growing Latino immigrant

community, said Myriam Met, an expert on immersion programs who is working closely with Utah officials on the initiative.

But the most in-demand programs in Utah are Mandarin. Ms. Met said there were fewer than 10 Chinese immersion programs in the nation in 2000. The current estimate stands at 75 Chinese programs, and by next fall, roughly a quarter of those will be in Utah, she said.

Some of the nation's oldest Chinese programs are offered in the 56,000-student San Francisco public schools.

Most students start in one of the city's five elementary schools, where they split instructional time between English and Cantonese or English and Mandarin. Eventually, many end up at Abraham Lincoln High School, where a mix of native Chinese-speakers and students who have been in the immersion program since the early grades take advanced Chinese-language courses, in addition to at least two content-area courses each year in Cantonese.

Amber Sevilla, a 14-year-old freshman in the Chinese-immersion program at Lincoln, is fluent in English, Cantonese, and Mandarin. She has been in Chinese immersion since kindergarten and learned some Chinese at home from her grandmother. Through middle school, nearly all her instruction was conducted in Chinese, including math. Currently, she is taking health education and college and career education in Chinese.

“I'm excited that I can count on being bilingual and biliterate as I go to college, and I know it's going to be an advantage for me even though I don't know yet what I want to do for my career,” said Ms. Sevilla. “It's hard work, but it's worth it.”

Like nearly all her classmates in the immersion program, Ms. Sevilla is on track to earn California's new state seal of biliteracy.

Cognitive Benefits

Rosa Molina, the executive director of Two-Way CAFE, an advocacy group for dual-language programs that is an affiliate of the California Association for Bilingual Education, said students like Ms. Sevilla benefit in multiple ways.

“They preserve their primary language or their heritage language, they develop a broader worldview that they take into college and the work world, and they gain huge advantages in their cognitive development that translates into flexibility in their thinking and the ability to successfully tackle really rigorous coursework,” Ms. Molina said.

Advocates for English-learners emphasize the importance of expanding programs that are truly two-way and fully accessible to ELLs. Laurie Olsen, a national expert on

English-learners who designed the instructional model in use at the Gardner Academy in San Jose, cautions against allowing programs to become dominated by middle- and upper-income students whose parents want them to learn a second language. If that happens, she said, one of the most promising approaches to closing the achievement gap between English-learners and fluent English-speakers will be squandered.

“We know that English-learners who develop proficiency in their home language do better in English and in accessing academic content,” she said. “Yet we still live in a world where the belief is wide that English should be enough.”

Published December 14, 2011, in *Education Week*

Science Looks at How to Inspire Creativity

By Sarah D. Sparks

In the continuing debate about American competitiveness in the global economy, politicians and educators alike have pointed not to students' test scores, but to their creativity and ingenuity, as models for the rest of the world.

Teaching creativity has been a hot-button topic this fall, from the National Academy of Education's annual meeting in Washington to a Learning and the Brain conference in Boston. Yet researchers are just beginning to determine what makes some students more creative than their peers, and how the classroom environment can nurture or smother that ability.

"To study creativity of young people who are on the move, we can't use our established habits," Shirley Brice Heath, an English professor emerita at Stanford University, told members of the education academy at its annual research meeting, which highlighted creativity and innovation.

"We can't look under the streetlight to find any keys we think we may have lost with regard to creativity," she said. "After all, schools are where the light has always been; that's not where the light is now with respect to creativity."

Howard E. Gardner, a professor of cognition and education at Harvard University, consid-

ers creativity one of five "minds," or ways of thinking—along with discipline, synthesis, respect, and ethics—that will be essential for young people to succeed in the future.

"We live in an era where everything that can be automated will be," he said at the Learning and the Brain research conference last month. "Only individuals who can regularly go beyond the conventional wisdom will be valued.

"While cognitive capacities are obviously valuable for creating," he said, "only those of a robust, risk-taking personality and temperament are likely to pursue a creative path."

Transfer Claims

Ellen Winner, the psychology chair and the director of the Arts and Mind Lab at Boston College, told participants at the Learning and the Brain conference that in a continuing series of studies on arts education and creativity, she had found "very little evidence that studying the arts improves grades or test scores, or that studying the arts improves creativity.

"These transfer claims have been posited without any particular mechanism; there's a lot of magical thinking going on," said Ms. Winner.

She said she found two "fatal flaws" in most studies linking arts education to creativity: First, few studies described what is actually

taught and learned in different arts classes that is intended to make students think more creatively; and, second, most of the studies used general paper-and-pencil tests that did not capture dynamic or subject-specific aspects of creativity.

"The most difficult problem we're facing is coming up with valid measures of creativity in the visual arts and other subjects," Ms. Winner said.

Other emerging research on creativity seems to point to two critical aspects of creativity that can be hard to teach: the willingness to take risks and learn from failure, and the ability to transfer ways of solving problems between seemingly unrelated situations.

Taking Chances

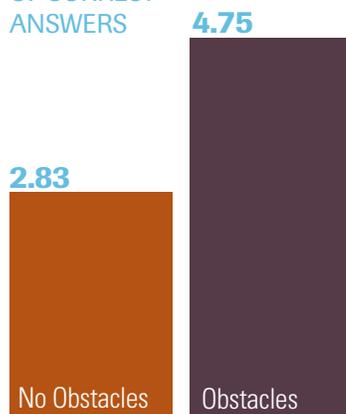
In a 30-year longitudinal study of 300 working-class black and white families, Ms. Heath and her colleagues have found positive risk-taking common among the most creative students.

"Risk we tend to think of in negative terms, but high risk in play is so endorphin-loading and high-energy, so it's part of what keeps kids engaged in creativity," Ms. Heath said.

"The ones that emerged as most creative, ... they used their play as work," she said. "They were very difficult to disengage from play.

"To a person, they disliked, avoided, subverted education if it was not related to what

NUMBER
OF CORRECT
ANSWERS



Benefits of Adversity

Challenging students to think around obstacles may improve "global thinking" and creativity, according to researchers at the University of Amsterdam in the Netherlands. In a series of experiments, researchers asked adults to navigate a character through a maze. For about half the participants, an obstacle appeared along the most direct path through the maze, forcing them to find an alternate route. The researchers later assessed the participants using a test intended to measure creativity. Among participants with "low volatility"—those considered actively engaged in the puzzle—subjects who had to work around an obstacle in the maze correctly answered 4.75 of the questions on average, compared with only 2.83 correct answers for those who had not faced the blocked maze.

SOURCE: *Journal of Personality and Social Psychology*

they saw as their interests,” Ms. Heath continued. “They never seemed to think about whether they were supposed to be learning or doing what it was that they were learning and doing.”

Students from more disadvantaged backgrounds may even be more willing to explore untested ways of doing things than their better-off peers, in part, she suggested, because they are less comfortable with their current situation. Mr. Gardner, speaking at the Learning and the Brain conference, also suggested these students may define success more broadly and thus be more willing to explore.

While some of the students Ms. Heath studied engaged in unhealthy risky behavior and got into trouble, she said most became involved in “high-risk ventures that carried meaning for them,” such as community groups and other activities focused on solving local problems.

However, even educators hoping to improve students’ creativity can inadvertently quash their willingness to take creative risks, according to Robert J. Sternberg, an expert in intelligence-testing research, who is provost and senior vice president of Oklahoma State University in Stillwater.

“Risk is essential to creativity, ... but if you want to get into the good college and the good graduate school and the good job, you don’t want to take too big a risk,” Mr. Sternberg said at the National Academy of Education meeting. “Schools often encourage you to do the opposite of what you’d need to be creative.”

In one study, for example, Mr. Sternberg found that university students in New Haven who took more risks got higher marks for creativity in a drawing contest, but for a writing contest, “when the kids in essays took controversial stands, the raters often rated them down,” he said.

In effect, Mr. Sternberg said, the raters, themselves graduate school art students, “were saying, ‘I want you to be creative—and be sure you agree with me.’”

Teaching Play

Ms. Winner, of Boston College, distinguished between disruptive, “revolutionary” creativity—for example, a Pablo Picasso who develops a new style of painting—and more general creativity, such as someone painting in the Cubist style that Picasso helped pioneer.

“It’s not at all clear to me that this [revolutionary] kind of creativity can be cultivated, though perhaps it can be asphyxiated,” she said.

Yet experts said schools can help students become more generally creative, going beyond simply mastering content knowledge or how

to perform specific skills to using their imagination to solve problems.

In her most recent research, Ms. Winner and her colleagues spent a year interviewing teachers and videotaping five arts classes at Boston Arts Academy and the Walnut Hill School for the Arts in Natick, Mass. From that material, the researchers identified eight “habits of mind” taught as part of art class that transfer to other subjects.

Among those habits was one called “stretching and exploration”—the equivalent of creativity in the context of the study.

The “stretch and explore” habit in art class looks similar to experimentation in science classes. Rather than simply telling a student how to perform a task, Ms. Winner said, the teacher might ask students “to try new things, take risks, and not be afraid of mistakes, but instead to capitalize on their mistakes.”

Now, Ms. Winner and her colleagues are involved in a two-year longitudinal study to develop measures to gauge whether the “stretching and exploring” that students learn to do in art class transfers to more creative thinking and problem-solving in math or science class.

Learning ‘Insights’

Similarly, researchers at the University of Amsterdam in the Netherlands found, in a study published last month in the *Journal of Personality and Social Psychology*, that being challenged increases students’ “global thinking” and creativity.

College students were asked to solve a maze puzzle, and for half of them, the most obvious route was blocked. After completing the maze, those who had been forced to find an alternative solution scored nearly 60 percent higher on the remote-associates test, a common gauge of creativity.

Facing an obstacle can push students to “incubate” potential ways to solve a problem, which can lead to learning “insights,” flashes of activity in part of the prefrontal cortex of the brain associated with more creative problem-solving, said Shelley H. Carson, a psychologist at Harvard University and the author of the 2010 book, *Your Creative Brain: Seven Steps to Maximize Imagination, Productivity, and Innovation in Your Life*.

Educators can help spark creative thinking, Ms. Carson said at the Learning and the Brain conference, by exposing students to creative work; providing an atmosphere in which unique and creative work is valued; and encouraging students to be intellectually curious and adventurous.

When students know they can explore and take risks safely, they are better able to connect disparate information and develop in-



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ROBERT J. STERNBERG

Provost and Senior Vice President,
Oklahoma State University

sights, she said.

“Every creative person knows that failure is part of the process,” Ms. Carson said. “You learn from failure, you learn from mistakes, and every idea you generate is not going to be a great idea, ... but the more ideas you generate, the more likely it is that some of them will succeed.”

Published January 18, 2012, in *Education Week*

FOCUS ON: SPECIAL NEEDS

Mind and Brain Research Trickles Into Special Ed. Classrooms

By Nirvi Shah
Rockville, Md.

In a corner of a classroom here at the Ivy-mount School, a frustrated 7th grader tells himself to take a deep breath. Slowly, without distracting his classmates, he calms down.

This exercise is among many strategies derived from brain-science research that educators at this private school are using with students with disabilities. In this case, the technique is being taught to students with Asperger syndrome, for whom self-control in a moment of frustration can be elusive.

The five steps to regaining calm—including breathing deeply, reading directions, and telling oneself to give something a try—are taped to many of the desks of students in the Model Asperger Program.

Ivymount is one of a growing number of schools trying to adapt techniques based on brain research to special education settings, a practice that many teachers and parents may not have even envisioned a few years ago. While some educators remain skeptical, brain research is slowly migrating from the lab into the classroom, both in predicting which students may have learning difficulties and intervening to help students diagnosed with disabilities.

Opportunities Emerge

Among the efforts under way:

- In Cambridge, Mass., a Harvard University center is devoted to training those who want to use neuroscience and cognitive science to improve teaching, including for students with disabilities.
- In Washington, George Washington University has created a doctoral program in applied neuroscience in special education.
- The Center for Applied Technology, in Wakefield, Mass., employs specialists in neuropsychology, along with other experts, to expand learning opportunities for students with disabilities.
- A professor at the Massachusetts Institute of Technology is using brain-imaging to predict which children in a given kindergarten class might eventually struggle with

reading, because of dyslexia or other reasons, so intervention can take place as early as possible.

“We are just beginning to understand how big this is,” said Maxine B. Freund, a professor in George Washington’s department of special education and the associate dean of research and external relations. “It’s an opportunity we treasure.”

That’s especially so for students with disabilities, said Kurt W. Fischer, a Harvard professor of psychology and human development and the founder of the graduate school of education’s Mind, Brain, and Education program.

“What we need to do is figure out how to harness those differences instead of making everyone learn the same way,” he said.

That doesn’t mean there shouldn’t still be some caution about translating brain research into educational techniques, he said.

“There are people that are skeptical, and they ought to be skeptical,” Mr. Fischer said. “There are lots of things happening,” he added, but “it’s still early.”

Turning a Corner

At MIT, neuroscientist and professor John D.E. Gabrieli has been working on using brain imaging to predict which students may eventually struggle with reading. He is clear about connecting his research with the classroom. One of his current projects involves working with about 20 Boston-area kindergarten classes in inner-city charter schools, suburban district-run schools, and Roman Catholic schools.

As many students as possible are brought to his lab for brain imaging—through the use of noninvasive functional magnetic-resonance imaging, or fMRIS—and the students get additional help based on the results. Mr. Gabrieli will follow the students for several years to see if the targeted interventions can stave off reading problems.

“How to diagnose and classify children—the more that we can make that scientific and less arbitrary, the better,” he said. “If something about the brain—the luck of the draw of their brain—is making reading extra hard for them, maybe we could just intervene early and spare them a lot of grief.”

Typically, reading problems aren’t diagnosed until students are in 3rd or 4th grade. Not only do reading problems at that age hamper students’ ability to learn many subjects, they’ve lost hours of reading practice outside of school, essentially falling even further behind, Mr. Gabrieli said. Children who enjoy reading passively hone their skills by reading for pleasure, something poor readers are less likely to do.

One research-based product that already appears to be helping some students is based on existing practices in special education.

Using BrainWare Safari, software made by Learning Enhancement Corp., based in Chicago, students play what seems like a video game for 30 to 45 minutes a day, several times a week, for three months. The exercises build students’ memory skills, their visual- and auditory-processing skills, thinking abilities, and sensory integration, said Betsy Hill, the president and chief operating officer of Learning Enhancement. The program replicates the work of speech and language therapists, vision therapists, and psychologists, work that is tedious for both students and therapists. Different exercises require students to click to a beat and deal with other distractions that can compete for what’s known as the working memory. Working memory allows students to do things like take notes at the same time the teacher is talking—a skill not all students easily master.

“Kids are doing one level of an exercise 100, 200, 300 times,” Ms. Hill said. “You need that kind of repetition to change those neuropathways.”

While students with disabilities may need to spend more time with the software for their brains to be reprogrammed, in a sense, all students have been shown to benefit, she said. One small study in the 550-student Harbor Beach community school district in Michigan, conducted by a district speech-language pathologist without Learning Enhancement’s knowledge, showed students’ average improvement on cognitive tests was three years and one month in learning progress after using the program for 12 weeks, confirming results published in a scientific journal.

The district was one of the first users of the program, now in about 300 schools across the

country. Harbor Beach was so convinced of BrainWare Safari's effectiveness, it is now required for all 3rd grade students new to the district.

Breaking Some Ground

At Ivymount, Monica Adler Werner, the director of the school's Model Asperger Program, said she learned about effective, research-based interventions for social skills at a conference 10 years ago and immediately asked, "Where is this happening?" The answer, she found, was nowhere.

About a year later, she started a summer camp based on the interventions she saw at that conference. Students were taught social skills and spent the rest of the day practicing them. Ms. Werner scaled up that summer camp into the program at Ivymount, which also works with students with other types of autism spectrum disorder and other disabilities. Most students who attend had been in regular public schools whose staff felt Ivymount was better suited to work with the students.

All the program strategies, whether based in neuroscience or other research, have something in common: They are meant to make the implicit explicit for students who don't have the same instinct to detect social cues their peers might pick up naturally. The program is intense, and the school year lasts 11 months.

In one exercise Ms. Werner created, students must each give a classmate a gift, which requires taking the recipient's perspective—a clear example of what researchers term "theory of mind."

Rather than follow the impulse to give gifts they themselves would want, students have to consider their classmates' likes and dislikes. Upon giving their gifts, students have to tell from the recipients' reactions whether they liked the presents.

And when they receive a gift, they must refrain from blurting out that they have the item already or that they don't like it. Sometimes, students are given truly undesirable gifts—broken clocks, a single sock, a hole puncher—to work on that skill.

"The whole social world is a problem for our students to solve," Ms. Werner said. "We break it down for them—help them learn what to look for."

Ms. Werner has a stack of research studies on the shelf in her office. She also has developed relationships with researchers and sits on a federal grant-review committee to keep abreast of more research in the works.

"We do all believe in evidence-based practice whenever possible," she said, noting that the process of taking research from lab to classroom isn't always smooth. "It's OK to make mistakes, as long as you fix them. ... We need to give ourselves the same space we give our students when they take risks."

Published February 1, 2012, in Education Week

Coming to Schools: Creativity Indexes

By Erik W. Robelen

At a time when U.S. political and business leaders are raising concerns about the need to better nurture creativity and innovative thinking among young people, several states are exploring the development of an index that would gauge the extent to which schools provide opportunities to foster those qualities.

In Massachusetts, a new state commission began meeting last fall to draft recommendations for such an index for all public schools, in response to a legislative requirement. Meanwhile, a California Senate panel last month approved a bill calling for the development of a voluntary Creative and Innovative Education Index. And Oklahoma Gov. Mary Fallin recently announced plans for a public-private partnership to produce the Oklahoma Innovative Index for schools, which she described as a "public measurement of the opportunities for our students to engage in innovative work."

Gov. Fallin couched the plan squarely in an economic context to advance the state's competitiveness and prepare young people for the workforce. The index, the Republican said, would prove a "very valuable tool to help Oklahoma be a national leader in innovation, critical thinking, and entrepreneurship."

Advocates say the idea is to promote a better balance in the curriculum, as well as campus offerings before and after school, especially in the era of high-stakes testing in reading and math.

"We're tapping into a very clear need, as expressed particularly by employers, to reincorporate into the curriculum and school experience many opportunities for young people to develop creativity-oriented skills," said Massachusetts Sen.

Stan Rosenberg, a Democrat and the lead sponsor of his chamber's 2010 bill calling for the index.

The Massachusetts legislation calls for an index that would "rate every public school on teaching, encouraging, and fostering creativity in students" and be based "in part on the creative opportunities in each school."

It cites as examples arts education, debate clubs, science fairs, filmmaking, and independent research.

Many advocates acknowledge the challenges of creating an index that doesn't turn into a mere checklist or become viewed as punitive.

Alicia A. Priest, the vice president of the Oklahoma Education Association, expressed mixed feelings about the concept.

"We are very interested in the idea, but the devil is in the details," she said. She noted concerns about using the approach to publicly measure schools, and even prefers to call the mechanism a "framework" instead of an index.

"If it's going to be something used as punitive, or even the appearance of, 'You're not good enough,' then that's not OK," Ms. Priest said.

Risky Business?

The emerging state efforts to promote creativity and innovation among their students pick up on a theme that's been gaining steam for some time in American political, business, and education circles.

"Building capacity to create and innovate in our students is central to guaranteeing the nation's competitiveness," declared the President's Committee on the Arts and the Humanities in a report last year.

In addition, fostering creativity has

become a high priority among some of the United States' top economic competitors. In a recent Education Week Commentary, Byongman Ahn, a former South Korean minister of education, said that "creating the type of education in which creativity is emphasized over rote learning" is a top education goal for his government. (See *Education Week*, Jan. 12, 2012.)

Researchers have recently examined the subject of teaching creativity, but experts are just beginning to determine what makes some students more creative than their peers and how the classroom environment can nurture, or smother, that capacity.

In fact, some emerging research seems to point to two critical aspects of creativity that can be hard to teach: the willingness to take risks and learn from failure, and the ability to transfer ways of solving problems between seemingly unrelated situations. (See *Education Week*, Dec. 14, 2011.)

Robert J. Sternberg, the provost and a professor of psychology and education at Oklahoma State University, who is an expert in intelligence-testing and has studied creativity extensively, said he's encouraged by Oklahoma's interest in developing an innovation index. He said it's important for schools to teach creative thinking, and developing some form of accountability around that is a good idea.

But, in an email, he cautioned that there are risks.

For example, "We don't want an index that trivializes creativity, such as by counting numbers of activities that, on their surface, sound creative rather than exploring what is actually done in the activities to encourage creativity," he wrote. Also, "We don't want to encourage quantity over quality of activities."

The apparent originator and a leading proponent of the index idea is Daniel R. Hunter, a playwright and founding partner of a Boston-based public relations firm who previously served as the director of Iowa's cultural-affairs department.

"This is not an effort to overthrow standardized testing," but rather "to provide schools with incentives to spend more time and resources" fostering student creativity, said Mr. Hunter, who also previously led a Massachusetts advocacy group for arts and culture that has disbanded.

"If the only public measurement of your school is a standardized test, then schools have every incentive to teach to the test," he said. "The index is a tool to get to what is happening in the classroom."

The Massachusetts commission has met twice in recent months to explore what's being called there the Creative Challenge Index.

"Our charge is to figure out what the index should be and how it would be implemented,"

said Jonathan C. Rappaport, a commission member and the executive director of Arts/Learning, a nonprofit group based in Natick, Mass. "We're only in the beginning stages."

But he and others stressed that the idea is far different from the state's testing system: The focus of the proposed index is "inputs," not "outputs."

"This is really to measure inputs, to show what opportunities kids have in their school day," Mr. Rappaport said.

And he said it's not simply about identifying classes or activities, but also the extent to which they actually encourage creativity.

"Just taking a music class doesn't mean you're going to be creative," he said.

Mr. Rappaport said the state may identify a handful of school districts that want to experiment with the idea on a pilot basis.

"We have to implement it in stages," he said.

He and other commission members say they are keenly aware of the dangers of crafting an oversimplified index that fails to adequately reflect opportunities for creativity, or that fosters the wrong incentives.

Susan Y. Whelple, the director of literacy and humanities for the Massachusetts education department, said that at the most recent meeting, commission members "had a very thoughtful discussion of how [the index] might be helpful in some ways and damaging in others."

She said: "Certainly, publishing ratings is one way that calls attention to a problem, but people also knew from their experience in schools how damaging it could be to say to the community, 'Look, this is somebody who rates very low on the scale.'"

Action to carry out the Massachusetts legislation has been slow, with the deadline for developing recommendations having been extended twice. But state officials say that with the commission members now all named—a joint process involving the governor and the state Senate and House—work is getting under way.

Ms. Whelple and others say it would take further action by lawmakers, however, to require that an index be implemented.

Paul Toner, the president of the Massachusetts Teachers Association, said he welcomes the idea of an index as advancing a "multiple measures" approach to evaluating schools.

"We see it as a way to get away from focusing on one or two test scores," he said, to "broaden the focus of what schools should be paying attention to: the whole child."

'Inspect What We Expect'

In Oklahoma, members have yet to be named to the panel that is to develop the index.



We see it as a way to get away from focusing on one or two test scores," to "broaden the focus of what schools should be paying attention to: the whole child."

PAUL TONER

President, Massachusetts Teachers Association

Susan E. McCalmont, the president of Creative Oklahoma, a nonprofit group helping to spearhead the undertaking, said a lot of questions remain.

"The work of the task force will be looking at how to set up parameters to measure," she said, and how to report that information to the public.

She noted that Oklahoma recently rolled out a system of letter grades for schools based mainly on test scores, and suggested that the results of the innovation index might be included along with those grades in school report cards, but in a different fashion.

"We do not want to do a letter grade, and we haven't decided if we're going to do a number, but it will be something easily understood, so this school is further ahead in [fostering] creativity and innovation than another," Ms. McCalmont said. "But it's not a tool intended to be punitive."

"To date," she said, "there's been measurement of everything else, but this was not on the table."

There already appears to be some division, however, on key aspects of the idea, including whether the index would be mandatory for public schools. Ms. McCalmont said she envisions that approach.

Gov. Fallin did not explicitly address the issue in her speech announcing the plan, but seemed to suggest it would be far-reaching.

"We're going to have an index, we're going to inspect what we expect in our schools," she said. "Schools will be recognized for their innovation indexes."

Phyllis Hudecki, Oklahoma's secretary of education and a member of the governor's cabinet, suggested that requiring participation might be a mistake.

"I don't foresee a mandate," she said, arguing that educators already feel burdened with the "continuous piling-on of requirements, and now we want you also to include creativity and innovation? They look at you like, 'You've got to be kidding.'"

Also, while the governor described the effort as designed to "measure" what schools are doing to promote creativity, Ms. Hudecki downplayed that notion.

"'Measuring' may be too strong a word," she said, emphasizing that much remains to be decided.

"We don't have any meat on the bones yet," she said.

Meanwhile, the California bill, approved Jan. 19 by the Senate appropriations committee, was slated for full Senate consideration by the end of January. It's similar to the Massachusetts measure, but is explicitly identified as a voluntary index. Gov. Jerry Brown, a Democrat, vetoed a version without that stipulation, included in a broader bill, last year.

Joe Landon, the executive director of the California Alliance for Arts Education, a strong backer of the bill, said he prefers that the index be mandatory, but said that wouldn't be politically feasible.

"When it's a mandate, then everybody has to respond, but in these economic times, that's not going to happen," he said. "We need to start somewhere, and this is a good place to start."

Published February 8, 2012, in Education Week

FOCUS ON: STUDENT PROFICIENCY

N.H. Schools Focus On Competency

Learning is 'anytime, anywhere'

By Catherine Gewertz

Brittany Rollins is hanging out a lot at the local animal shelter this year. Delving into the issue of pet euthanasia and writing about it will help her earn English/language arts credits toward graduation.

The 17-year-old senior at Newfound Regional High School, in the rural central New Hampshire town of Bristol, is part of one of the most aggressive statewide efforts in the country to embrace competency-based learning. In New Hampshire, this means saying that accomplishment doesn't depend on how long students are in their seats, but whether they can demonstrate that they know their stuff.

It means letting students learn academic content in new ways. It means agreeing on what constitutes mastery, and holding all students to it, instead of letting some earn diplomas with weak skills. It means figuring out multifaceted ways for students to show what they know, and, ideally, it means letting them progress toward mastery at their own pace.

"Newfound is a school that is really pushing ahead on this," said Chris Sturgis, the founder of MetisNet, a Santa Fe, N.M.-based organization that consults with foundations nationally on education issues, including competency-based learning.

Embracing that approach fully, however, can be tough because it challenges such basic systems as testing and grading. Brittany Rollins' experience at Newfound Regional illustrates both how far New Hampshire has come in shaking off traditional conceptions of time-based learning, and also how far it still has to go.

Brittany's off-campus work in an "ex-

tended learning opportunity" reflects the state's emphasis on three related ideas: "anytime, anywhere" learning, which includes out-of-school and virtual programs; personalized education, which strives to tailor studies to students' needs and interests; and competency-based learning.

'Anytime, Anywhere'

New Hampshire began by piloting competency-based approaches a decade ago. But in 2005, the state gave districts a deadline: By the 2008-09 school year, high schools would have to award credit based not on seat time, but on demonstrated mastery of course-level "competencies"—the bundles of skills and knowledge that districts specify to reflect state curriculum frameworks.

New Hampshire has gone further than most states in forging the policies to enable such an approach. For instance, a few states allow districts the option of awarding credit for demonstrated proficiency rather than seat time. New Hampshire is the only state that requires districts to do so, though some districts have yet to make that change.

In Brittany's case, she'll be able to demonstrate mastery of her subject matter on her own timetable. She'll prove her knowledge and skills piece by piece, in a variety of ways, as she masters them.

She says the obligation to demonstrate proficiency in new ways has unleashed an enthusiasm she doesn't often experience in classrooms.

"I'm good at creative writing, but not as good when it comes to getting the facts, so this project is a challenge," Brittany said. "But I like setting it all up myself. And I'm so interested in this subject that I can write more easily about it. It's much better for me

than having a teacher stand in front of me and tell me what to do.”

Brittany has to conduct in-depth research, produce articles and papers, keep a journal documenting her process, and present her work to a panel of educators and community members this spring. It’s part of New Hampshire’s move toward performance assessments that gauge not only content knowledge but crosscutting skills such as building an argument and making oral presentations.

The fact that Brittany is parceling out pieces of the English/language arts assessment as the weeks unfold shows the state’s time-flexible approach. She meets often with her journalism teacher, Dave Harlow, and the school’s extended learning opportunity coordinator, Elizabeth Colby, to discuss her progress on the eight English/language arts competencies she has targeted for completion this year. They include knowing how to write for multiple purposes and audiences; how to speak “purposefully and articulately” and listen “attentively and critically”; and how to gather, organize, and evaluate information.

A Work in Progress

While the 425-student Newfound Regional High has made big strides with extended-learning opportunities and performance assessment, other key aspects of a competency-based system have been more elusive for the school, which is part of the Newfound Regional School District.

Its report cards, for instance, are a work in progress. Ideally, a competency-based report card would have nothing but A’s and B’s, and would feature a narrative description of where students are in their journey toward those designations of mastery, said Newfound’s principal, Michael O’Malley. But now, the school’s progress reports still carry A-to-F letter grades, with a sentence or two describing students’ work habits.

The school has taken steps, though, toward the report cards it ultimately envisions: Students are rated separately for attitude and effort, so that letter grades reflect only content mastery. Next year, there will be no D’s or F’s, said Ms. Colby.

Newfound Regional has revised its grading policy accordingly. Its teachers are to give no student work less than a 50 percent score, to offset the downward pull of a bad score or two in averaging for an overall grade. Not all teachers abide by that policy, however, Mr. O’Malley acknowledged. But the idea behind it is to move toward the view that grades are fluid rather than fixed, only a momentary glimpse of where students are at a given time.

It’s hard to imagine dropping letter grades altogether, said Mr. O’Malley, when parents expect them and college admissions rely on

grade point averages. “That untethering from a 200-year-old system is really rugged,” he said.

Another key revision at Newfound has been to allow students who haven’t performed well on a test to retake it after teachers “reteach” the content. This rejection of a “one-shot-and-you’re-out” approach to testing, Mr. O’Malley said, reflects the idea that mastering the concepts, regardless of when that happens, is the goal.

But the unfortunate fallout, he said, is that some students have been gaming the new system by putting only halfhearted effort into tests because they know they can retake them. School officials are now discussing how to deal with the issue, he said.

Teaching itself has had to adapt to the state’s new vision. The staff at Newfound Regional is working with a “culture change” team from the Center for Secondary School Redesign, which is overseeing a federal Investing in Innovation, or i3, grant to 13 New England high schools working on student-led learning and performance-based assessment.

Teachers must learn to become “facilitators” instead of imparters of knowledge as students take a bigger role in shaping their own learning, and must acquire new ways of evaluating their students’ work, said Joe DiMartino, the president of the Warwick, R.I.-based center.

“Most teachers didn’t sign up to be facilitators,” he said, “so it’s not a small thing to change.”

A good part of the work the center is doing with Newfound Regional, Mr. DiMartino said, is on “inter-rater reliability,” or making sure that every adult who takes part in evaluating students’ work—teachers, guidance counselors, administrators, community members serving as mentors—does so with a shared rubric and concept of rigor.

The Pace of Change

Even as Brittany earns some of her credits with out-of-school projects and performance assessments, she is earning others in traditional classrooms, with rows of chairs and desks, and taking multiple-choice and essay exams. Only about 15 percent of Newfound Regional’s students are engaged in nontraditional coursework such as extended-learning opportunities or online courses, Mr. O’Malley said.

And whatever the competencies they’ve already mastered, students in New Hampshire must still take the statewide standardized tests in literacy and math every year in grades 3-8 and 11.

“If you’re really in a proficiency-based system, you want to be able to take the assessment that matters around the time you en-

gage with the material. So the systems aren’t perfectly aligned,” said Nicholas C. Donohue, who oversaw the early competency-based pilots as New Hampshire’s commissioner of education from 2000 to 2005 and is now the president of the Nellie Mae Education Foundation, of Quincy, Mass. The foundation is overseeing similar work in five New England states.

“The federal accountability system is based on a 20th-century model, and our state expectations are based on this new model,” said Paul K. Leather, the state’s deputy commissioner of education. He expressed hope, however, that new assessments being designed for the Common Core State Standards will help bridge those two models. Plans for those tests include some performance-based tasks.

Online learning can play a part in competency-based approaches, in part because of its potential to let students pace their coursework as they like. Students at Newfound Regional High can use New Hampshire’s Virtual Learning Academy Charter School, or VLACS, to take coursework online. In this rural community, where dial-up Internet service is not uncommon, students can do VLACS coursework at Newfound’s computer lab, or from home if technology permits.

But while online learning facilitates the “move-on-when-ready” approach that is ideal for competency-based learning, it’s not a complete solution if a state’s educational vision includes real-world learning, Ms. Sturgis said.

“The ability to let kids move forward in courses and credits has to be an application of their skills, not just moving to another level of a software program or connecting with a teacher online,” she said.

The idea that students can move on when they are ready—from course to course or grade to grade—is a piece of competency-based learning that is especially hard to put into practice, advocates of the approach say. A few districts, such as Colorado’s Adams County School District 50, near Denver, allow students to do so. But almost everywhere else, that isn’t the case.

At Newfound, students still move from one grade to the next only when they have accumulated enough credits.

“These are the ‘messy middles’ of the work we’re doing,” said James LeBaron, Newfound Regional’s school redesign coordinator. “We’re in the thick of it, and we’ve come a long way. But we’re also not as far along as we’d like to be.”

Published June 6, 2012, in *Education Week*

FOCUS ON: BRAIN SCIENCE

Teachers Need Lessons in Neuroscience, Experts Say

'Neuro-myths' seen permeating the field

By Sarah D. Sparks

A little knowledge about the brain can be a dangerous thing, and experts in mind, brain, and education studies are calling for more formal teacher training in the biological underpinnings of learning.

"We don't have much neuroscience in our teacher training; most of the books available are from the brain-based-learning industry, not scientists," said Paul A. Howard-Jones, a senior lecturer in psychology and neuroscience at the University of Bristol, in the United Kingdom, and the director of Neuroeducational.net, a site that analyzes new research for teachers. "In the absence of legitimate neuroscience in education," he said, "a neuro-mythology has arisen in schools."

The science of mind, brain, and education—the melding of cognitive psychology, educational neuroscience, and education—is still a nascent research field, but it has seen rising interest among teachers.

Yet only a handful of preservice teacher and administrator programs offer certification in educational neuroscience, among them Harvard University's Mind, Brain, and Education program, in Cambridge, Mass.; the Southwest Center for Mind, Brain, and Education at the University of Texas at Arlington; and the Brainsmart graduate program at Nova Southeastern University, in Winter Park, Fla.

"For the most part, teachers are not exposed systemically in a way that allows them to understand things like brain plasticity," said Michael J. Nakkula, the chairman of applied psychology and human development at the University of Pennsylvania's Graduate School of Education. Mr. Nakkula is part of the Students at the Center project, a series of reports on teaching and learning launched this spring by the Boston-based nonprofit group Jobs for the Future.

As a result, many teachers are exposed to "bits and pieces" of professional development about neuroscience, said Donna Wilson, the chief academic officer of Nova Southeastern's Brainsmart master's degree program.

'Bits and Pieces'

In a study of 158 preservice secondary school teachers in the United Kingdom, Mr. Howard-Jones found that more than 80 percent believed incorrectly that students should be taught based on their brains' "learning styles," and another one in five mistakenly thought a student's brain would shrink if he or she drank fewer than six glasses of water a day.

Two researchers at Arizona State University, in Tempe, found that a majority of both incoming and veteran teachers reported they followed neuroscience research on the Internet, on television, and in journals, and believed neuroscience findings could help "answer questions now debated in education," particularly on ways to help students with cognitive disabilities. But the researchers—M. Zambo, an associate professor of educational leadership, and Ronald Zambo, an associate professor of teacher preparation—also found a majority of the teachers believed that evidence supported various brain myths.

Dr. Janet N. Zadina, a former high school teacher who is now an adjunct assistant professor in neurology at Tulane University, in New Orleans, said more cross-training of teachers and neuroscientists, including lab work for the teachers and classroom experience for the researchers, would help stop the "telephone game" of half-truths conveyed now in the education neuroscience field.

Examining Practice

Dr. Judy Willis, a neurologist, has seen evi-

dence of those myths in practice.

Dr. Willis had been a clinician for 15 years when what she calls the "weird" referrals started piling up in the late 1990s: Teachers were sending rising numbers of students to be evaluated for conditions they didn't have, from attention deficit disorder to epilepsy.

"It was so profound that I finally had to check it out," she said.

In classroom observations, Dr. Willis said, she found high rates of boredom and stress among students, and teachers who often had little understanding of potential stress-related neurological reasons for their students' behavior. Rather, she heard teachers attribute problems to students' brain hemispheres or to whether they were drinking enough water.

She later went into teaching herself, becoming a teacher trainer who shares research on the effects of student disengagement and stress.

"The amount of information is increasing logarithmically," Dr. Willis said. "Unless you have a basis of foundational knowledge, it will be impossible to evaluate claims and data."

Toolbox

Dr. Zadina, who won the Society of Neuroscience's 2011 science educator award for her work training teachers in brain processes, said she hopes eventually that most school districts will have an educational neuroscience liaison on hand, much like curriculum directors, to connect with researchers and translate new research into practice.

"There's just no mechanism in place now for them to work with scientists," she said.

A handful of programs are trying. The Southwest Center partnered last fall with Texas' Arlington Independent School District and the Center for Brain Health at the University of Texas at Dallas. Four Arling-

ton district teachers are among 15 working on master's-degree research projects related to district issues, and the center also brings in neuroscience researchers for in-service professional development on topics from dyslexia to math.

As teachers learn more about the realities of educational neuroscience, so neuroscientists are trying to learn more about teachers.

"This is really the other 50 percent of education," said Vanessa Rodriguez, a Harvard doctoral student and researcher. Harvard's Mind, Brain, and Education program is developing a model of the "teaching brain" by scanning 10 to 15 veteran teachers of kindergarten through high school.

"Once we have the teaching brain and the learning brain, we can start to look at the interaction of the two," Ms. Rodriguez said. "Understanding teaching can help us understand learning better."

Published June 6, 2012, in Education Week

FOCUS ON: BRAIN SCIENCE

Neuroscientists Find Learning Is Not 'Hard-Wired'

By Sarah D. Sparks

Neuroscience exploded into the education conversation more than 20 years ago, in step with the evolution of personal computers and the rise of the Internet, and policymakers hoped medical discoveries could likewise help doctors and teachers understand the "hard wiring" of the brain.

That conception of how the brain works, exacerbated by the difficulty in translating research from lab to classroom, spawned a generation of neuro-myths and snake-oil pitches—from programs to improve cross-hemisphere brain communication to teaching practices aimed at "auditory" or "visual" learners.

Today, as educational neuroscience has started to find its niche within interdisciplinary "mind-brain-education" study, the field's most powerful findings show how little about learning is hard-wired, after all.

"What we find is people really do change their brain functions in response to experience," said Kurt W. Fischer, the director of Harvard University's Mind, Brain, and Education Program. "It's just amazing how flexible the brain is. That plasticity has been a huge surprise to a whole lot of people."

In contrast to the popular conception of the brain as a computer hard-wired with programs that run different types of tasks, said Dr. Jay N. Giedd, a neuroscientist at the National Institute of Mental Health, brain activity has turned out to operate more like a language.

Different parts of the brain act like the letters of the alphabet, he said, and by the time a child is 8 months old, the letters are there—the basic connections have formed in the hippocampus or the prefrontal cortex, say—but then through experience, those neural letters activate in patterns to form words, sentences, and paragraphs of thought.

That analogy offers a whole different idea of how the brain develops, both normally and abnormally.

"When I first started, we made the mistake of talking about, 'Oh, the hippocampus is memory; the prefrontal does decisionmaking, impulse control'—and it's sort of a half-truth," Dr. Giedd said at a recent Learning and the Brain Society talk.

"I was looking for letters—a hole in this part of the brain, damage in that part of the brain," he said. Researchers do find predictable problems, he said, "but it's not because of everything that lies in that spot; it's because it's part of a word or sentence or paragraph that uses that letter a lot. ... The cells that fire together are wired together—and grow together."

Moreover, Mr. Fischer and other mind-brain-education researchers said, helping teachers and students understand how the brain changes in response to experience may be the best way to link neuroscience findings to classroom experience.

Rocky Start

Education watchers have had great hopes for dramatic, instruction-changing findings since the early days of educational neuroscience. President George H.W. Bush declared the 1990s "the decade of the brain," but by the end of it, the promise of the research—most of it done with animals—had not translated into clear guidelines for instructional practice.

In 1997, the cognitive scientist and philosopher John T. Bruer of the James S. McDonnell Foundation, in St. Louis, declared in a landmark essay in the American Educational Research Association's journal *Educational Researcher* that directly connecting neuroscience to classroom instruction was "a bridge too far." He urged collaboration among cog-

nitive psychologists, neuroscientists, and educators.

“All of our outcome measures, the things we are hoping to see, are not neurological changes; they are behavioral changes,” explained Daniel T. Willingham, a psychology professor at the University of Virginia, in Charlottesville. “We don’t measure how are your dendritic connections, we measure how well you can read.”

“Trying to leverage behavioral science [for education] is complicated enough,” he said. “For neuroscience to get into the mix, we have translation problems. The more distant you get from the level of the classroom, the less likely [the research] is to make a difference in the classroom.”

Dr. Kenneth S. Kosik, a neuroscience professor at the University of California, Santa Barbara, and co-director of the Neuroscience Research Institute, helped found the Needham, Mass.-based Learning and the Brain Society in 1999 to bring together experts from those different fields. But he acknowledged that, 15 years after Mr. Bruer’s critique, “we still have a paucity of real, concrete findings in neuroscience that we can say will change what goes on in the classroom.”

Interdisciplinary turf wars are partly to blame for slowing the development of mind-brain-education science, said Dr. Janet N. Zadina, a former high school teacher turned adjunct assistant professor in neurology at Tulane University, in New Orleans, and the winner of the Society for Neuroscience’s 2011 science educator award.

“At first, it was defensiveness; cognitive psychology wanted to claim it, neuroscience wanted to claim it, educators wanted to claim it, and because the fields have been separate, they were all reinventing the wheel,” she recalled.

Bridging the Disciplines

In the absence of cohesive collaboration among the disciplines, Dr. Zadina said, teachers, policymakers, and education companies were often left to draw their own conclusions from the research, and they often came to overly simplistic or outright wrong conclusions.

One 2011 Arizona State University study asked 267 preservice and active teachers to review one of three versions of a fake journal article reporting inaccurate information: One version contained only text, the second contained a graph, and the third had a picture of a brain scan. Teachers were more likely to consider the article containing the brain scan credible, even though it was unrelated to the text.

“There’s a reductionism [in which] finding a difference [on a brain scan] is equated with explaining the difference,” said Carol A. Tavris, a psychologist and the author of the 2010 Prentice Hall book *Psychobabble and Biobunk: Using Psychological Science to Think Critically About Popular Psychology*. “It is easy for the public to infer that a snapshot out of context is not a snapshot, but a timeless, unchanging blueprint.”

Because most members of the public, including many teachers and researchers, don’t understand how brain-imaging equipment works, they often develop “technomyopia—the sense that the technology knows more than I do,” Ms. Tavris said in a keynote address to the Association for Psychological Science last month.

Yet technology used in brain imaging, including functional magnetic-resonance imaging, or fMRI, and magnetoencephalography, can be thrown off by movement, she said, and readings are easily misinterpreted.

“Neuroscientists love their brain scans,” Dr. Kosik agreed. “They can be interpreted in all kinds of ways, as though they’re Tarot cards, when you are talking to a teacher, ... then you go home and say, ‘That was a beautiful picture with lots of brain stuff, but, OK, what does it mean, what do I do next?’”

For example, early brain-imaging studies on dyslexia pointed to differences between dyslexic and typical readers in the back left of the brain—a region associated with sound processing. That led some educators to consider dyslexia a hard-wired physical problem in the brain and therefore harder to treat with educational interventions. Yet emerging research on language development shows that a person processes both letter sounds and the direct meanings of words, and uses different neural connections to comprehend a language like English, in which the same letters can have multiple sounds, than for Finnish, which has more stable phonemes, the sounds that make up spoken words. Later studies have shown various subtypes of dyslexia respond differently to interventions, and in some cases, those with the disorder can have an edge in types of pattern recognition like the kind astronomers use.

“We got very excited about that” finding, Mr. Fischer said, “because it shows we need to stop thinking about simple disabilities; we need to think about patterns of understanding, patterns of processing. Different kids learn differently.”

Ms. Tavris told Education Week she sees little potential in the near future for neuroscience to do more than reinforce findings from psychology and behavioral sciences.

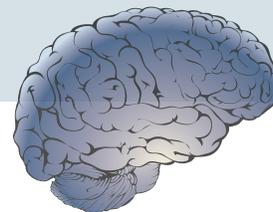
Yet Mr. Fischer argued that methods for measuring brain growth and activity have

Toolbox

Researchers use a variety of new technologies to take measurements on the brain, including:

- **Electroencephalography (EEG)** measures changes in electrical voltage in neurons by using sensors placed on the scalp.
- **Magnetoencephalography (MEG)** uses arrays of highly sensitive magnetometers to measure the electrical currents produced by brain activity.
- **Functional magnetic-resonance imaging (fMRI)** measures changes in blood flow during brain activity.

For more on the advantages and disadvantages of these techniques, see the full package of these articles at www.edweek.org/go/neuroscience.



all been developed in the past 10 to 15 years, and “it takes a while when you have a new tool to figure out how to use it effectively.”

Moreover, he added, laboratory-based psychological studies can be just as difficult to translate into classroom practice.

“In cognitive science,” he said, “you flash a word on the screen for a 10th of a second—that’s not what happens in a classroom.”

Dr. Kosik, Mr. Fischer, and others in mind-brain-education research agree that the neuroscience evidence in their field has been sketchy so far, but they argue that criticizing the field for replicating educational findings from psychology misses the point of mind, brain, and education.

“What we’re trying to do is cover the discipline [of learning] more broadly,” Mr. Fischer said. “We need to figure out how to do more practical research. We need to have research in school settings and learning environments to become a norm.”

“We do it in medicine for just about everything,” he said. “We need to do it in education.”

Mind-brain-education experts have also called for the creation of more laboratory schools, similar to teaching hospitals in medicine, in which teachers can test the implications of emerging research. Doing so could take translations of mind-brain-education research beyond “just a talk on the brain,” Dr. Zadina said, to “an overhaul of practice, the basis of what we do.”

Broad changes in perspective will be more important to shifting teacher practice than fMRI results of a particular intervention, according to Marc Schwartz, the director of the Southwest Center for Mind, Brain, and Education at the University of Texas at Arlington. “I tell [teachers] right from the beginning that silver bullets don’t exist,” Mr. Schwartz said, but argued that doesn’t mean neuroscience findings, such as those on brain plasticity, can’t be relevant to education.

“Variability is often overlooked as a gift rather than a nemesis; teachers think, ‘these students are so different, they can’t adapt to what I’m teaching,’” he said. “Mind-brain-education [study] has given us a more flexible view of children, and to the extent teachers accept that, they become more powerful teachers.”

The 300-student Jacob Shapiro Brain Based Instruction Laboratory School in Oshkosh, Wis., does not look promising from the outside: A hulking, windowless concrete throwback to the 1970s open-concept school design, it has virtually no interior classroom walls.

Yet for the past six years, the charter school—with a 2011-12 enrollment in which 45 percent of students are living in poverty and 30 percent require special education services—has been building just the sort of teaching environment that could help translate brain research into classroom practice throughout the district.

Learning Laboratory

The 50-odd teachers are on monthly listservs for new research and discuss the findings during regular lunch discussions. “If it’s been studied, we’ll probably talk about it: neuroscience, cognitive psychology, behaviorism,” Principal B. Lynn Brown said.

“A student’s brain physically changes every day, and the way we teach either enhances or impairs it,” she said, noting that she and her teachers hold summer seminars for other district staff on the brain’s flexibility and response to instruction. “We have to ask ourselves as educators, what does our practice say about what we believe? We are explicitly teaching thinking skills.”

As a laboratory school, the Jacob Shapiro school regularly provides training seminars for teachers and administrators from other schools and districts and plays host to observ-

ing researchers; the children have learned to ignore visitors moving in and out of the classrooms.

During one such visit last fall, the 2nd grade science class was learning about butterflies. The students took a lot of breaks, all of them active; students started out with wild wriggles and moved to smaller and slower movements, quieting. Students with difficulty regulating their emotions learn about executive function in the prefrontal cortex of the brain, and how, like lifting weights to build a muscle, they can practice self-control and attention, according to Kristine Hutchinson, the school’s music teacher, who also helps implement Jacob Shapiro’s discipline program.

Students who became stressed or frustrated during class could seek one of the school’s many “safe spots,” quiet nooks with soft seating and pictures reminding them of those lessons in calming themselves down, such as taking deep breaths, squeezing a compression ball, or writing out their anxieties. “It’s not a time-out spot; it’s a place kids voluntarily go,” said Ms. Hutchinson. “We check in with them, but we’re teaching them to self-regulate.”

Three times a week, students also take a 30-minute class in metacognitive skills, learning about how their brains work and how to think about their own learning and problem-solving.

In one session, thinking-skills teacher Shirley Rose set out a spatial-logic problem for the 3rd graders to teach directions. She drew out the image of a man standing in the center of a group of objects, and the children talked through ways to figure out which direction the man was facing and which objects he could see at any one time.

“When I first started this, sometimes you are driven to just finish this sheet and make sure all the answers are correct, and really that’s not the point,” said Ms. Rose. “The point is to get them to understand their own thinking and strategies.”

Even young children can understand the basic concepts of brain plasticity—for example, that their brains are malleable and will change as they practice something—and she said “it becomes a very powerful thing for them, that just because they have an error, it’s not this terrible, dreadful thing.”

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Published by Editorial Projects in Education, Inc.

6935 Arlington Road, Suite 100

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