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# AMERICAN Educator

A QUARTERLY JOURNAL OF EDUCATIONAL RESEARCH AND IDEAS

# Putting the Focus on Student Engagement

**THE BENEFITS OF PERFORMANCE-BASED ASSESSMENT** PAGE 4

AFT FOR HILLARY 2016

# HILLARY CLINTON
## Advocating *for* women and girls

"Well, if calling for **equal pay** and **paid leave** and **women's health** is playing the gender card, **deal me in**."
**—HILLARY CLINTON**

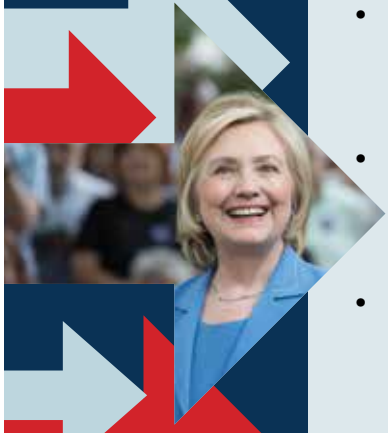

PHOTO COURTESY HILLARY FOR AMERICA

### Standing up for equal pay and equal treatment for women in the workforce:

- Will lead the effort to pass the Paycheck Fairness Act in order to close loopholes in existing law and give women the legal tools they need to fight workplace discrimination. *Think Progress* (April 14, 2015)
- Has a strong track record of fighting pay discrimination, including co-sponsoring the Lilly Ledbetter Fair Pay Act in the Senate, which expanded the right to take pay discrimination disputes to court. (S.1843, July 20, 2007; S. 181, Jan. 8, 2009, enacted Jan. 29, 2009)

### Creating opportunities for young women and girls:

- As secretary of state, elevated gender equality as a key pillar of U.S. foreign policy.
- Created the position of U.S. ambassador-at-large for global women's issues and ensured that position was made permanent.
- Helped launch the first U.S. National Action Plan on Women, Peace, and Security to promote the role of women in peace and security processes.
- Advanced women's economic empowerment, championed programs to prevent and respond to gender-based violence, and spearheaded public-private partnerships to improve the status of women and girls. *Huffington Post* (Sept. 1, 2015)

### Championing women's health and the needs of families:

- Will develop a national paid leave program to help parents stay home with their newborn children, give working families more flexibility to care for family members in need, and provide a buffer against income loss when a crisis hits a family. *New Republic* (May 11, 2015)
- As senator, championed access to emergency contraception and voted in favor of strengthening a woman's right to make her own healthcare choices.
- As first lady, fought for the creation of the Children's Health Insurance Program, providing cost-effective healthcare coverage for children in need. *Washington Post* (Oct. 5, 2007)

### Protecting the right to organize:

- Recognizes that union organizing is one of the most effective ways to close the pay gap. On average, women in unionized jobs make more than men in nonunion jobs. Institute for Women's Policy Research, "Status of Women in the States" (2015)
- Will work to ensure working people have the right to organize and bargain collectively. *Politico* (June 7, 2015)

### Reducing student debt:

- Wants to reduce interest rates for future student loans so that college is more affordable for students and families.
- Will work to enable millions of borrowers to refinance their existing student loans at the current low federal loan rates.
- Plans to stop predatory schools and lenders by enacting a Borrower Bill of Rights, helping to ensure that families and students know their rights and understand their options.

For more information on Hillary Clinton's priorities, go to **www.aft.org/election2016**.
Sign up to join the Political Activist team and receive up-to-date election news. Text **VOTE** to **69238**.



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# A Reset We Need to Get Right

RANDI WEINGARTEN, AFT President

THE DAY AFTER President Obama signed the Every Student Succeeds Act (ESSA) in December, the American Federation of Teachers convened a telephone town hall about the new law. More than 172,000 educators and activists called in—the response was unprecedented. The number one issue raised was: How will this new law affect the classroom? Every educator knows that No Child Left Behind and the Obama administration's Race to the Top policies, while well intentioned, went terribly wrong by creating a test-and-punish environment in America's schools. Our members want to know: Will this law be different? Will it support our students and our profession? And will the voices of educators be heard?

The passage of ESSA provides a much-needed opportunity to move past the era of high-stakes testing and punitive sanctions, which left students stressed or bored, parents frustrated, and teachers demoralized. ESSA is not perfect, but it maintains the original intent of the Elementary and Secondary Education Act by supporting the disadvantaged schools and children who need it most. (Title I funding is maintained the way it's currently allocated.) And it makes it possible to redefine accountability—to both expand what constitutes student learning and make everyone, not just individual teachers, responsible for every student's education.

Teachers are on the receiving end of a lot of reforms and policies. The bottom line from their perspective is (and should be): Does it work for kids? And does it work in classrooms? That is the lens through which we view ESSA. AFT members alone took more than 100,000 online actions related to this reauthorization, submitted 20,000 comments to Congress, and met with numerous congressional leaders and staff.

Teachers want the latitude, tools, resources, and respect they need to provide their students with the excellent education those students deserve. And they recognize the potential of this law to help create those conditions.

It is critical that states create accountability systems that are aligned with what kids need to know and be able to do and what teachers need to help get them there, while providing relevant indicators of where they are in that process. ESSA gives states and districts the opportunity to move away from top-down, test-and-punish accountability and toward accountability systems that unleash teachers' creativity to cultivate meaningful learning that prepares children for the complex world they are entering. Teachers must be fully involved in the development of these new systems.

The AFT supports a framework of indicators for school success that has three broad categories: academic outcomes, opportunity to learn, and engagement and support. The first, academic outcomes, means not only achievement on standardized assessments, but also success in performance assessments and other meaningful demonstrations of college and career readiness. The second category, opportunity to learn, includes access to a full curriculum that incorporates science, history, and the arts; access to high-quality teaching and student support; and access to safe and adequate facilities. Finally, the engagement and support category considers indicators of social-emotional skills and support, and indicators of teacher, parent, and community engagement. We believe such indicators can serve as a guide for states and districts and provide meaningful information for schools, families, and communities.

ESSA must truly be a reset of education policies, not a repeat of failed ones. It will take time to put in place new policies and practices, so we are asking for time—within reason—to do this right. Public education has been subject to countless reforms that were undermined by hasty, inadequate implementation. Now, states must take the time to bring key stakeholders together and ensure that all voices are heard, instead of merely rushing to repackage the system that is currently in place.

The AFT believes that a moratorium on the stakes attached to accountability systems, until those systems are fully implemented, makes sense; many states have already begun this process. For example, New York has adopted a four-year break for students and teachers. Utah has introduced legislation to temporarily limit how test scores are used. A lawsuit in New Mexico challenges the state's unreliable and unfair teacher evaluation system. And just recently, Tennessee announced that test scores would not be used in teacher evaluations.

ESSA must truly be a reset of education policies, not a repeat of failed ones.

We must seize the opportunity to get this reset right. This is our chance to redefine student learning in a robust way that any parent or educator would value, and to offer interventions that will put struggling schools on the path to success. I challenge district, state, and federal officials to empower and support teachers to stoke students' curiosity and help them pursue their dreams. The AFT stands ready to partner at every level with all who share the goal of reclaiming the promise of public education—and that starts with bringing back the joy of teaching and learning.

Follow Randi Weingarten: **twitter.com/rweingarten**.

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ROY REID

Pictured on the cover: A microbiology class at Urban Academy Laboratory High School in New York City.

## OUTRAGE IN DETROIT

AFT members have mobilized with the Detroit community to make deplorable environmental and learning conditions in school buildings a national issue. Many school settings are undercutting educational opportunities by exposing students, educators, and school visitors to dangerous conditions that could seriously harm their health, safety, and welfare. That warning was laid out in a lawsuit filed in January by the Detroit Federation of Teachers, its affiliates, and several parents. On February 9, members and school employees joined with parents, students, community leaders, and AFT President Randi Weingarten in a day of action, calling attention to these problems through "walk-ins" at Detroit public schools. The unacceptable school conditions have received national media attention from *PBS NewsHour* and *People* magazine: **www.bit.ly/20kiPKv**.

DETROIT FEDERATION OF TEACHERS

**Deplorable conditions inside one Detroit school, where buckets have been placed to catch water leaking from classroom ceilings.**

## MINNESOTA'S PRE-K PUSH

Concern about persistent opportunity and achievement gaps in Minnesota has fueled a new call in the state for universal prekindergarten for 4-year-olds. It comes from the Educator Policy Innovation Center, a group founded by Education Minnesota to bring research-proven solutions and the voice of educators to the challenges facing schools. Along with universal access, the group's new report lays out major components and indicators of program quality, calling high standards in early education "absolutely critical." The report is available at **www.bit.ly/1V4xUOZ**.

## STEPS TOWARD IMMIGRATION REFORM

Even with Justice Antonin Scalia's death in February, the U.S. Supreme Court this term could potentially end a challenge to two major federal initiatives that give 5 million aspiring Americans the chance for temporary relief from deportation and for work authorization. Such a ruling in *United States v. Texas* would be welcome but falls short of the ultimate goal: comprehensive immigration reform. That is the argument made by AFT Executive Vice President Mary Cathryn Ricker and Marielena Hincapié, executive director of the National Immigration Law Center, in a recent column in *The Hill*. "A temporary reprieve from deportation [is] not a green card or even a pathway to citizenship," Ricker and Hincapié write. "We know that entire families, along with local economies, benefit when immigrants are allowed to apply for deportation relief and work authorization." Read the column at **http://go.aft.org/AE116news4**.

## CHICAGO TEACHERS REJECT CONTRACT OFFER

On February 1, the Chicago Teachers Union (CTU) voted down the Chicago Board of Education's latest contract proposal for failing to address the difficult conditions in schools, the lack of services for the neediest students, and the long-term fiscal crisis that threatens to gut public education in the city. CTU President Karen Lewis, who is an AFT vice president, says her members already have given more than $2 billion back to the district over the last five years in the form of rescinded raises, layoffs, and a three-year partial suspension on pension contributions by the school system. Three days after the CTU vote, more than 3,000 rank-and-file members, parents, students, and public education advocates marched through downtown Chicago in support of the union and its efforts to secure a fair contract. At press time, union members are continuing a series of demonstrations and actions while fact-finding continues between CTU and the district. Additional information is available at **http://go.aft.org/AE116news1**.

## TEACHER IMPROVEMENT PLANS CHALLENGED BY NYSUT

The New York State United Teachers (NYSUT) has taken the state Education Department to court for what the union says are actions on teacher improvement plans that violate teachers' collective bargaining rights. The suit was filed in January in the New York Supreme Court on behalf of four teachers and six local teachers unions. It charges that the Education Department violated the Taylor Law (which governs public employee contracts and negotiations) because it took teacher improvement plans, which had previously been bargained, into the realm of management prerogative. Details are available at **http://go.aft.org/AE116news2**.

## EASING STUDENT DEBT

Student debt has soared to more than $1.3 trillion, and activists are committed to finding solutions. In January, seven U.S. senators launched #InTheRed, a campaign to push legislation that would ease this financial burden. On January 28, National Student Debt Day, students gathered for advocacy workshops and encouragement from Senator Elizabeth Warren (D-MA), a champion of affordable higher education. Students then met with lawmakers on Capitol Hill to launch the Young Invincibles' Campaign to Fix Higher Ed. Read the full story at **http://go.aft.org/AE116news3**.


SENATE DEMOCRATIC MEDIA CENTER

**Senator Elizabeth Warren at a press conference for #InTheRed.**

# Putting the Focus on Student Engagement

## The Benefits of Performance-Based Assessment

**Left, students at New York City's Urban Academy Laboratory High School observe art during a gallery visit.**

ILLUSTRATIONS BY WILLIAM DUKE, PHOTOGRAPHS BY ROY REID

By Avram Barlowe and Ann Cook

The large numbers of teachers and families of children in public schools participating in a movement to opt out of high-stakes, standardized testing indicate strong resistance to a school "reform" that has done little to improve public education and much to undermine it.

Bipartisan legislation allowing parents to "opt out" is currently being debated in many state legislatures. Feeling the pressure of parents, educators, and community members, politicians and policymakers have slowly begun to respond to the collateral damage generated by high-stakes testing, which has resulted in public school closures, as well as demoralized students and teachers. Suddenly, testing has become a major issue in local elections.

Last year, the American Statistical Association released a statement criticizing the use of value-added measures (VAM) in teacher evaluation. VAM purports to show the contribution of individual teachers by comparing their students' current test scores with the scores of those same students in previous school years, as well as with the scores of other students in the same grade, so that administrators can isolate the contribution, or "value added," that each teacher provides in a given year. The American Statistical Association argued that value-added measures based on standardized tests "do not directly measure potential teacher contributions toward other student outcomes."[1]

The American Educational Research Association has also cautioned against the use of VAM in teacher evaluation.[2] Even the Bill

*Avram Barlowe has taught history and social studies in New York City public high schools for 35 years. A founding member of Urban Academy Laboratory High School, he is the school's liaison to the New York Performance Standards Consortium. Ann Cook was the cofounder and codirector of Urban Academy Laboratory High School. She is the executive director of the Consortium.*

& Melinda Gates Foundation, a major proponent of VAM, has backed off its initial support.[3]

In California, Governor Jerry Brown recently signed legislation suspending standardized exit exams the state required high school seniors to pass in order to graduate. So distrustful was Brown of the tests' value that he made the law retroactive to 2004, thus allowing students who had met all other graduation requirements to receive their diplomas.[4]

In New York, Governor Andrew Cuomo has also dialed back the emphasis on high-stakes testing. Cuomo and the legislature had approved a teacher evaluation system in which up to 50 percent of a teacher's evaluation was based on student standardized test scores. But in December 2015, a task force created by the governor to review the Common Core State Standards and their alignment to standardized tests recommended that such tests no longer be used to evaluate teacher and student performance. The governor has embraced the recommendations of the task force, whose members include Randi Weingarten, the president of the American Federation of Teachers.[5]

**Above, Urban Academy students at work in a painting class.**

The new federal law permits several states to develop assessment systems that allow for performance-based assessments in lieu of standardized tests.

Perhaps most significant of all, last spring half a million parents across the country opted their children out of their annual standardized state tests.[6]

The pushback has not been confined to the states. In fall 2015, it reached the federal level when then–Secretary of Education Arne Duncan called for a cap on standardized tests and recommended that no student spend more than 2 percent of instructional time taking them. "At the federal, state, and local level, we have supported policies that have contributed to the problem in implementation," he noted. "We can and will work with states, districts, and educators to help solve it."[7]

A few months after Duncan's statement, President Obama signed into law the Every Student Succeeds Act, which reauthorizes the Elementary and Secondary Education Act, formerly known as No Child Left Behind. One of the hallmarks of the law is that it prohibits the federal government from mandating or prescribing the terms of teacher evaluation. And it stipulates that the giving of federal funds to schools can no longer be conditioned on using student test scores in teacher evaluation. Just as important, the law permits several states to develop and implement assessment systems that allow for performance-based assessments in lieu of traditional standardized tests.

While there are conditions and limits, states now have an opportunity to reshape their assessment and accountability systems, which in turn could lead to more fundamental changes in public education as a whole. We encourage them to consider implementing performance-based assessment. Given that the tide is turning away from testing for accountability purposes, a time-honored approach that has worked for students and teachers in New York deserves a second look.

## How We Can Do Better

For more than two decades, the New York Performance Standards Consortium has offered a viable option to preparing students for college and career. The Consortium's approach relies on performance-based assessments, which include essays, research papers, science experiments, and high-level mathematical problems that have real-world applications. Instead of superficially assessing what students know and can do on a bubble test, performance-based assessments measure a student's knowledge and skills in a deep and meaningful way over time.

Just as important, they promote student and teacher ownership, essential to student engagement. Answering someone else's questions about historical events, literary genres, scientific facts, or mathematical procedures is not nearly as effective as students generating and answering their own questions, making decisions, finding their voice, and handling ambiguity.

The Consortium, a coalition of nearly 40 public high schools, has shown that acquiring academic knowledge and skills requires helping students engage with the power of ideas. The Consortium schools rely on a constructive assessment system that grows out of curriculum, respects teachers as the professionals they are, and initiates collaborative projects with other groups of teachers and schools as opposed to the competitive structures set up by past federal education policies such as No Child Left Behind and Race to the Top.

In Consortium schools, curriculum drives assessment, as it

should. When it's the other way around, the result is that test prep too often dominates instruction. Fortunately, Consortium schools have steered clear of this misguided practice because they view assessment as an extension of the learning process, not as a punitive bludgeon.

**Consortium schools prioritize projects. Right, notes from an Urban Academy student's science experiment analyzing microbes on moldy bread.**

The Consortium's story began in 1992, when then–New York State Education Commissioner Thomas Sobol recognized the accomplishments of 28 small New York City public high schools. He designated these schools Compact for Learning schools and directed the New York State Education Department to draw on their expertise to help other schools that were struggling.[8]

Impressed with the way these schools assessed their students, Sobol granted them a waiver from most of the state's Regents exams (standardized tests in core high school subjects) required for graduation.[9] Drawing on the work of distinguished educators such as Vito Perrone, Ted Sizer, and Deborah Meier,* these schools had created successful learning environments that engaged diverse groups of students and promoted inquiry-based teaching and learning.

By 1998, however, standards-driven assessment began to dominate the educational landscape with new tests and demands for new standards. Sobol had moved on, and the new commissioner, Richard Mills, along with an assertive New York State Board of Regents, adopted a one-size-fits-all approach to curriculum, instruction, and assessment. Only the state's private school association, the New York State Association of Independent Schools, and some of the Compact for Learning schools received a waiver to remain outside this mandate.

Responding to this changing education landscape, the public schools formed the New York Performance Standards Consortium and reached out to the United Federation of Teachers, as well as the parent community and other political allies, to gain support. The move led to a direct confrontation with Mills and his allies in the state Department of Education.

When it looked like the waiver might be withdrawn, more than 1,500 parents, teachers, and students belonging to the Consortium took their case to the board of regents and state legislators. Consortium advocates argued for flexibility in ascertaining students' educational achievement through performance-based assessments and promoted the idea that the Consortium's approach produced better results.[10]

While not suggesting that every school adopt its system, the Consortium asked why the department did not want its schools to continue to flourish. To maintain the waiver, the Consortium focused on making public the results of the department's test-driven approach to assessment alongside the Consortium's model, which was equal to or better than existing educational approaches. Ultimately, student achievement in Consortium schools was favorably measured in terms of student demographics, school climate, and teacher retention, as well as student dropout and graduation rates.

Through a prolonged campaign that involved litigation, lobbying, mass protest, and media persuasion, the Consortium protected the waiver and Mills's efforts to rescind it were unsuccessful.

## A Look at Performance Assessments

Today, the Consortium includes 38 New York public high schools that use performance assessments in lieu of four out of the five Regents exams mandated for the state's high school graduates (students still take the Regents exam in English language arts). The 36 schools that are located in New York City are grouped together under their own superintendent. Two other schools are located in Rochester and Ithaca, and they report to their local superintendents.

The Consortium continues to support a teacher-designed, student-focused, and externally reviewed assessment system that provides a fuller and deeper measure of student achievement than standardized testing.

In building and sustaining its approach, Consortium educators understand what subsequent years of headlines and published standardized test results have failed to acknowledge: a crucial link exists among assessment, curriculum, and teaching. High-stakes, test-driven assessment inhibits collaboration among educators, hinders student engagement, and undermines critical thinking.

The Consortium's approach is based on the idea that because learning is complex, assessment should be too. In other words, if schools are to challenge students to think critically, explain their work, and pose and consider questions that involve complex responses, it follows that students should be required to demonstrate in a systematic way what they know and can do with the knowledge and skills they have learned. Thus, the Consortium's system of assessment centers around tasks in various disciplines that are assessed using rubrics that focus on skills understood to

*Vito Perrone, former vice president of the Carnegie Foundation for the Advancement of Teaching, was a longtime opponent of standardized testing. Ted Sizer was dean of the Harvard Graduate School of Education and the founder of the Coalition of Essential Schools. Deborah Meier, the first teacher to receive the MacArthur "genius" award, is a senior scholar at New York University's Steinhardt School of Culture, Education, and Human Development and is considered the founder of the small-schools movement.

be essential to the discipline. (For an example of a task and rubric, see page 11.)

In a Consortium school, students engage in extensive reading, writing, analysis, and discussion in all classrooms, which is work that builds toward the graduation or performance-based assessment tasks (PBATs) required of every Consortium student:

- An analytic essay on literature,
- A social studies research paper,
- An extended or original science experiment, and
- A higher-level mathematics problem.

Consortium teachers cultivate a learning environment in which student voices play a critical role.

Many schools add supplementary assessments in areas such as foreign language acquisition, creative arts, physical education, and community service.

The rubrics are constructed working backward from an analysis of what knowledge and skills are required for college completion. Students demonstrate their learning through the PBATs, which are evaluated by external assessors. (For more on one external assessor's experience, see page 8.) Such individuals have not taught the particular student whose work they are assessing, and they often come from local colleges or work in fields relevant to the subject discipline. Assessors respond to student work using the rubrics for both their written and their oral presentations.

In addition to providing guidelines for how the written work is to be assessed, the rubrics for each subject area also include an oral requirement: an unscripted conversation among external assessors who, through participation in students' oral presentations, play an essential part of an authentic performance assessment.

To establish the reliability of these rubrics, Consortium teachers gather annually to participate in "moderation studies" where they regrade graduation-level PBAT papers using the subject area rubrics. They also examine the teacher assignments that helped generate the PBAT using a depth-of-knowledge assessment developed by educational research scientist Norman Webb.

PBATs incorporate commonly accepted learning standards, enjoining students to write well, read analytically, punctuate properly, solve geometry problems, and be mathematically literate, but they also require students to do work that challenges and engages their thinking. For instance, such work includes researching and writing substantive essays that analyze different viewpoints; formulating, conducting, and analyzing the findings of their own science experiments; applying mathematical concepts to concrete problems; and interviewing adults who have subject-matter expertise. Consequently, the assignments, discussions, debates, experiments, and research projects that one sees in Consortium schools align with and often exceed college-level expectations and norms.

In Consortium schools, assessment tasks are based on curriculum and instruction; assessments are not imposed on them, which can lead to the teach-to-the-test syndrome that afflicts many public schools. With performance assessments, tasks become possibilities for further exploration only after students—with teacher input—have studied the material, discussed and debated it, and also carefully weighed what might make an interesting choice for a topic or a question. Such engagement strengthens the relationship between a teacher and a student, enabling both to invest in the task and take ownership of it.

Consortium schools also differ from traditional public schools in the diversity of course offerings, which also helps to keep students engaged. For example, in one Consortium school last year, social studies offerings included (but were not limited to) semester-long classes with titles such as Constitutional Law, the Civil War and Reconstruction, Popular Culture in the 1920s and the Present, Political Philosophy, Ethics, Biographies, the History of Black Cinema, Economic Policy and the American Dream, Modern Chinese History, India: Colonialism and Independence, the History and Politics of Disney Films, Puerto Rican History, Slave Revolutions, and Comparative Religion. In each of these courses, a wide variety of sources and teacher- and student-derived questions were explored. As is standard in Consortium schools, students are allowed to choose, with teacher input, which courses and performance assessments most interest them and suit them best.

Homework assignments complement course and assessment choices and build skills required to complete performance-based assessments. The homework requires students to support their opinions and interpretations with evidence and organize their thoughts coherently.

Teachers inform students when the work they have done on a particular assignment is strong enough to merit the research and revision process involved in producing a PBAT. To begin a PBAT, a student engages in a period of intensive work, which culminates in an oral presentation of a paper to a committee of outside examiners who discuss both the paper and related topics with the student.

The final paper is added to the collection of all the student's performance-based assessments. At a minimum, the collection includes the literary essay, the social studies research paper, the original science experiment report, and the mathematics problem application. Additional PBATs as required by individual schools—such as artifacts from the student's creative arts PBAT, evidence of second language learning, and internship reflections—are also included, as well as the rubrics used to assess the work.

## The Impact on Students and Teachers

The results of the Consortium's work have been well documented. Thousands of students' lives have been positively affected, and

hundreds of teachers have chosen to remain in the profession because of the responsibility and respect they have gained as Consortium teachers.

Consortium students include a larger percentage of minority and low-income students than the overall New York City public school population. Although they begin school with lower academic achievement, they graduate from Consortium schools and attend college at higher percentages. For example, the graduation rate of black students from Consortium schools is 74.7 percent, compared with 63.8 percent for all New York City public schools. For Latino students, the graduation rate from Consortium schools is also higher than the rate from all New York City public schools: 71.2 percent compared with 61.4 percent.[11]

Additionally, Consortium schools graduate twice as many special education students as New York City public schools and nearly double the number of English language learners. The four-year Consortium graduation rate for English language learners is 70.9 percent, compared with New York City's rate of 37.3 percent.

And, compared with the larger public school system, Consortium schools boast higher college acceptance and persistence rates for all students and for students of color: 83.8 percent of the Consortium's black graduating seniors and 88.3 percent of Latino graduating seniors are accepted into colleges, compared with national rates of 37 percent and 42 percent, respectively.[12]

Consortium schools boast higher college acceptance and persistence rates for all students and for students of color.

Consortium teachers engage in a variety of tasks that are critical to a performance-based assessment system. They design challenging curricula and tasks, respond to student interests and needs, develop and revise rubrics, and participate in extensive Consortium- and school-based professional development. Collaboration is extensive, from observing each other's classrooms to visiting each other's schools and serving as external evaluators for performance-based assessments, sharing curricula, and evaluating each other's work at the annual moderation studies.

The very nature of these schools enables Consortium teachers to teach differently; they strive to cultivate a learning environment in which student voices play a critical role. Instead of scripting predetermined questions and answers in the manner of some lesson plans, they learn to ask open-ended questions and respond to students' answers, turning them into new ques-

## Learning on Display

**BY ANYA KAMENETZ**

On a cloudy afternoon in January, I am sitting in a coffee shop near Hunter College waiting for a 17-year-old girl named Micaela Beigel, a student at a New York City public school called Urban Academy Laboratory High School. We have never met before, but I am here to pass judgment on one of her most important qualifications for high school graduation.

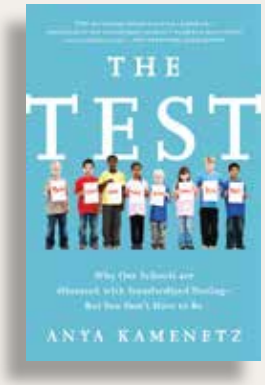
Beigel is tall and round-faced with a tiny, glittering nose stud. She introduces herself forthrightly with none of the diffidence of your stereotypical teen. She is toting a copy of Jane Austen's *Pride and Prejudice*, heavily marked up and leafed with Post-It notes. I've been asked to reread the book too.

For the next 45 minutes, we discuss the novel—as a character study of Lizzy Bennet, as a portrait of female friendship, as a model of marriage, as a reflection on women's changing roles, as the basis for centuries of adaptations and related works. Beigel's ideas are more sophisticated than those of many college graduates I've met. She challenges a simplistic feminist critique that I put forward, referring to another class she's taken on images of women in Disney: "Just saying that *Pride and Prejudice* correlates with the marriage structure doesn't mean that's the only thing it's about. It's like the Little Mermaid: yes, she trades her voice to get a man, but she's also struggling with identity, growing up, self-confidence, determination. You need to look at all the things that come out of the story."

Urban Academy is a member of the New York Performance Standards Consortium, a group of 38 public high schools across New York state that have been thriving for more than two decades with performance assessments. The Consortium's model is now spreading across the country, in part because of the standardized testing backlash.

Instead of cramming for tests, students like Beigel learn in order to *do* things. They complete tasks designed to correspond as closely as possible to the work that artists, scientists, researchers, and other professionals do in the real world. To graduate, Urban Academy students must present a literary essay, a social studies research paper, a science experiment, and an application of higher-level mathematics.

Within reason, students can choose topics that interest them. Besides discussing *Pride and Prejudice* with me, Beigel did her "criticism proficiency" on a Roman Vishniac retrospective at the International Center of Photography, for which she interviewed attendees and led a discussion and Q&A with her classmates on the power of media.




*Anya Kamenetz is the lead education blogger at National Public Radio. This article is excerpted from her book* The Test: Why Our Schools Are Obsessed with Standardized Testing—But You Don't Have to Be, *available from PublicAffairs, a member of the Perseus Books Group. Copyright © 2014. The paperback edition of* The Test *has recently been released (January 2016).*

**Consortium schools encourage field trips to enhance learning. Left, Urban Academy students inspect sculptures in New York City's Battery Park.**

tions, if necessary. They encourage students to explain their answers with support and to expand on them with evidence.

Moreover, in developing assignments and working with students to create performance assessments, Consortium teachers engage in intellectual work that parallels the work they demand of their students. Teachers routinely engage in the scholarly work of locating and presenting additional materials and sources for students' consideration.

The PBATs complete this work. They give teachers a much more comprehensive picture of a student's strengths and weaknesses and overall achievement. The teacher can then understand the student as a reader, a writer, and a thinker in ways that teaching focused on preparing students for high-stakes tests does not allow.

To support their growth as professionals, Consortium teachers spend considerable time collaborating with colleagues, observing each other's teaching, discussing students, developing and critiquing an ever-expanding curriculum, and planning other joint work, such as team-taught courses and schoolwide projects.

The Consortium schools also participate in monthly workshops in which teachers from different schools exchange ideas about materials, methodology, student work, and challenges they face. These workshops currently include curriculum and teaching seminars in the four major disciplines (literature, social studies, science, and mathematics); a new school-mentoring project; a union representatives' political education committee; a lesbian, gay, bisexual, transgender, and queer curriculum group; a special education group; and a college advisory counselors' group. Through this work, the Consortium is creating a network where teachers can learn from each other to enhance their knowledge and skills.

She wrote an argumentative paper on culpability in the My Lai massacre and a critique comparing the book and film versions of *A Clockwork Orange*, and she is putting together a book of photographs she took at her upstate summer camp. For her science requirement, she took a class at Hunter College and conducted a psychological study of people's attitudes toward book and movie genres, applying basic statistical concepts such as correlation.

Beigel struggled in her previous, high-pressure school. After transferring, she flourished at Urban Academy, which allowed her to lean into her passions. "This is an alternative system where I get to explore new things and create," Beigel told me. "I rediscovered why I like learning—I used to feel bad about reading for fun." And, not for nothing, "I got into a good college." She'll start in the fall at Goucher.

Performance schools are wide open to the world. Students get feedback from all directions. They present their work to fellow students, teachers from other schools who haven't taught the students, academic experts, and other professionals. That's how I got here. After interviewing Ann Cook, the executive director of the Consortium, I asked whether there was any way to observe the performance assessment process up close, and she said I was perfectly qualified to be an English evaluator.

Since 1865, the New York State Board of Regents has offered a set of subject-area examinations. In 2000, the state rewrote the exams and standards and required all students to pass at least five Regents exams, making the Regents diploma, once a kind of honors diploma, mandatory for all students. "Once Regents exams became high stakes, test prep became the curriculum," said Cook. She saw public schools that catered to diverse needs and interests, like vocational and technical education or the arts, disappearing, victims of the single standard of success. She was part of a group of high school leaders across the state interested in other ways of assessing student work. "When the Regents started on the standards kick, we got really serious and organized the Consortium formally," receiving waivers from the state to use performance-based assessments in lieu of exams. The Consortium's website is emblazoned with the tag line, "The alternative to high-stakes testing."

"I'm a terrible test taker," said Beigel of the Regents. "A week of three-hour exams? It's the worst situation ever."

Performance learning allows students an unusual level of personalization and autonomy. This model at first seems shockingly subjective, especially if you've been spending your days looking at percentiles and proficiency scores. I know that leading up to our chat, Beigel read the novel several times over three semesters, watched many adaptations, and worked intensively with an academic mentor trained and experienced in giving her feedback. But as an outside evaluator, I sign off on a rubric and dash off my impressions of Beigel's performance to her teacher, Sheila Kosoff, more or less as set forth here, and that's that.

On reflection, I realize, as Walter Lippmann reminded his readers in 1926, that multiple-choice tests offer no more than the illusion of precision. By contrast, performance tasks put human judgment back into the equation. The process reflects the real world, where rubrics don't hold much sway either. At crucial points in life—job interviews, work presentations, cocktail parties—everyone is going to have to convince a stranger that they know their stuff. And Beigel clearly did.

## Creating Equal Educational Opportunity

As the Consortium schools have shown, performance assessment is a clear and superior alternative to standardized testing because it enables teachers to make effective, productive judgments about what their students know and can do.

But performance assessment is not just a better method of assessing what students have learned; it also has a powerful impact on school culture, student engagement, and curriculum and instruction. What makes an authentic performance assessment system distinct from one that is commercially mass-produced is the professionalism of its teachers and the opportunity for student voices to be heard and respected.

**At Urban Academy, student engagement extends beyond textbooks. Above, students collect data for a horticulture class.**

Just as important, performance-based assessment exposes low-income students to challenging curricula. Although wealthier suburban districts may already provide their students with college-prep work, it is rare to see that level of intensity in urban schools located in high-poverty neighborhoods. The Consortium has changed that for our schools—including those in central Brooklyn and the South Bronx—and that achievement has been recognized by civil rights groups that have lauded the Consortium's commitment to equality of educational opportunity.[13]

In addition to support from civil rights groups, the Consortium has also received recognition from the American Federation of Teachers. In 2013, the Consortium won the AFT's Prize for Solution-Driven Unionism, a $25,000 award honoring local unions' innovative approaches to complex problems.

Recognition of the Consortium's work has also come from longtime Consortium supporter Pedro Noguera, a professor of education at the University of California, Los Angeles. In a talk given recently to a group of educators, Noguera explained the assumptions about students and learning that guide performance assessment:

> If our aim was to prepare our young people to become responsible adults then we would actually approach the work very differently in many cases. First of all we would focus on helping young people to make good decisions. To think and reason, to problem solve, to think critically.
>
> We have to recognize that as adults our students won't just follow directions, they will have to make decisions on their own. It's something that many parents have trouble with, because they often are afraid of what happens as their children get older, and they begin to lose the ability to control who their children's friends are and how they spend their time. … And I would say that schools also play a major role in this.[14]

Noguera's point is one that the emphasis on testing in the name of high standards tends to miss. Many highly publicized charter schools that tout their test scores are also places where student voice and self-expression are sacrificed in the name of restrictive rules and regulations. These schools' guiding assumption seems to be that because their students come from lives of relative chaos (upon which order must be imposed), certain rights, responsibilities, and freedoms, as well as opportunities for intellectual inquiry and exposure to a challenging, nuanced curriculum, are inappropriate.

In the same talk, Noguera keenly observed that an overemphasis on testing dovetails with how students, especially low-income students, are expected to think and behave:

> Unfortunately what is often driving these high-performing schools is the idea that the kids need to be broken. That the kids' culture needs to be taken away from them and replaced with something else, because they come in with deficits. They come in as damaged goods. And these schools believe that their job is to mold the kids into something else.[15]

As one Consortium student put it, such an approach attempts to "take the community out of the kid."

Consortium schools, of course, would agree.

The United States today faces growing inequality, which threatens our students' futures and our own. The human rights challenge of our time must not involve preparing them to compete for diminishing shares of a fading American dream. Schools instead must help them reclaim it.

We should seek to enhance democracy by producing educated, thoughtful citizens ready and willing to tackle the daunting problems we face. We firmly believe the ability to analyze information and apply concepts to the real world is inextricably tied to the pursuit of equality and justice. Performance assessment engages this relationship in ways that a standardized test cannot. It directly connects the development of students' academic, intellectual, and social skills while bringing students and teachers together in a joint process of learning—the very purpose of school. ☐

*(Endnotes on page 43)*

# Sample Performance Task and Rubric

All Consortium schools require students to complete academic tasks to demonstrate college and career readiness and to qualify for graduation. In some classes, the tasks are crafted by the teacher, and in other instances, by the student. All graduation-level tasks, like the literature one shown below, are evaluated using the Consortium rubrics.

### Literature Task

The student will write a well-developed literary analysis, using a text of appropriate complexity and showing connections between the text and other substantial issues, such as a larger issue or theme, another work of literature, the historical or biographical context, a filmed version of the text, or noted works of relevant criticism.

The paper is organized around a compelling argument and thesis, uses relevant evidence and quotations that support the argument, and provides meaningful interpretation of texts. In addition to demonstrating accepted conventions for writing, the paper also has evidence of a student's voice and style.

Each student also presents orally, either defending the paper or by demonstrating ability to adapt skills to a new text, which the student has read independently.

External evaluators assess both written and oral work using the Consortium rubric for a literary analysis shown below.

| Performance Indicators | Outstanding | Good | Competent | Needs Revision |
|---|---|---|---|---|
| Thesis and organization | • Efficiently organizes paper around a clear, compelling argument<br>• Develops argument thoughtfully and persuasively<br>• Uses relevant, convincing evidence and quotations that thoroughly support argument | • Has a clear argument<br>• Effectively organized and developed coherently around central argument<br>• Uses relevant evidence and quotations that support central argument | • Has a central idea<br>• Mostly organized around a central idea, but may lose focus at times<br>• Uses relevant evidence and quotations to support central idea | • Lacks a central idea<br>• Unfocused organization<br>• Little, irrelevant, or no evidence used |
| Analysis | • Provides deep insight and creates meaningful interpretation of texts<br>• Elaborates on central argument and meaning of supporting evidence; answers question, "So what?"<br>• Considers author's language, craft, and/or choice of genre<br>• Analysis drives discussion of literary elements when relevant | • Creates meaningful interpretation of texts<br>• Explores central argument and meaning of supporting evidence; answers question, "So what?"<br>• Analysis drives discussion of literary elements when relevant | • Provides basic interpretation of texts<br>• Develops central idea and explains choice of evidence and quotations | • Summarizes or uses faulty analysis<br>• Little or no interpretation of texts<br>• Little or no use of evidence or quotations |
| Style and voice | • Evidence of ambition, passion for subject, or deep curiosity<br>• Writer willing to take risks<br>• Displays intellectual engagement<br>• Creative, clear, and appropriate use of language and word choice | • Evidence of a mind at work<br>• Evidence of interest in topic<br>• Clear and appropriate use of language and word choice | • Communicates ideas clearly<br>• Shows some awareness of appropriate language and word choice | • Relies on conversational language<br>• Little or no evidence of formal or appropriate use of language and word choice |
| Connections | Makes insightful connection between text and something outside the text:<br>• Another work of literature, or<br>• Historical context, or<br>• Biographical context, or<br>• Larger issue or theme of importance (must be supported with relevant evidence), or<br>• Film version of text, or<br>• Substantial criticism | Makes appropriate connection between text and something outside the text:<br>• Another work of literature, or<br>• Historical context, or<br>• Biographical context, or<br>• Larger issue or theme of importance (must be supported with relevant evidence), or<br>• Film version of text, or<br>• Substantial criticism | Establishes a connection between text and something outside the text:<br>• Another work of literature, or<br>• Historical context, or<br>• Biographical context, or<br>• Larger issue or theme of importance (must be supported with relevant evidence), or<br>• Film version of text, or<br>• Substantial criticism | Inappropriate or no connection made between the text and something outside the text |
| Conventions (for writing assignment only) | Mechanical and grammatical errors are rare or non-existent; follows accepted conventions of quotations and citations; uses transitions effectively | Few mechanical or grammatical errors; follows accepted conventions of quotations and citations; makes some use of transitions | Some mechanical or grammatical errors but communication is not impaired; demonstrates knowledge of accepted conventions of quotations | Communication is impaired by errors; little or no use of conventions or quotations and citations; shows little awareness of appropriate use of transitions |
| Presentation (for oral component only) | Communicates ideas clearly in appropriate, sophisticated, and original way to audience; able to respond to questions and expand on ideas; presents complex, accurate, substantive ideas and information clearly | Communicates clearly in appropriate and original way to audience; able to respond to questions and expand somewhat on ideas; presents accurate, substantive ideas and information clearly | Communicates clearly in appropriate way to audience; able to respond accurately to questions; presents some substantive ideas and information accurately | Neither clear nor appropriate presentation to audience; cannot respond well to questions; does not present accurate or substantive ideas or information |

SOURCE: NEW YORK PERFORMANCE STANDARDS CONSORTIUM, *EDUCATING FOR THE 21ST CENTURY: DATA REPORT ON THE NEW YORK PERFORMANCE STANDARDS CONSORTIUM*, 9–12.

# Technology in Education

## What Teachers Should Know

ILLUSTRATIONS BY VIKTOR KOEN

By Pedro De Bruyckere, Paul A. Kirschner, and Casper D. Hulshof

One of the most frequently cited reasons for justifying the need for change in education, or at least for labeling education as old-fashioned, is the enormous technological (r)evolution our world has undergone in recent years. Nowadays, we have the Internet in our pocket, in the form of a smartphone, which has exponentially more computing power than the Apollo Guidance Computer that put the first men on the moon! A school with desks, blackboards or whiteboards, and—perish the thought—books seems like some kind of archaic institution, one that, even if it does use a smartboard or a learning platform, operates in a manner that bears a suspiciously strong resemblance to the way things were done in the past.

In education, we often have the feeling that we are finding it harder and harder to reach our students. That is why we are so feverishly interested in smartboards or learning platforms or anything new on the market that might help. Every new tool seems like a possible solution, although sometimes we really don't know what the problem is or even if there is one.

Regrettably, we have become saddled with a multiplicity of tools, methods, approaches, theories, and pseudotheories, many of which have been shown by science to be wrong or, at best, only partially effective. In this article, which is drawn from our book *Urban Myths about Learning and Education*, we discuss these miracle tools and the idea that young people today are somehow "digital natives," and we examine the fear that technology is making our society and our students less intelligent. To illustrate that

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many claims about technology in education are in fact spurious, we will focus in this article on five specific myths and present the research findings that dispel them.

## Myth 1: New technology is causing a revolution in education.

School television, computers, smartboards, and tablets such as the iPad—it was thought that all these new tools would, or will, change education beyond recognition. But if you look at the research of someone like Larry Cuban, it seems that classroom practice has remained remarkably stable during recent years.[1] Even Microsoft cofounder Bill Gates—whom you would hardly suspect of being against technology in education—summarized his view on the matter as follows: "Just giving people devices has a really horrible track record."

The correct use of tools and resources nevertheless does have the potential to change education. Very often these change phenomena are general rather than specific. For example, the influence of the printed word is gigantic, but this influence—like so many other tools and resources—is anchored in society as a whole. You need to come down to the level of something like the book or the blackboard if you want to consider a resource that has specifically changed education.

In 1983, Richard Clark published a definitive study on how it was pedagogy (i.e., teaching practice) and not the medium (i.e., technological tools and resources, such as whiteboards, hand-held devices, blogs, chat boards) that made a difference in learning, stating that instructional media are "mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition."[2]

In 1994, Clark went as far as to make a daring prediction: namely, that a single medium would never influence education. He based this position on his opinion that, at that time, there was no proof to show that a medium was capable of ensuring that pupils and students could learn more or more effectively. He saw the medium as a means, a vehicle for instruction, but that the essence of learning remained—thankfully—in the hands of the teacher.[3]

We are now 20 years further down the line, and the question needs to be asked: Does Clark's position still hold true? During those 20 years, we have seen the explosion of almost unimaginable technological possibilities. Even so, Clark and Richard Mayer continue to assert that nothing has fundamentally changed.[4] They argue that 60 years of comparative studies about teaching methods and teaching resources all confirm that it is not the medium that decides how effectively learners learn.

Clark and David Feldon confirm that the effectiveness of learning is determined primarily by the way the medium is used and by the quality of the instruction accompanying that use.[5] When media (or multimedia) are used for instruction, the choice of medium does not influence learning. John Hattie described, for example, how instructional methods that are more effective within conventional environments, such as learner control and explanative feedback, are also more effective within computer-based environments.[6]

This can be called the "method-not-media" hypothesis, as tested in a study where students received an online multimedia lesson on how a solar cell works that consisted of 11 narrated slides with a script of 800 words.[7] Focusing on the instructional media being used, students received the lesson on an iMac in a lab or on an iPad in a courtyard. But they also used different instructional methods.

Students received either a continuous lesson with no headings (this was the standard method) or a segmented lesson in which the learner clicked on a button to go to the next slide, with each slide having a heading corresponding to the key idea in the script for the slide (this was the enhanced method). By combining changes in both medium and method, we can see what matters most. Across both media, the enhanced group outperformed the standard group on a transfer test where students had to use the information in settings other than those in the text, yielding a method effect on learning outcomes for both desktop and mobile medium.

> We often have the feeling we are finding it harder to reach our students. That is why we are so feverishly interested in anything new on the market that might help.

Across both methods, looking at the medium, the mobile group produced stronger ratings than the desktop group on self-reported willingness to continue learning, yielding a media effect on motivational ratings for both standard and enhanced methods. Effective instructional methods can improve learning outcomes across different media, whereas using hand-held instructional media may increase students' willingness to continue to engage in learning.

If we look at the influence of technology on the effectiveness of instruction, the picture is not fully clear. This can partly be explained by the fact that relatively little research has been carried out that involves the comparison of two similar groups, one group learning with and the other group learning without the benefits of a new technology.

The different metastudies on this subject, analyzed by Hattie, reveal a considerable variation in results.[8] A review study on the implementation of technology, more specifically Web 2.0 tools such as wikis, blogs, and virtual worlds, in K–12 and higher education, suggests that actual evidence regarding the impact of those technologies on student learning is fairly weak.[9] There are still a number of studies that point to a positive gain in learning terms,[10] but the majority equate the positive learning effect resulting from the good use of technology with good teaching. The crucial factor for learning improvement is to make sure that you do not replace the teacher as the instrument of instruction, allowing computers to do what teachers would normally do, but instead use computers to supplement and amplify what the teacher does.

A 2009 metastudy about e-learning did, however, tentatively conclude that the use of both e-learning and contact education—which is known as blended learning—produces better results than lessons given without technology.[11] This is also the case when you use computer game–based learning; the role of instruction still needs to have a real significant learning effect, reflecting the conclusion of one meta-analysis.[12] Such instructional support may appear in several forms, such as providing feedback, scaffolding, and giving advice.

Still, there remain some questionable claims that technology can change, by itself, the present system of education. Clark and Feldon summarize the various claims and responses:[13]

- The claim: *Multimedia instruction accommodates different learning styles and so maximizes learning for more students.* Clark and Feldon describe how learning styles have not proven to be "robust foundations on which to customize instruction." And, as we explained in our book, the idea of learning styles* in themselves is already a very stubborn and harmful urban myth in education.
- The claim: *Multimedia instruction facilitates student-managed constructivist and discovery approaches that are beneficial to learning.* In fact, Clark and Feldon found that "Discovery-based multimedia programs seem to benefit experts or students with higher levels of prior knowledge about the topic being learned. Students with novice to intermediate levels of prior knowledge learn best from fully guided instruction."† This is another example of how the medium does not influence the learning. Prior knowledge is an individual difference that leads to learning benefits from more guidance at low to moderate levels but not at higher levels, regardless of the media used to deliver instruction.
- The claim: *Multimedia instruction provides students with autonomy and control over the sequencing of instruction.* Although technology can deliver this, the more important question is whether this is a good thing. Letting students decide the pace of learning (e.g., by allowing them to pause or slow down videos or presentations) is beneficial to learning. But only a small group of students has the benefit of being given the chance to select the order of lessons, learning tasks, and learning support. For the majority of students, this has a mostly negative influence on learning.[14]

The point that teachers should remember is this: the medium seldom influences teaching, learning, and education, nor is it likely that one single medium will ever be the best one for all situations.

## Myth 2: The Internet belongs in the classroom because it is part of the personal world experienced by children.

How often have you heard this? It sounds so logical, doesn't it? At the same time, many teachers have discovered, at their expense, that using information and communications technology in their lesson "randomly," in an unstructured way, does not always have lasting success. The problem is that most research studies have been evaluations of relatively short-term projects. Some research, for instance, focuses on the extent to which participants liked the medium being used during the actual test, which for a student actually lasted for about 12 minutes.[15]

Also note that in this research, being motivated because of the medium did not help learning as much as the chosen pedagogical approach. But when we discuss implementing technology and the Internet in the classroom, people argue not for using it once or only for a short period, but for long-term implementation. Therefore, it is the impact over a longer period that really needs to be determined.

A study by the Canadian Higher Education Strategy Associates described how students had a preference for "ordinary, real life" lessons rather than e-learning or the use of some other technology.[16] It was a result that surprised the researchers. "It is not the portrait we expected, whereby students would embrace anything that happens on a more highly technological level. On the contrary—they really seem to like access to human interaction, a smart person at the front of the classroom."

Many claims about technology in education are in fact spurious.

The findings also revealed that the more technology was used to teach a particular course, the fewer the students who felt they were able to get something out of that course. While the 1,380 students from 60 Canadian universities questioned for this survey were generally satisfied with the courses they took, the level of satisfaction fell significantly when more digital forums, online interactions, or other technological elements were involved. Yet, at the same time, more than half the respondents said that they would skip a lesson if there was more information or a comparable video lesson online.

Although these results at first glance seem to be fairly negative for e-learning, the responses to some additional questions were more positive. The majority of students (59.6 percent) said that they would like more electronic content in their courses. When asked what they would specifically like to see online, 53.6 percent answered that they would like more online course notes, with 46.4 percent advocating more recordings of lessons on the web.

These findings are broadly in keeping with the results of a 2011 literature study that investigated the expectations of young people with regard to new forms of education and information and communications technology.[17]

*For more about the research behind learning styles, see "Do Visual, Auditory, and Kinesthetic Learners Need Visual, Auditory, and Kinesthetic Instruction?" in the Summer 2005 issue of *American Educator*, available at www.aft.org/ae/summer2005/willingham.
†For more about fully guided instruction, see "Putting Students on the Path to Learning" and "Principles of Instruction" in the Spring 2012 issue of *American Educator*, available at www.aft.org/ae/spring2012.

The study reached the following conclusions: First, the technological gap between the students and their teachers is not enormous, and certainly not so large that it cannot be bridged. In fact, the relationship is determined by the requirements teachers place on their students to make use of new technologies. There is little evidence that students expect the use of these new technologies. Second, in all the studies consulted, the students persistently report that they prefer moderate use of information and communications technology in their courses. ("Moderate" is, of course, an imprecise term that is difficult to quantify.) Third, students do not naturally make extensive use of many of the newest technologies, such as blogs, wikis, and virtual worlds. Students who need or are required to use these technologies in their courses are unlikely to object to them, but there is not a natural demand among students for any such use.

Maybe this will change as technology becomes more and more ingrained. However, a study of students in Glasgow, Scotland, found little change; these students appeared to conform to fairly traditional pedagogies, albeit with minor uses of technology tools that deliver content. Research comparing traditional books with e-readers shows that students prefer paper.[18]

The sad thing is that even if students did prefer to use technology in school, this would not mean that they would learn more. In 2005, Clark and Feldon wrote, "The best conclusion at this point is that, overall, multimedia courses may be more attractive to students and so they tend to choose them when offered options, but student interest does not result in more learning and overall it appears to actually result in significantly less learning than would have occurred in 'instructor led' courses."[19] A decade later, based on 10 years of additional research, Clark and Feldon stand by this conclusion.[20]

In her book, danah boyd describes the main reasons young people use technology. These reasons are mainly social, such as sharing information with each other, and meeting each other online and in real life. They do discuss schoolwork with each other, but this is very different from using Facebook as a learning tool or their phone as a learning machine.[21]

## Myth 3: Today's "digital natives" are a new generation who want a new style of education.

Digital natives! Whenever the question of digital innovation in education is discussed, this is a term that immediately comes to the surface. But it should be avoided. Even the person who coined the term digital natives, Marc Prensky, admitted in his most recent book, *Brain Gain*, that the term is now obsolete.[22]

The concept is usually used to describe young people who were born in the digital world and for whom all forms of information and communications technology are natural. The adults who were born earlier are therefore "digital immigrants," who try with difficulty to keep up with the natives. Prensky first coined both terms in 2001.[23]

With this concept, he referred to a group of young people who have been immersed in technology all their lives, giving them distinct and unique characteristics that set them apart from previous generations, and who have sophisticated technical skills and learning preferences for which traditional education is unprepared. However, Prensky's coining of this term—and its counterpart for people who are not digitally native—was not based on research into this generation, but rather created by rationalizing phenomena that he had observed.[24]

As the digital native concept became popular, extra claims were added to the initial concept. Erika Smith, of the University of Alberta, describes eight unsubstantiated claims in the different present discourses on digital natives:[25]

- They possess new ways of knowing and being.
- They are driving a digital revolution and thereby transforming society.
- They are innately or inherently tech savvy.
- They are multitaskers,[†] team oriented, and collaborative.
- They are native speakers of the language of technologies and have unique viewpoints and abilities.
- They embrace gaming, interaction, and simulation.
- They demand immediate gratification.
- They reflect and respond to the knowledge economy.

Smith is not alone in concluding that there is little to no proof for these claims. A meta-analysis conducted in 2008 had already shown that there was little hard evidence to support the use of the term digital natives.[26]

But maybe the concept of digital natives was more a kind of prediction, and we just had to wait. Perhaps today's young people are true digital natives. If we look at the research performed in high-tech Hong Kong by David M. Kennedy and Bob Fox, the answer is more nuanced.[27] Kennedy and Fox investigated how first-year undergraduate students used and understood various digital technologies. They discovered, like danah boyd did with the American teenagers, that the first-year undergraduate students at Hong Kong University do use a wide range of digital technologies.

The students use a large quantity and variety of technologies for communicating, learning, staying connected with their friends, and engaging with the world around them. But they are using them primarily for "personal empowerment and entertainment." More

[†]For more about multitasking, see "Have Technology and Multitasking Rewired How Students Learn?" in the Summer 2010 issue of *American Educator*, available at www.aft.org/ae/summer2010/willingham.

importantly, Kennedy and Fox describe that the students are "not always digitally literate in using technology to support their learning. This is particularly evident when it comes to student use of technology as consumers of content rather than creators of content specifically for academic purposes."

Other researchers have reported that university students use only a limited range of technologies for learning and socialization. For example, one study found that "the tools these students used were largely established technologies, in particular mobile phones, media player, Google, [and] Wikipedia. The use of handheld computers as well as gaming, social networking sites, blogs, and other emergent social technologies was very low."[28] This finding has been supported by a number of other researchers who came to similar conclusions,[29] namely that university students do not really have a deep knowledge of technology, and what knowledge they do have is often limited to basic Microsoft Office skills (Word, Excel, PowerPoint), emailing, text messaging, Facebook, and surfing the Internet.

Computers should be used to supplement and amplify what the teacher does.

When looking at the same topic in another continent, Europe, the large-scale EU Kids Online report of 2011 placed the term digital natives in first place on its list of the 10 biggest myths about young people and technology. Just 36 percent of Europe's 9- to 16-year-olds said that they knew more about the Internet than their parents.[30]

Studies in other countries, including Australia, Austria, Canada, Switzerland, and the United States, all come to the same conclusion: there is no such thing as a generation of digital natives.[31]

## Myth 4: The Internet makes us dumber.

In recent years, a number of authors—often neurologists—such as Baroness Susan Greenfield and Manfred Spitzer, in his 2012 book *Digitale Demenz* ("Digital Dementia"), have appeared from a new group of technological critics who seem to agree that we are all becoming more stupid because of the technology we are using.[32] Though what they posit in their books—very strong, sometimes not completely well-founded positions[33]—need to be taken with a grain of salt, they refer to the plasticity of the brain in arguing that the Internet is rewiring our brains in a harmful way.

It is certainly true that what's known as the Flynn effect (the observed rise in IQ scores over time) has come to a halt in some countries, but the reasons for this halt are neither uniform nor clear. James Flynn, who named this effect, shared his doubts in his 2012 book *Are We Getting Smarter?*[34] about whether the effect actually measures that we really have become smarter. There are other plausible reasons for the rise in the test scores, such as education more closely mimicking IQ tests. Research even suggests that the better scores on IQ tests result from increased luckier guessing on harder test items.[35]

As a result, it is not easy to say whether the Internet might be partly responsible for the halt in the phenomenon, as we do not know for certain what actually caused the Flynn effect.[36] Some authors even see the use of new media as an important contributory factor in the rise of average IQ that has been evident in recent years.[37]

Nowadays, we are relying more and more on technology. As an illustration of this fact, Betsy Sparrow, a professor at Columbia University in New York, has described the "Google effect."[38] Together with her team, she discovered that students remember information more easily if they think that this information is not likely to be available on the Internet. Her study also revealed that students are better at remembering where to find something on the Internet than they are at remembering the information itself. In this respect, the popular Google search engine is increasingly acting as a kind of "external memory."

But is this really evidence to show that the Internet is making us dumber? To be honest, we don't know. At the moment, there is no conclusive, empirical proof that decides the issue one way or the other. Although Nicolas Carr has provided many indications in his book *The Shallows*, his arguments are personal and anecdotal, rather than scientific.[39] Perhaps Steven Pinker is right when he says that we are now making better use of our brains by using Google for "unnecessary information,"[40] just as we now use satellite navigation or another global positioning device instead of a map. And in the final analysis, we certainly know more now than we did in the past. So why should we be more stupid?

In an opinion piece from 2010, in reaction to the publication of Carr's book, two leading neurologists explain why the digital alarmists are wrong:[41]

> The basic plan of the brain's "wiring" is determined by genetic programs and biochemical interactions that do most of their work long before a child discovers Facebook and Twitter. There is simply no experimental evidence to show that living with new technologies fundamentally changes brain organization in a way that affects one's ability to focus. Of course, the brain changes any time we form a memory or learn a new skill, but new skills build on our existing capacities without fundamentally changing them. We will no more lose our ability to pay attention than we will lose our ability to listen, see or speak.

Still, there are reasons to consider being careful with the total amount of screen time that children may have in a normal day. The American Academy of Pediatrics (AAP) warns that studies have shown excessive media use can lead to attention problems, school difficulties, sleep and eating disorders, and obesity.[42] This view has been confirmed by a study by researchers from Iowa State University.[43] Therefore, the AAP recommends no more than one to two hours of screen time a day for children two years and older. John Hattie also describes a clear negative impact of excessive television consumption on learning. Finally, a recent review

article in *The Neuroscientist* paints a disturbing picture of what is happening to this group:[44]

> Growing up with Internet technologies, "Digital Natives" gravitate toward "shallow" information processing behaviors characterized by rapid attention shifting and reduced deliberations. They engage in increased multitasking behaviors that are linked to increased distractibility and poor executive control abilities. Digital natives also exhibit higher prevalence of Internet-related addictive behaviors that reflect altered reward-processing and self-control mechanisms. Recent neuroimaging investigations have suggested associations between these Internet-related cognitive impacts and structural changes in the brain.

Note that many of these studies examined the influence of television rather than the influence of interactive technology, such as smartphones and social media. Also note that most of these studies found a correlation rather than a causal relation; that is, there may be other reasons why children who watch a lot of television have poorer school results.

### Myth 5: Young people don't read anymore.

Of course young people read. They read a lot. As Amelia Hall Sorrell and Peggy F. Hopper explain, teenagers constantly read what is available to them through the different forms of technology that continue to evolve.[45] But when people think that young people today read less, it's not about reading online content or text messages, it's about reading books.*

*For more about how to engage young people in reading for pleasure, see "For the Love of Reading" in the Spring 2015 issue of *American Educator*, available at www.aft.org/ae/spring2015/willingham.

In 2010, *Reader's Digest* in the United Kingdom conducted a survey on the reading habits of some 2,000 adults and 700 children.[46] The results revealed that one in five children hardly ever reads a book, one in three never reads a book, and one in 20 has never read a book. These figures support a perception that many people seem to have; namely, that young people and children don't read anymore, and certainly not for pleasure. But is a survey in a popular monthly magazine a reliable source for such a sweeping claim?

Perhaps more scientifically gathered data could tell us more. A 2007 report, *To Read or Not to Read*, describes a significant decline in reading by youngsters in the United States in the previous 20 years.[47] The study compared data from 1982 and 2002,

## Learning and Technology: A Few Tips

Educators can use technology in the classroom in many different ways. These can range from using smartboards to show simple PowerPoint slides or videos during a lesson and providing online support material such as teaching aids, to the spectacular massive open online courses (known as MOOCs) that universities are currently using to allow tens of thousands of students worldwide to follow the same studies through video lessons, self-testing, and discussion forums. Much research has been carried out (and is still being carried out) to investigate the best way to make use of technology for learning purposes both inside and outside the classroom.

Here, we offer a number of concrete, scientifically based pieces of advice—call them rules of thumb—specifically geared for teaching through technology, which we hope educators at all levels will find immediately useful. Remember, these are broad pieces of advice that can never suit all learners, teaching contexts, and learning contexts!

1. Graphic images with text work better than text alone; however, this depends on the topic being presented and expertise level of the learner. Minimize the on-screen text you use and supplement it with clear images that clarify and enhance the most important content.
2. Stick to the most relevant material. Students are distracted by details like irrelevant subtitles and nonessential illustrations, as well as animations with narration (especially when the narration is identical to the text in the animation), and interesting but essentially irrelevant information.
3. If you are using images in online lesson material or apps, it is better if the accompanying text is spoken rather than written. This allows the learner to concentrate better on the visual information (minimizing a split-attention effect) contained in the image or graphic, without being distracted by too much written text.
4. Work with relatively small amounts of learning material, not large chunks. Divide the content to be learned into short segments. Four segments of five minutes each will work much more effectively than one long video of 20 minutes.
5. If you want to give learners control, allow them control over stopping, going back, and repeating dynamic images (video, animations, etc.) and not the content order of the lesson(s).
6. Build in plenty of opportunities for students to practice what they are learning through your technology-based lessons—at least as many as in traditional lessons.

–P.D.B., P.A.K., and C.D.H.

and found that less than one-third of the 13-year-olds were daily readers. The percentage of 17-year-olds who read nothing at all for pleasure doubled over the same 20-year period. Yet the amount they read for school or homework stayed the same. However, these data are already quite old and stem from the beginnings of the digital era.

The Programme for International Student Assessment (PISA) study carried out by the Organisation for Economic Co-operation and Development (OECD) looks not only at learning results but also at the learning behavior of the respondents. In 2011, PISA published a report analyzing the pleasure reading of young people.[48] This study found that, on average, two out of three students read every day for pleasure. It also noted that the percentage of students who reported that they read for enjoyment daily dropped in the majority of OECD countries between 2000 and 2009, but in some countries that proportion increased. In the United States, the average remained the same. Boys and girls from families with a higher socioeconomic status read more than young people from families with a lower socioeconomic status; moreover, the gap between the two has increased between 2000 and 2009.

The educational sciences must be driven by theories and theory development, and not by simple observations and conclusions.

In 2012, Stage of Life polled teenagers about their reading habits and found that 77.7 percent of them read at least one extra book per month for personal pleasure beyond what is required for school. Nearly a quarter (24.5 percent) read five or more books per month outside of school. These figures are much higher than the PISA figures, but this probably is due to the way the teenagers were selected.[49]

In the United States, the Pew Research Center examined the reading habits of the American audience in 2012, youth included.[50] Book readers under the age of 30 consumed an average of 13 books in the previous 12 months and a median of six books; in other words, half of book readers in that age cohort had read fewer than six, and half had read more than six.

Still, even in these digital times, libraries remain important to many American youngsters.* Pew found that in the 12 months before the survey in 2013, 53 percent of Americans aged 16 and older had visited a library or bookmobile, 25 percent had visited a library website, and 13 percent had used a handheld device such as a smartphone or tablet computer to access a library website.

To sum all this up, young people are still doing a lot of reading, and these statistics make clear that many of them are reading for pleasure. However, we need to be careful about making too many sweeping assertions, since the reading figures in many countries are falling. Even so, we know that reading continues to be important: both reading by young people themselves and parents reading to their children.

Though there is good empirical proof out there refuting these myths, they persist. Why? Anthropologists tell us that myths function in culture and society to express, enhance, and codify belief, while language historians[51] attribute their persistence to increased, almost unlimited, information availability. Our society serves up so much instant and pervasive information, which we fail to examine discerningly, that we end up circulating and strengthening myths through repetition and enhancement.

This vicious cycle is compounded by what journalist Farhad Manjoo discusses in *True Enough: Learning to Live in a Post-Fact Society*.[52] Self-styled experts (educational charlatans) publish anything they want and come at us from all directions, in every medium, without any "check" on their expertise. The "real danger of living in the age of Photoshop isn't the proliferation of fake photos," Manjoo writes. "Rather, it's that true photos will be ignored as phonies."

In education, how do we combat this? In our view, there is only one answer: the educational sciences must be driven by theories and theory development, and not by simple observations and conclusions. Strong empirical data must come from experiments set up according to good research methodologies (i.e., randomized control trials, real control conditions, samples large and representative enough to justify implementation decisions, etc.) rather than legends and hype. Only after these evidence-informed methods are slowly but surely tested in real-life settings can we think about large-scale implementation.

Finally, teachers, administrators, and politicians must learn to become knowledgeable and aware consumers. To that end, we suggest keeping in mind the following: if something sounds too good to be true, it probably isn't true. ☐

*(Endnotes on page 43)*



*For more about the importance of school librarians to learning, see "Beyond the Stacks" in the Winter 2014–2015 issue of *American Educator*, available at www.aft.org/ae/winter2014-2015/freeman.

# Building Strong Children

## Why We Need Nurses in Schools

By Erin D. Maughan

The number of students with chronic and complex health conditions significantly affects a teacher's ability to teach and meet the needs of the whole child—especially combined with the impact of societal issues such as poverty, violence, and the growing population of families who speak a language other than English at home. Education in America is free, but healthcare is not. This fact presents a unique divide among schools and even within classrooms, where some students have parents who have good healthcare coverage and seek medical attention regularly, while others come from families who are limited to emergency room visits for chronic illnesses or only see a healthcare professional in life-threatening situations.

School nurses can help bridge this divide. Often, they are the only healthcare professional that students see regularly. So when a class includes Paul (who has missed multiple days of school, seems distracted when he does attend, and often has a deep, penetrating cough), Keisha (who stays in her seat during class but always seems drowsy), Aidan (whose disruptive behavior makes instruction difficult), and Anni (who is struggling to learn English), the school nurse should be one of the first resources their teacher turns to.

Unfortunately, not every school has a nurse. Only about 50 percent of schools have a full-time registered nurse for at least 30 hours per week, and 18 percent do not have a nurse at all.[1]

While the National Association of School Nurses (NASN) recommends that every student have access to a school nurse every day, the presence of a nurse in school depends on state nurse practice acts and regulations. NASN recommends that the severity of a student population's health needs should factor into how many school nurses should staff a school. Home and family factors, such as poverty and home languages other than English,

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ILLUSTRATIONS BY ENRIQUE MOREIRO

should also factor into determining adequate nurse staffing.[2]

Currently, more than 61,000 school nurses work in K–12 schools.[3] According to the National Center for Education Statistics, there are 52 million students in our nation's public schools. Studies indicate that as many as 27 percent of American children have chronic health conditions (such as asthma, diabetes, severe food allergies, and seizure disorders), which school nurses are trained to help manage.[4]

With so many students in need of medical care in school—whether that care is related to a chronic illness or an emergency situation—and so few nurses in schools to help them, policymakers, educators, and the general public must understand all that school nurses do so they can advocate for having one in every public school.

## Meeting Students' Needs

It would seem that teacher preparation programs would be the perfect place for educators to learn how school nurses enable teachers to focus on instruction. Yet few education courses cover what, exactly, school nurses do.

A skilled school nurse can be a lifesaver (both literally and figuratively) for teachers. School nurses have medical training to deal with the physical and mental illnesses of students as well as the entire school population. To help ensure school nurses have the skills needed to address current health concerns, NASN recommends that a school nurse have a minimum of a bachelor's degree in nursing as well as a registered nurse (RN) license. A bachelor's program in nursing covers the leadership skills of community and public health nursing, whereas shorter programs, such as associate degree RN programs or licensed practical/vocational nurse (LPN/LVN) programs, may mention these areas but do not emphasize them. Such skills are critical for school nurses to obtain so they can meet their students' complex health needs. It may be appropriate for aides and LPNs/LVNs to perform certain healthcare-related tasks, but only when an RN is providing proper oversight.

Of course, school nurses' primary purpose is to keep students healthy and safe so they are ready to learn. School nurses do this in several different ways. These include working with students to manage chronic health conditions (e.g., observing them use an inhaler during an asthma attack or helping them check their blood sugar), identifying students who might have an undiagnosed health condition that is impeding their well-being and ability to learn, and reinforcing current medical and legislative policies that affect student health (e.g., allowing students to carry their inhalers and including a school nurse on appropriate individualized student educational team meetings).

School nurses make sure students know how to manage their conditions by taking their medication or adhering to other treatments. Technological innovations and medical advancements happen quickly, and school nurses work hard to stay up to date. In so doing, they act as the bridge between the school and a student's healthcare provider to ensure a student's needs are met.

Some children who have complex medical issues require treatments ranging from catheters to gastrointestinal tubes. School nurses work with teachers and other school staff so that everyone on the educational team understands how best to support students' needs. They also work hard to connect families struggling with poverty or serious health issues to community resources such as health insurance, food pantries, language assistance programs, and transportation services, as well as offsite healthcare providers.

Only about 50 percent of public schools have a full-time registered nurse for at least 30 hours per week, and 18 percent do not have a nurse at all.

As a school nurse for several years, I found home and family factors underlying many children's health concerns. For example, learning that a student did not have electricity and heat at home helped me understand his poor health and helped his teachers understand his academic struggles. By connecting his family to social service agencies in the community, progress was made in helping the student feel well enough to focus on learning. As is so often the case, school nurses do more than hand out Band-Aids and ice packs and check for lice!

School nurses spend much of their time ensuring that all students in the school are ready to learn, and they help to identify those who may be at risk of not progressing academically. To that end, school nurses conduct vision and hearing screenings and follow up with families to ensure students receive eyeglasses or other treatments. If a family member or a teacher is concerned about a student, a school nurse can provide individual screenings and follow-up as well.

In addition, discussions about a student with the school nurse might result in some suggestions that a non–medically trained professional might not provide. For instance, if a student is frequently asking to use the toilet and has shown recent weight loss, a school nurse might suggest that the student see a healthcare provider, as these can be signs of diabetes.

School nurses also serve as health leaders in a school by ensuring that current, evidence-based practices are in place so that the school environment supports students—for example, eliminating environmental asthma triggers such as idling cars or buses near school buildings and playing fields to ensure students with asthma can participate in physical activity.*

School nurses can provide general evidence-based health education, specific trainings, or health promotion activities for students and school staff on a variety of topics. For example, school nurses may train school staff on what to do in a medical emergency or provide outreach to parents when there is an increase in a specific illness among students, to help minimize its further spread.

Monitoring the health of a school community by collecting data is another key practice of school nursing. It was actually a school nurse who identified the first case of H1N1 (swine flu), whose spread reached pandemic proportions in 2009,[5] and school nurses have identified measles, pertussis, tuberculosis, and other communicable disease outbreaks in their school communities by virtue of tracking symptoms and immunity. Electronic school health records facilitate their ability to analyze data quickly,[6] and to work with local health departments to stop outbreaks and prevent them in the future through improved prevention methods.

School nurses also provide valuable information to school leaders regarding major concerns that can affect a student's ability to attend school and learn. Unlike the administrators or staff who take the calls reporting a student's absence, school nurses have an overarching view of the school community's physical health and can address the underlying physical, social, and mental health causes of absenteeism.

## A Return on Investment

I loved being a school nurse, but, covering multiple schools, I often felt stretched thin. After seeing the overwhelming health needs students had, I decided to earn a doctoral degree in nursing, hoping to make a greater impact. I soon realized there was a dearth of research on the positive impact of school nurses, so I focused on marshalling the evidence to support the benefits of school nursing. However, measuring the effects of school nursing is complex because school nurses are part of a larger team. Also, the standard "random control trial" does not work well in many situations; we do not want to withhold health interventions from students in the name of seeing what works.

This is not to say no evidence exists. Many researchers have shown that when school nurses intervene, they can help decrease rates of student absenteeism and early dismissals of students due to health concerns.[7] Often, student absences are related to unknown or poorly controlled chronic conditions that school nurses can assess; then they can help students and their families better manage these conditions, leading to improved attendance.[8]

As a school nurse for several years, I found home and family factors underlying many children's health concerns.

Research shows that school immunization rates are higher when a school nurse is present to follow up with parent concerns and help connect families to healthcare providers.[9] In addition, school nurses have been found to help students stop smoking, lose weight, avoid pregnancy, and improve their mental health, all factors that influence student learning.[10] Besides helping to keep students in school, school nurses may decrease a school's liability, as researchers have found that when school nurses provide medication to students, fewer medication errors occur.[11]

My current role as the director of research at NASN is to gather research on school nursing and ensure that school nurses follow evidence-based practices. One of my greatest pleasures is helping school nurses collect and use their school's data to illustrate the importance of what they do and how it affects student health.

Generally, people agree that having a school nurse is good for a school. Yet, in a time of tightening budgets and increased class sizes, districts often choose to disinvest in school nursing. But researchers have found that having a school nurse actually results in returns on the investment—not only in dollars saved but in time spent on instruction.

One study that investigated the amount of time principals and other staff focused on health concerns instead of instruction found that when there was a school nurse in the building, the principal saved nearly one hour and clerical staff about 46 minutes that they otherwise would have spent on student health. Teachers were also able to devote more time to instruction when a school nurse was present. Using these data, the study's authors

*For more on common environmental problems in the school setting, see "First, Do No Harm" in the Winter 2011–2012 issue of *American Educator*, available at www.aft.org/ae/winter2011-2012/landrigan.

calculated the savings per school to be $133,174.89, which translates to a $1.84 return on investment for every dollar invested.[12]

Another analysis, this one from school nurses in the Massachusetts Essential School Health Services program, found that for every dollar spent on school nurses, society gains $2.20.[13] It is important to note that this analysis only measured program benefits as savings in the costs of medical procedures, parents' lost productivity (when they take their students out of school for treatment or come to school to give them medication), and teachers' lost productivity (when they have to deal with students' health issues instead of teaching). This study did not look at emergency room visits, hospitalizations, or 911 calls, nor did it factor in school nurses' prevention and promotion efforts to help individual students better manage their conditions and improve their health.

Return-on-investment studies that have focused on prevention often show higher returns on investment. For example, Trust for America's Health found that for every dollar spent to support community prevention programs that address smoking and promote exercise, $5.60 would be saved after five years.[14] In Canada, every dollar spent on measles, mumps, and rubella immunizations saves $16,[15] and every dollar spent on mental health and addictions saves $7 in healthcare costs and $30 in lost productivity and social costs.[16] Prevention and promotion efforts that focus on children save all of society millions of dollars but require an initial investment.

Given that education dollars always seem to be tight, school districts have found innovative funding streams for school nursing. Some school districts partner with local public health departments to share the cost of nurses, while others have partnered with local healthcare systems or community agencies.* With the emphasis on decreasing hospital admissions and increasing hospital and community partnerships, hospitals have also become involved in funding or providing school nurses.

Although each state's Medicaid laws are different, school districts or other health entities employing school nurses can bill Medicaid for reimbursement of particular procedures performed in schools. As a result, some school districts have been able to hire additional school nurses with these reimbursed funds.

Investing in school nurses helps students stay healthy and ensures they're ready to learn so they can graduate and become productive citizens. As Frederick Douglass once said, "It is easier to build strong children than to repair broken men." With nurses in schools, educators, families, and school nurses can work together to build strong children. ☐

Having a school nurse actually results in returns on the investment—not only in dollars saved but in time spent on instruction.

*School districts that have partnered with local health departments include Austin Independent School District, Akron Public Schools, Dayton Public Schools, and Provo City School District. For more on these partnerships, visit www.bit.ly/1SMy53w, www.bit.ly/1JJftyI, www.bit.ly/1Tqh26C, and www.bit.ly/1OSB72d.

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# School Nurses Make a Difference

**BY SUSAN KITCHELL**

While studying comparative literature in graduate school, I woke up one day and realized I needed to choose a career path. I made a list of various possibilities based on two criteria: I wanted to be able to support myself anywhere in the world, and I wanted to complete whatever studies the career required in a short amount of time. It may seem pretty odd based on my interest in literature, but I put nursing on the list. Having never been inside a hospital or around anyone seriously ill, I knew very little about nursing as a career choice, but it seemed to fulfill my criteria. In the end, it was the path I chose.

The next step was figuring out how to become a nurse. From watching TV, it seemed to me as though all nurses went through hospital-based training programs. But someone told me about a two-year bachelor of science in nursing program that had an expansion grant specifically targeting students like me with a bachelor's degree in another area. I applied and was accepted to the program at SUNY Downstate Medical Center in Brooklyn, New York, and I earned my initial nursing degree in 1976 (I now also hold a master's degree in nursing and am a pediatric nurse practitioner as well as a child and family clinical nurse specialist). Since then, I have enjoyed a 40-year-long (thus far!) career that I have never regretted for a moment.

My first nursing position was at Roosevelt Hospital in New York City. I specialized in pediatrics and pediatric critical care for more than 20 years before finding myself as a school-based healthcare provider. Throughout my career, I have met the goals I initially set for myself when I first made my list: I have worked in Peru, Mexico, Ecuador, Nepal, and Israel, as well as in New York, Massachusetts, New Jersey, and California.

When I became a mother in 1996, the middle-of-the-night phone calls from the hospital saying "You need to come in" became more of a challenge. I realized I needed a position where I could work daytime hours within my field of expertise and still have time to spend with my family. When I saw a posting for a school nurse position in the San Francisco Unified School District (SFUSD), I applied.

Since January of 1997, I have been a school nurse. In SFUSD, I have worked at both the elementary and secondary levels, and, over the years, my assignments have varied greatly. There were years when I worked in one high school and two middle schools, and there was one year when I had a different site each day. Luckily, for the past five years, I have been at one secondary-level site full time—the Galileo Academy of Science and Technology, a large urban high school with nearly 2,000 students.

Being at a single site has allowed me to develop ongoing and meaningful relationships and engage with the wider community.

As you can imagine, being spread thin with minimal time at multiple sites was pretty awful. It was difficult to build relationships with students and families and to connect with faculty and staff. Being at a single site has allowed me to develop ongoing and meaningful relationships and engage with the wider community.

Unfortunately, school nurses are not mandated in California schools, and not all SFUSD schools have nurses based on site. While nearly 40 nurses work in the district, SFUSD enrolls more than 57,000 students at more than 130 schools. Based on recommendations from the U.S. Department of Health and Human Services, I should not be the only nurse at Galileo. The school should have two full-time nurses assigned, and another working with us a few times a week!

While some schools in SFUSD have a full-time nurse on a daily basis, the degree of need in every school is quite high. I fully believe in the American Federation of Teachers' position that every child should have access to a school nurse. I would also add that every child *deserves* a school nurse. In SFUSD, as in many school districts around the country, there is not a nurse in every school—and there should be.

## No Typical Day

Contractually, I work a seven-hour day, but, as with most of us in educational settings, my day extends beyond those hours. One of the things that I like best about working as a school nurse is that there is no "typical" day. While I may have standing meetings scheduled on given days or prescheduled student-focused meetings, I cannot plan for events that pull me from scheduled meetings or for situations that show up on my doorstep. I never know if there is going to be a major emergency or a situation where a student is in dire need of a trusted adult willing to listen to his or her concerns.

A big piece of my job is attending to the physical health of students. Some

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students who come into my office do not have a primary care practitioner or have not seen a healthcare provider in years. If something is wrong with them, I have to discern what it might be and what additional services they may need, and then connect those students with those services. I follow students with chronic illnesses, such as those who have asthma, diabetes, epilepsy, or other disorders that may affect them (and their performance) at school. There are also the emergencies—the student who gets hurt on the field during gym, the student who slips on the stairs, the student who faints, and so on.

I also see many students with mental health challenges. Often, mental health issues will manifest physically, or students will claim a physical ailment in order to avoid the stigma they may feel around admitting a mental health concern. For many students, saying they have a headache or a stomachache is a safe way for them to leave class and come to the nurse's office. As we talk and issues surface, I may realize they are struggling with depression or anxiety or with difficulties at home. I then connect them with on-site services or refer them to outside providers.

I also deal with social ills plaguing many of our students. For example, I have worked with many students in unstable housing situations. Sometimes, they've been evicted from their homes and are living four or five in a room in a shelter with no privacy. These students sometimes come to my attention when they are referred by teachers because they appear disheveled or their personal hygiene needs are not being met. I may use my stethoscope to examine students, but I mostly rely on my assessment skills, years of experience, and gut feelings to determine what kinds of help our students need.

I remember one student in particular who came from a home rife with domestic violence and drug abuse. He was in and out of foster care, and his school attendance was suffering. People at school were really worried about him. For school nurses, unfortunately, this is not an uncommon story. He was initially referred to me because of personal hygiene issues, but our relationship expanded to include discussion of his dreams and aspirations as well as his life challenges. Over the course of his four years at school, I worked closely with him to ensure his physical and mental health didn't prevent him from achieving academic success. Not only did I watch him graduate on time, I worked with him to consider his life beyond high school. I encouraged him to attend college and helped him make that dream a reality with enrollment at Tuskegee University. It meant the world to me when he invited me to his college graduation, and I was thrilled to be remembered as someone who influenced his life.

> My dream is for all high schools to become full community schools with full-scope services available not only to students but to their families as well.

The most rewarding part of my job (and, equally, the most challenging) is working with adolescents. I really enjoy connecting and communicating with them as they blossom into adulthood. They have insight. They have awareness. The great reward is to watch that process in "real time" while working one-on-one with them.

The real challenge is that they're still teenagers, constantly testing limits. They may hear what I have to say, but they don't always listen. Sometimes a student will confide in me, and, as I'm listening with my nonjudgmental face, as a mom, my brain is screaming, "You did *what*?" Sometimes, I'm the only adult that students trust. Sometimes, I'm the only adult who gives them the time of day. I consider it a privilege and an honor to work with them.

I am here for faculty and staff as well. I provide individual consultations on health issues they may be facing, including helping to monitor ongoing conditions such as elevated blood pressure. I answer questions on how to navigate healthcare systems as well as sometimes providing information related to the health of their own children. I also offer professional development opportunities and workshops on topics such as meeting the needs of bereaved children in school settings (for which the AFT provided training).*

I'm especially proud of the success our district has enjoyed around reproductive health. In SFUSD, school nurses have played a major part in the decrease in the teen pregnancy rate.† The California legislature passed a law in 2003 requiring health education to be "comprehensive, medically accurate, and age- and culturally-appropriate."Our state law allows students 12 years and older to take charge of and responsibility for their reproductive health. To that end, school nurses in SFUSD are often involved in making certain that our students receive accurate information and rapid access to reproductive healthcare.

School nurses in our high schools are also part of the San Francisco Wellness Initiative, which is a partnership among SFUSD, the San Francisco Department of Public Health, and the San Francisco Department of Children, Youth and Their Families. This partnership allows for every

*To read more about this AFT training, see http://go.aft.org/AE116link1.

† From 2003 to 2013, the teenage birth rate in San Francisco declined from 20.0 births per 1,000 girls aged 15–19 to 10.2 births per 1,000 girls aged 15–19, a 49 percent decrease (which is above the 41.1 percent decrease statewide for the period).

## Facts about School Nursing

- More than **61,000** registered nurses (RNs) work in K–12 schools across the United States.
- **82 percent** of K–12 schools have a school nurse, but many are part time or do not hold an RN license.
- Only **50.8 percent** of schools have a full-time RN for at least 30 hours per week.
- **51.1 percent** of schools meet the 1:750 ratio of nurses to regular education students recommended by the Healthy People 2020 initiative of the U.S. Department of Health and Human Services. The National Association of School Nurses recommends a ratio that accounts for physical, mental, and social health needs.
- As many as **27 percent** of public school students have chronic health conditions.

**For more information, visit:**

- National Association of School Nurses: **www.nasn.org**
- AFT Nurses and Health Professionals: **www.aft.org/healthcare**
- Healthy People 2020: **www.healthypeople.gov**

–EDITORS

SOURCES: HEALTH RESOURCES AND SERVICES ADMINISTRATION, *THE U.S. NURSING WORKFORCE: TRENDS IN SUPPLY AND EDUCATION*; CENTERS FOR DISEASE CONTROL AND PREVENTION, *RESULTS FROM THE SCHOOL HEALTH POLICIES AND PRACTICES STUDY 2014*; AND ROBERT WOOD JOHNSON FOUNDATION, *CHRONIC CARE: MAKING THE CASE FOR ONGOING CARE*.

high school to have on-site services to respond to the physical and mental health needs of students.‡

The role of the school nurse in our district is also affected by the receipt of grant funding. Depending on the grant, our roles are expanded or contracted. For example, thanks to a California Tobacco-Use Prevention Education grant, school nurses at the high school level are charged with providing tobacco-use prevention activities and services.

While the Wellness Initiative is a step in the right direction, my dream is for all high schools to become full community schools with full-scope services available not only to students but to their families as well. Fortunately, the city does run health clinics for teenagers throughout San Francisco, so I do refer students to those when they have health needs beyond what I can handle. One such clinic is located very close to our school, and students feel very comfortable going there.

### Union Support

I have strong relationships with faculty and staff throughout my school. I am Galileo's union building representative, and I've served on the executive board of the United Educators of San Francisco (UESF) for the last 16 years and on the UESF bargaining team. I've been a union member my entire adult working life, both with nonnursing unions and nursing associations.

It was initially strange to learn that I was being represented by a local union mostly made up of teachers and paraprofessionals, and we had a few issues to work through over the course of my first several years in the district. Fortunately, union leadership was open to learning about the needs of nonclassroom personnel, and I was happy to learn about the needs and issues affecting my coworkers in the classroom.

In my time on the UESF executive board, I have worked to ensure that school nurses and other nonclassroom staff are recognized for the work we do and receive equal representation. Proudly, our UESF banner now reflects the wide variety of classifications among its members by stating that we are a union of school professionals.

My first encounter with the union came as a result of my initial placement on the salary scale. Even though I came to the school district with more than 20 years of nursing experience, I was initially placed at the five-year experience level because, according to my then-supervisor, my work outside of schools did not count for much (despite the fact that it had always been with children and families). There were also workday issues, including how many hours we worked, how we worked, and whether the travel time between schools counted toward hours worked—among other basic nuts and bolts of health and welfare issues.

With the support of the UESF, a grievance was filed, and, in the end, 14 nurses had their salaries increased based on their previous nursing experience (regardless of where that experience occurred). Thanks to our union, my colleagues and I succeeded in having our prior experience recognized and rewarded.

The AFT, which is now the second-largest union of nurses in the country, has been a vocal supporter of the vital services school nurses provide. Within the AFT, school nurses belong to the Nurses and Health Professionals division, yet we have the unique position of straddling two worlds as we provide vital healthcare in public schools and, in so doing, directly support the AFT's educational mission. In the years to come, I hope every student in our country has access to a school nurse every day.

‡ For more on the San Francisco Wellness Initiative, see www.sfwellness.org.

# Understanding Misconceptions

## Teaching and Learning in Middle School Physical Science

ILLUSTRATIONS BY JAMES YANG

By Philip M. Sadler and Gerhard Sonnert

Everybody wants teachers to be knowledgeable. Yet there is little agreement on exactly what kinds of knowledge are most important for teachers to possess. Should teachers have deep knowledge of the subject matter they are teaching, gleaned from college study, additional graduate courses, or even research experience? Do they need to understand how students typically think when they approach a problem or theory? Is there some optimal combination of these different types of knowledge?

Researchers have long speculated that a teacher's knowledge of common student misconceptions could be crucial to student learning.[1] This view recognizes that learning is as much about unlearning old ideas as it is about learning new ones.[2] Learners often find it difficult to change their misconceptions, since these are ideas that make sense to them. Some researchers advocate, therefore, that teachers should know common student misconceptions for the topics that they teach,[3] and others suggest that teachers interview[4] or test[5] their students to reveal student preconceptions early on in the learning process. Yet the research falls short in assessing teachers' knowledge of particular student misconceptions and the actual impact of this knowledge on student learning.

Such discussions as these, if they use data at all, are often based on indirect methods of gauging teacher knowledge. College degrees earned, courses taken, and grades achieved often serve as proxies for a teacher's subject-matter knowledge, which is

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identified as the general conceptual understanding of a subject area possessed by a teacher.[6] But studies that rigorously investigate the relationship between the different kinds of teacher knowledge and student gains in understanding are rare.[7]

We set out to better understand the relationship between teacher knowledge of science, specifically, and student learning.[8] We administered identical multiple-choice assessment items both to teachers of middle school physical science (which covers basic topics in physics and chemistry) and to their students throughout the school year. Many of the questions required a choice between accepted scientific concepts and common misconceptions that have been well documented in the science education literature.[9] We also asked the teachers to identify which wrong answer they thought students were most likely to select as being correct. Through a student posttest at the end of the school year, we were able to study the impact on student learning of teacher knowledge of science and the accuracy of their predictions of where students are likely to have misconceptions.

We set out to better understand the relationship between teacher knowledge of science and student learning.

Not all items had very popular wrong answers, but for those that did (12 items of the 20, or 60 percent), we found that teachers who could identify these misconceptions had larger classroom achievement gains, much larger than if teachers knew only the correct answers. This finding suggests that a teacher's ability to identify students' most common wrong answer on multiple-choice items, a form of pedagogical content knowledge, is an additional measure of science teacher effectiveness. For items on which students generally had no popular misconceptions, teacher subject-matter knowledge alone accounted for higher student gains.

## Our Study

The goal of our study was to test two hypotheses regarding teacher knowledge in middle school physical science courses:

> Hypothesis 1: Teachers' knowledge of a particular science concept that they are teaching predicts student gains on that concept.
>
> Hypothesis 2: Teachers' knowledge of the common student misconceptions related to a particular science concept that they are teaching predicts student gains on that concept.

We assessed teachers' subject-matter knowledge and their knowledge of students' misconceptions in the context of the key concepts defined by the National Research Council's (NRC) National Science Education Standards and measured their relationship to student learning.* We administered the same multiple-choice items to both students and teachers. And we asked teachers to identify the incorrect item (that is, the student misconception) that they believed students would most often select in lieu of the correct answer. This method allowed us to simultaneously evaluate the teachers' knowledge of both subject matter and students' misconceptions and examine if these teacher measures predict student gains in middle school physical science classrooms.

Science learners often struggle with misconceptions, and multiple-choice tests function well in diagnosing popular misconceptions that can impede the learning of science concepts.[10] Good examples include the causes of the seasons and of the phases of the moon. For instance, a particularly common view, often held by adults, is that the seasons are caused by the earth's elliptical orbit rather than the changing angle of the sun's rays hitting the surface of the earth. In the documentary *A Private Universe*, bright and articulate graduating college seniors, some with science majors, revealed their misunderstandings of such common middle school science topics.[11] If teachers hold such misconceptions themselves or simply are unaware that their students have such ideas, their attempts to teach important concepts may be compromised.

We measured gains on key concepts during a one-year middle school physical science course. As is common in this type of research, we controlled for differences in student demographics, such as race, ethnicity, home language spoken, and parents' education. By using individual test items, we could assess how strongly teachers' subject-matter knowledge and knowledge of students' misconceptions were associated with student gains.

Our study design was also able to account for the amount of physical science content taught during the middle school years, which can vary greatly. While some schools devote an entire academic year to the subject, other schools include physical science within a general science sequence that covers earth and space science and life science. Also, we were concerned that the initial science achievement of participating classrooms might obscure any changes in student achievement during the school year. For example, it may be that, compared with their less experienced colleagues, more experienced or expert teachers were assigned students who have shown higher prior achievement. Administering a pretest, a midyear test, and a posttest enabled us to control for students' baseline knowledge level.

Our initial nationwide recruitment effort yielded 620 teachers of seventh- and eighth-grade physical science at 589 schools (91 percent of which were public). Of the teachers who at first volunteered to be part of this study, 219 followed through. They were quite experienced, with a mean time teaching of 15.6 years and a mean time teaching middle school physical science of 10.4 years. They had a range of undergraduate preparation: 17 percent had a degree in the physical sciences; 25 percent, a degree in another science; 36 percent, a science education degree; 23 percent, an education degree in an area other than science; and 9 percent, a degree in another field. Multiple undergraduate degrees were held by 8 percent of teachers. Of the total sample, 56 percent held a graduate degree in education and 14 percent held a graduate degree in science.

*We conducted our study prior to the advent of the Next Generation Science Standards, for which curricula are not yet widely available.

In return for their participation, we offered to report back to teachers the aggregate scores of their students and the associated student gains in comparison with our national sample.[12] Seventy-eight percent of the students were in eighth grade, while 22 percent were in seventh grade. At the end, we obtained usable data from a total of 9,556 students of 181 teachers.

## Design Details

For the assessment, we constructed multiple-choice questions[13] that reflect the NRC's physical science content standards for grades 5–8.[14] While we are constrained from publishing the actual wording of the 20 questions because the assessment is widely used by professional development programs nationally,[15] the assessment addresses three content areas: properties and changes of properties in matter (six questions), motions and forces (five questions), and transfer of energy (nine questions). (See Table 1 on page 29 for details.)

Multiple-choice questions fell into two categories with respect to the relative popularity of the wrong answers. Eight of the 20 questions had "weak" or no evident misconceptions, with the most common wrong answer chosen by fewer than half of the students who gave incorrect responses. Consider the results for Sample Item 1 (shown below), for example. While 38 percent of students answered this question correctly (option d), a corresponding 62 percent answered incorrectly, with 42 percent of those who were incorrect selecting option b. While option b was the most popular wrong answer, it was not chosen by more than half of the students who answered incorrectly, so the item is considered not to have an identifiable misconception.

1. A scientist is doing experiments with mercury. He heats up some mercury until it turns into a gas. Which of the following do you agree with most?

a. The mercury changes into air. [chosen by 12 percent]
b. Some of the mercury changes into carbon dioxide. [chosen by 26 percent]
c. The mercury changes into steam. [chosen by 14 percent]
*d. The gas is still mercury. [chosen by 38 percent]*
e. The mercury is completely destroyed when heated. [chosen by 10 percent]

A total of 12 questions had "strong" misconceptions, meaning 50 percent or more of students who chose a wrong answer preferred one particular distractor. For example, as shown in Sample Item 2, only 17 percent of students answered the question correctly (option a), and a corresponding 83 percent answered incorrectly. A very large fraction (59 percent) of students chose one particular wrong answer, option d; of the students choosing an incorrect answer, 71 percent preferred this single distractor. This response indicates a strong misconception.

2. Eric is watching a burning candle very carefully. After all of the candle has burned, he wonders what happened to the wax. He has a number of ideas; which one do you agree with most?

*a. The candle wax has turned into invisible gases. [chosen by 17 percent]*
b. The candle wax is invisible and still in the air. [chosen by 6 percent]
c. The candle wax has been completely destroyed after burning. [chosen by 8 percent]
d. All of the wax has melted and dripped to the bottom of the candle holder. [chosen by 59 percent]
e. The candle wax has turned into energy. [chosen by 10 percent]

We found that student gains are related to teacher knowledge.

Classroom coverage of the content represented by the test items was near universal. Only eight teachers reported that they did not cover the content tested by one particular item, and two teachers reported that they did not cover the content in two items.

In Table 1, we break down by standard the broad concepts addressed by the 20 test items, with their common misconceptions noted in italics underneath each one. Relevant earlier studies about these specific student misconceptions are cited in the endnotes.

On the midyear and end-of-year assessments, we included four nonscience questions—two reading and two mathematics—to get a general sense of students' engagement in and effort on the tests themselves. The two reading questions were constructed to represent students' comprehension of a science-related text. The first of these required the students to comprehend the actual text, while the second required them to infer from the text. Similarly, of the two mathematics questions, one required a well-defined arithmetic operation, while the second required students to identify the relevant features of a word problem before responding. Mean reading and math scores were both 58 percent.

These four items were used to construct what is called a composite variable. Students who correctly answered fewer than half of the nonscience content items (27 percent of participants) were tagged as "low nonscience"; those who correctly answered at least 50 percent of the four reading and math items were tagged as "high nonscience." This index allowed us to examine gains for each group separately. We hypothesized that students who performed in the low-nonscience range in reading and doing simple math would have had difficulty answering the sci-

ence questions on the test or simply would not have given the test their best effort.

## Teacher Subject-Matter Knowledge and Knowledge of Students' Misconceptions

Teacher performance in subject-matter knowledge on the pretest was relatively strong, with 84.5 percent correct on nonmisconception items and 82.5 percent on misconception items. On average, teachers missed three out of 20 items. Teachers' knowledge of students' misconceptions—that is, the ability to identify the most common wrong answer on misconception items—was weak, with an average score of 42.7 percent identified. On average, they identified only five out of the 12 items with strong misconceptions.

Teachers' performance on each of the eight nonmisconception items fell into one of two categories (see Figure 1 on page 30):

- Subject-matter knowledge (teacher answered correctly)—84.5 percent of responses.
- No subject-matter knowledge (teacher answered incorrectly)—15.5 percent of responses.

As expected, the majority of teachers were competent in their subject-matter knowledge, especially when the item did not include a strong misconception among its distractors.

Teachers' performance on each of the 12 misconception items fell into one of four possible categories (see Figure 2 on page 30):

- Had both subject-matter knowledge and knowledge of students' misconceptions (teacher answered correctly and knew the most common wrong student answer)—40.7 percent of responses.
- Had subject-matter knowledge, but no knowledge of students' misconceptions (teacher answered correctly but did not know the most common wrong student answer)—41.8 percent of responses.
- Had no subject-matter knowledge, but had knowledge of students' misconceptions (teacher answered incorrectly but knew the most common wrong student answer)—2.0 percent of responses.
- Had neither subject-matter knowledge nor knowledge of students' misconceptions (teacher answered incorrectly and did not know the most common wrong student answer)—15.5 percent of responses.

In the case of teachers not knowing the science (that is, answering the item incorrectly), most selected the dominant student misconception as their own "correct" answer. We decided to combine the third and fourth categories into one, because teachers in both categories did not possess the relevant subject-matter knowledge for that item. Moreover, it is hard to interpret the meaning of the very small (2 percent) category of teachers' responses that lacked subject-matter knowledge but showed knowledge of students' misconceptions.

Teacher subject-matter knowledge and knowledge of students' misconceptions thus appear related, rather than independent from each other.[25] Whereas some researchers have argued that there are no formal differences between types of teacher knowledge,[26] it seems that subject-matter knowledge, at least in the form that we measured, should be considered a necessary, but not sufficient, precondition of knowledge of students' misconceptions.

## Table 1. Science Concepts Tested and Common Misconceptions

### Properties and Changes of Properties in Matter

Concept: A substance has characteristic properties.
Misconception: *Boiling point varies with the amount of material.*[16]

Concept: Substances react chemically in characteristic ways with other substances to form new substances.
Misconception: *Burning produces no invisible gases.*[17]

Concept: All substances are composed of one or more elements.
Misconception: *Matter is not conserved.*[18]

### Motions and Forces

Concept: Position can be used to represent an object's motion.
Misconception: *Objects that are speeding up cover the same distance per unit of time.*[19]

Concept: An object's position, direction of motion, and speed are interrelated.
Misconception: *Graphs of motion versus time are similar to the physical path followed by the object.*[20]

Concept: Forces can act in the direction opposite to an object's motion.
Misconception: *Force is always in the direction of an object's motion.*[21]

### Transfer of Energy

Concept: Objects come to the temperature of their surroundings.
Misconception: *Some materials are intrinsically cold.*[22]

Concept: Light propagates and interacts with matter, and it is passively detected.
Misconception: *Light travels in a straight line even when it interacts with matter.*[23]

Concept: Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.
Misconception: *Electricity behaves in the same way as a fluid.*[24]

## Student Achievement

Student scores were relatively low, indicating that the science assessment items were difficult. The mean pretest score across all items (both those without misconceptions and those with misconceptions) was 37.7 percent. Mean scores on the final test were higher at 42.9 percent: 44.8 percent for items without misconceptions and 41.7 percent for those with misconceptions. Students had a slightly easier time learning the content for which there appeared to be no dominant misconception. Our analysis of teacher knowledge at the start of the year shows high levels of subject-matter knowledge, with some weaknesses, and rather moderate levels of knowledge of students' misconceptions, as measured by teachers' prediction of the most common wrong answers of their students. Most importantly, we found that student gains are related to teacher knowledge, as shown in Figure 3 on page 31. Students made high gains on nonmisconception

questions when teachers had high subject-matter knowledge. On misconception questions, students made medium gains if the teachers had *both* high subject-matter knowledge and high knowledge of misconceptions. In all other constellations, the student gains were low.

In addition, we found interesting differences between high-nonscience and low-nonscience students. The former showed much larger gains than the latter. The high-nonscience students, even if their teacher did not have the requisite subject-matter knowledge and knowledge of students' misconceptions, made moderate gains. There are many possible explanations for this result. For instance, these students may have found ways to gain knowledge from other sources, such as their textbooks, homework, or discussions with other students.

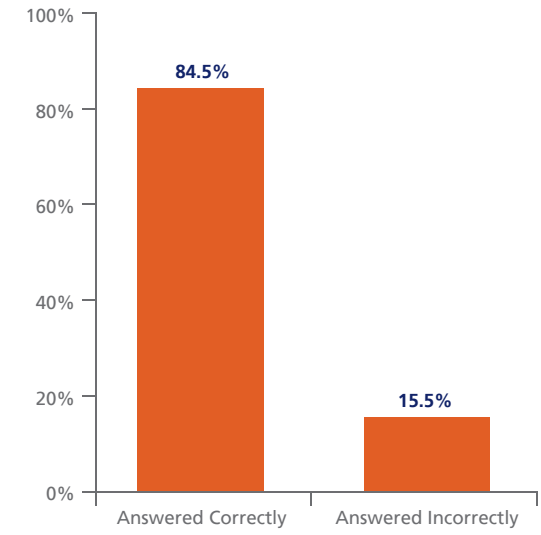
Having a more knowledgeable teacher is associated with even larger gains for the high-nonscience students than for the low-nonscience students, bringing to mind the so-called Matthew effect, which, loosely stated, says that those with an attribute in abundance (in this case, knowledge) tend to gain more than those who start with less.[27] Research has found that students with low reading levels exhibit lower gains in other subjects because much of the effort behind learning requires reading texts.[28]

It also may be the case that students who answered the embedded reading and mathematics items incorrectly may simply not have taken these questions (or the test as a whole) seriously. Those with low scores on these questions may have gotten these questions wrong because they were uninterested, and their performance on the 20 science items may likewise have suffered. If this is the case, the findings for students of high-nonscience levels (73 percent of the total) should be emphasized as more fairly reflecting the impact of teacher subject-matter knowledge and knowledge of students' misconceptions.

However, a significant gain was seen on nonmisconception items for low-nonscience students if they had a knowledgeable teacher, so at least some appear to have taken the tests seriously. It also appears that students with low reading and math scores were particularly dependent on the teacher's subject-matter knowledge, exhibiting no significant gain unless their teachers had the requisite subject-matter knowledge for these items (and the items

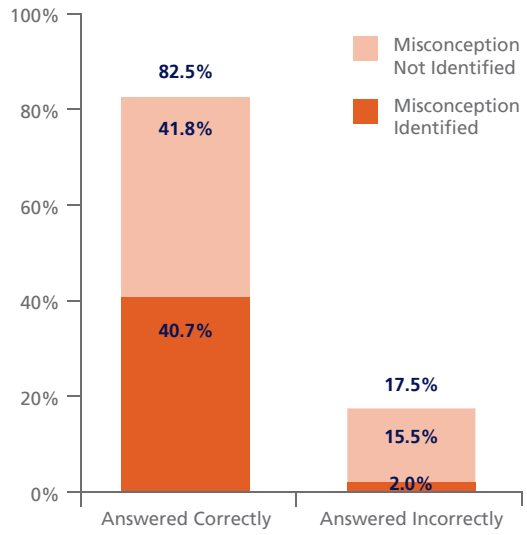
Teachers' subject-matter knowledge should be considered a necessary, but not sufficient, precondition of knowledge of students' misconceptions.

## Figure 1. Teachers' Performance on the 8 Nonmisconception Questions




Percentage of nonmisconception questions teachers answered correctly

## Figure 2. Teachers' Performance on the 12 Misconception Questions




Percentage of misconception questions teachers answered correctly, and percentage of misconceptions they correctly identified

had no misconceptions). The lack of gain on misconception items for these students, independent of the level of teacher subject-matter knowledge or knowledge of students' misconceptions, is particularly troubling. These items may simply have been misread, or they may be cognitively too sophisticated for these students, or the students may not have tried their hardest on a low-stakes test.

Among the students with high math and reading scores, our analysis reveals a clear relationship of teacher knowledge to student gains. For nonmisconception items, student gains are nearly double if the teacher knows the correct answer. When items have a strong misconception, students whose teachers have knowledge of students' misconceptions are likely to gain more than students of teachers who lack this knowledge. Much of what happens in many science classrooms could be considered as simply a demonstration of the teacher's own subject-matter knowledge, without taking into account the learner's own subject-matter knowledge. Without teachers' knowledge of misconceptions relevant to a particular science concept, it appears that their students' success at learning will be limited.

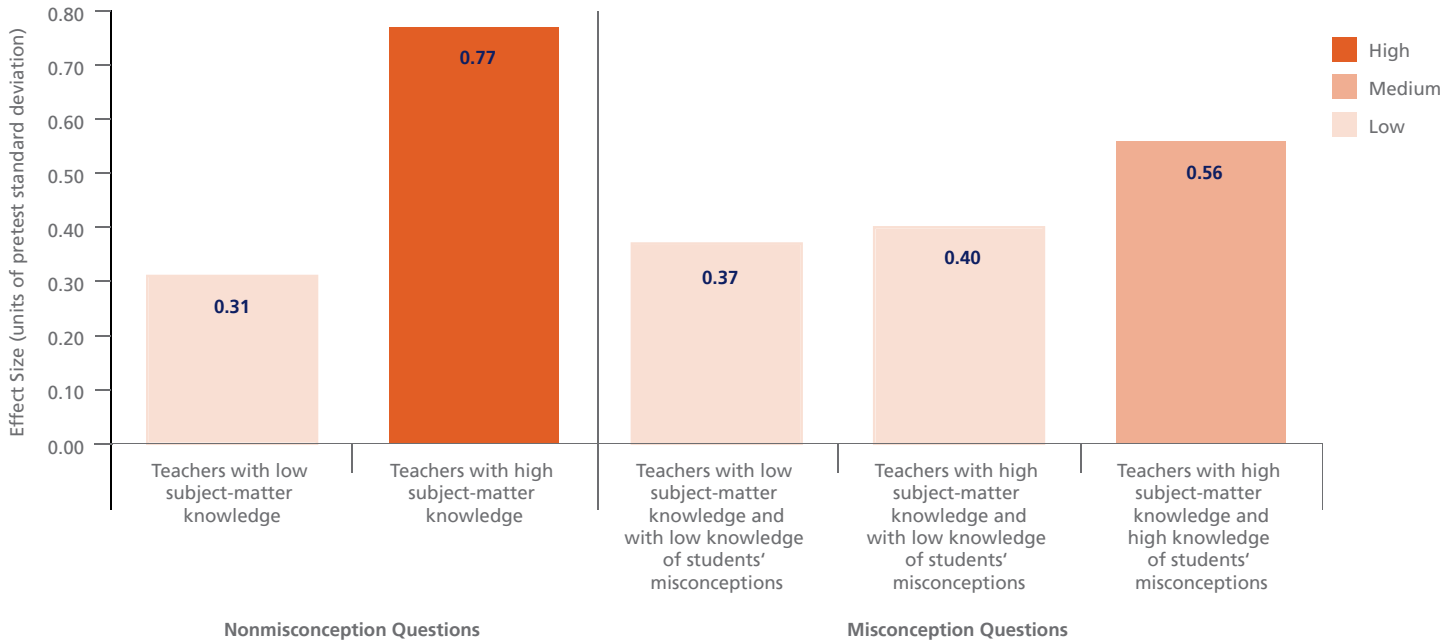
Notably, "transfer" of teacher subject-matter knowledge or knowledge of students' misconceptions between concepts appears to be limited. For example, a teacher's firm grasp of electrical circuits and relevant misconceptions appears to have little to do with the effective teaching of chemical reactions. Teachers who are generally well versed in physical science still may have holes that affect student learning of a particular concept. Our findings suggest that it is important to examine teacher knowledge surrounding particular concepts, because student performance at the item level is associated with teacher knowledge of a particular concept.

Moreover, in teaching concepts for which students have misconceptions, knowledge of students' ideas may be the critical component that allows teachers to construct effective lessons. Because teachers' knowledge of students' misconceptions is low, compared with their knowledge of the science content, professional development focusing on this area could help teachers (and students) substantially.

Subject-matter knowledge is an important predictor of student learning. The need for teachers to know the concepts they teach may sound like a truism. But while one may assume that the science content of middle school physical science is, in general, well understood by teachers, there are noticeable holes in their knowledge, which differ by teacher. It is not surprising that teachers with the proper subject-matter knowledge of a given concept can achieve larger gains with their students than can those lacking that knowledge; a teacher without subject-matter knowledge may teach the concept incorrectly, and students may end up with the same incorrect belief as their teacher.

Effectiveness of middle school science teachers may thus have more to do with a mastery of *all* the concepts that they teach than with the depth of their knowledge in any particular topic. The increasing involvement of science professors in teacher professional development could focus those programs

## Figure 3. Classroom Gain




"Classroom gain" represents the effect size that teachers with various levels of subject-matter knowledge and knowledge of students' misconceptions had on a test of their students' achievement.

The following levels of classroom gain are indicated: low=0.30; medium=0.50; high=0.70.

Our study found a high gain in student achievement on nonmisconception questions when teachers had high subject-matter knowledge. We also found a medium level of student gain on misconception questions when teachers had both high subject-matter knowledge and high knowledge of students' misconceptions. When teachers had low subject-matter knowledge or low knowledge of students' misconceptions, gains in student achievement remained low.

too narrowly on the scientists' special areas of expertise, which might boost participants' subject-matter knowledge only in a narrow set of topics. Conducting a diagnostic identification and remediation of teachers' knowledge "holes" might prove more advantageous.

An intriguing finding of this study is that teachers who know their students' most common misconceptions are more likely to increase their students' science knowledge than teachers who do not. Having a teacher who knows only the scientific "truth" appears to be insufficient. It is better if a teacher also has a model of how students tend to learn a particular concept, especially if a common belief may make acceptance of the scientific view or model difficult.

This finding, too, has practical implications. In professional development, an emphasis on increasing teachers' subject-matter knowledge without sufficient attention to the preconceived mental models of middle school students (as well as those of the teachers) may be ineffective in ultimately improving their students' physical science knowledge. ☐

Teachers who know their students' most common misconceptions are more likely to increase their students' science knowledge than teachers who do not.

## Endnotes

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2. Lee S. Shulman, "Those Who Understand: Knowledge Growth in Teaching," *Educational Researcher* 15, no. 2 (1986): 4–14. Two other key studies that emphasize the importance of subject-matter teaching and knowledge of common student struggles and errors are Heather C. Hill, Stephen G. Schilling, and Deborah Loewenberg Ball, "Developing Measures of Teachers' Mathematics Knowledge for Teaching," *Elementary School Journal* 105 (2004): 11–30; and Pamela L. Grossman, *The Making of a Teacher: Teacher Knowledge and Teacher Education* (New York: Teachers College Press, 1990).

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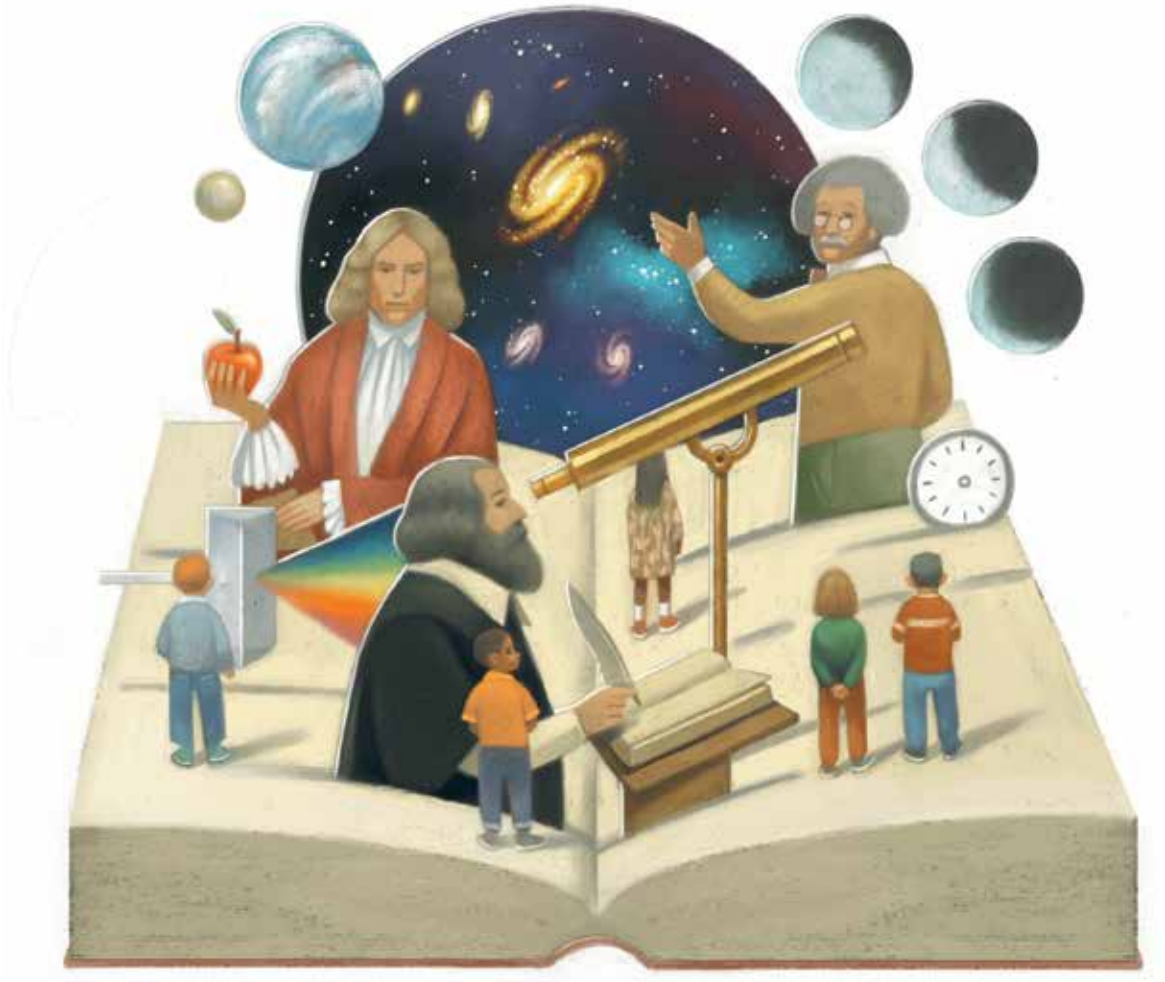
# Narrative Nonfiction

## A Writer Reflects on Writing Real Stories



*More than a decade has passed since* American Educator *featured the work of Joy Hakim, a writer whose nonfictional accounts of history and science have long fascinated students and teachers alike. With the advent of the Common Core State Standards, and their strong emphasis on nonfiction, Hakim's accounts may prove useful to educators seeking worthwhile content that both expands students' background knowledge and sparks their imagination.*

*The following pages introduce Hakim to those unfamiliar with her work (and also reacquaint those who are fans). She recounts her journey from newspaper reporter to children's book author, while sharing her thoughts on the importance of narrative nonfiction in student learning. Throughout her career, Hakim has written stories rich in detail about figures such as Aristotle, Alexander the Great, Nicolaus Copernicus, Sir Isaac Newton, and many others. On page 36, we give a glimpse of how she takes readers on a journey back in time by excerpting a chapter from her latest publication,* Reading Science Stories, *an e-book available on Amazon.com. This particular chapter tells the story of Michael Faraday and James Clerk Maxwell, whose efforts laid the foundation for "an electromagnetic revolution," as Hakim eloquently writes.*

*–EDITORS*

By Joy Hakim

It was the 1980s, and someone on the Virginia state school board, looking closely at a widely used high school textbook, was horrified by liberties the publisher had taken with Shakespeare. When the bard used a difficult word, the publisher substituted another, without any notation. So teachers were teaching Shakespeare, and students were reading Shakespeare, without knowing that they actually weren't.

Board members checked other school texts. The state-approved American history text was, as students kept telling them, boring, really boring. No one read it gladly. The more the board looked, the duller the textbooks got. Some had errors. Energized,

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*Joy Hakim writes nonfiction books for children. A former teacher and journalist, she is the author of* A History of US, *a 10-volume series that was made into a PBS special called* Freedom. *This article is adapted from Hakim's* Reading Science Stories. Reading Science Stories *is excerpted and adapted from* The Story of Science *by Joy Hakim, published by Smithsonian Books, and from other work she is writing about evolutionary biology, all rights to such other work being reserved by Ms. Hakim.*

ILLUSTRATIONS BY GIANNI DE CONNO

the Virginians invited leading textbook publishers to a meeting in Richmond to discuss what they now saw as a major education problem: commercial schoolbooks. Two national publications (*Time* and *Newsweek*) noted the upcoming session.

I was a newspaper reporter who had become an editorial writer at the *Virginian-Pilot* in Norfolk, and I volunteered to go to Richmond to cover the event because I thought it had the potential to impact American education. The publishers sent their sales representatives, not editorial staff. One perky rep, leather briefcase in hand, explained that Virginia had a textbook problem because its schools taught American history in seventh grade and the rest of the country chose eighth (or maybe it was vice versa). I shook my head in disbelief. A board member rolled her eyes.

Driving home, I did some thinking. Before I became a reporter, I'd been a classroom teacher. I taught elementary, middle, and high school classes, including special education. I also taught writing to high school English teachers for University of Virginia credit, and American literature at Tidewater Community College. As for American history, an op-ed piece I'd written on Thomas Jefferson for the *Wall Street Journal* had been well received.[1] I thought if I took a year off from paying work, I could write a readable U.S. history book.

Ah, how little I knew about what I was getting into. It would be 10 years before I had a published book in hand. Meanwhile, I tumbled into a publishing world focused on profits, not on educational challenges. What happened next? I began writing stories from American history and testing those nonfiction stories in classrooms, eventually in six cities across the country. I was also paying neighborhood children to act as editors. Given salaries ($5 a read), they didn't hold back.

I also got cogent comments from teachers and students in the six cities. A small grant allowed me to visit classrooms. In San Diego, the superintendent asked if he could test the book citywide. But I didn't have a book; I had a manuscript for a book, which I was sending to schoolbook publishers. There were about 30 of them then (today, three mega-publishers control much of the school market).

Every publisher who saw the manuscript turned it down. It was enthusiasm from teachers and students that kept me writing. The book morphed into two volumes, then four; finally, I formatted it into 10 small chronological books, titled *A History of US*. I intended the books to teach reading, writing, and thinking skills as well as American history, and I didn't want a behemoth text that would overwhelm young readers.

Eventually, Oxford University Press published *A History of US*; it was Oxford's entry into the young adult market, and to everyone's surprise, the books did well.[2] Oxford produced excellent teaching manuals, and an educator team at Johns Hopkins University added innovative teaching materials that cross disciplines.

A young reader wrote a letter suggesting that I write about science next. When a second letter-writer asked the same thing, I paid attention. A teacher friend told me that hands-on science, which dominates in schoolrooms, isn't enough. Children need to know the story behind an experiment if they are to understand and remember it. For me, science, like history, became a way to teach reading and thinking skills as well as subject matter.

For me, science, like history, became a way to teach reading and thinking skills as well as subject matter.

There was still more to consider; I realized that even though we were living in the greatest scientific era ever, we as a population were scientifically illiterate. We were doing a poor job making our students aware of the big ideas that underlie our time. I saw myself among the illiterates. But as a newspaper reporter, I was trained to tackle and research any subject. I also knew how to find experts to back up my work. I soon developed an overwhelming thirst: to understand today's science.

So I began writing to answer my own questions as well as those of potential readers, and after a few years, I had three books of science stories. Those books, *Aristotle Leads the Way*, *Newton at the Center*, and *Einstein Adds a New Dimension*, were published by Smithsonian Books and the National Science Teachers Association as a three-part series, *The Story of Science*.[3] The books won a bunch of prizes, including a science book of the year award from USA Book News, and they will be available in e-book format this spring.

As for their classroom use, the books baffled some school authorities. Were they language arts, or history, or science? For me, they were all of those. During a visit to a Maryland school, I

met four teachers—math, science, language arts, and history—all working together on a coordinated science-based curriculum. It was what I had intended.

Which brings us to the e-book excerpted on page 36, *Reading Science Stories*. It's a book meant to examine scientific ideas, to hone nonfiction reading skills, and also to be enjoyed across disciplines. At a time when the Common Core State Standards, and many educators, understand the value of nonfiction reading, it seems timely.

What about its readers? What age should they be? That's a question I'm often asked. Quick answer: all my books seem to test at a fifth-grade reading level, as does most newspaper writing. But no one would confine newspapers to fifth-graders.

I see attempts to narrowly categorize school reading to specific age levels as shortsighted. *The Adventures of Tom Sawyer* can be read in third grade and in college seminars. My books turn up across that same spectrum of grades. It's the teaching and the expectations that vary with different ages. Do you and your students enjoy the book? If so, feel free to read and teach it, no matter their age.

As for their classroom use, my books baffled some school authorities. Were they language arts, or history, or science?

The chapter included in this *American Educator* issue, "Field Days for Faraday and Maxwell," focuses on two little-known scientists, Michael Faraday and James Clerk Maxwell. In their 19th-century world, horses and muscles were major sources of power, as they had always been. But Faraday understood that the sun's rays carry energy, and he figured out that it travels in alternating waves of electricity and magnetism. That insight needed to be expressed mathematically. Maxwell took Faraday's intuition and turned it into four equations that power today's world.

Without Faraday and Maxwell, there would have been no electrical or electronic revolutions, no relativity from Einstein. It's hard to find historic figures that are more important. And for the most part, we haven't told our children about them. Am I suggesting that you teach Maxwell's equations? Or Einstein's? Not unless you can (I can't), but stories can help you teach their significance and imprint it in young minds. And those nonfiction stories will do something else. I believe they can impact reading scores. The thinkers behind the Common Core State Standards seem to agree, as do other educators.

In a report titled *Choosing Blindly: Instructional Materials, Teacher Effectiveness, and the Common Core,* the Brookings Institution says, "There is strong evidence that the choice of instructional materials has large effects on student learning—effects that rival in size those that are associated with differences in teacher effectiveness."[4]

And whereas improving teacher quality "is challenging, expensive, and time-consuming," according to the Brookings report, "making better choices among available instructional materials should be relatively easy, inexpensive, and quick."[5] Some education critics may blame teachers for declining reading scores, but I see dreary school reading materials as major culprits.

Which brings us back to textbooks: Einstein was coauthoring a physics textbook when his pal Max Born, also a Nobel Prize winner, wrote him a note that said, "To present a scientific subject in an attractive and stimulating manner is an artistic task, similar to that of a novelist or even a dramatic writer. The same holds for writing textbooks."[6]

Artistic textbooks? Is that possible? Yes, it is. But today, many school texts are commercial ventures that are routinely ghostwritten. Publishers often put a professor's name on the cover to help with sales. These formulaic books take a huge portion of school budgets, they help explain disappointing test scores, and they give nonfiction a bad image at a time when it has become the reading form of our time.* Textbooks should be the work of our best writers. David Saville Muzzey, a Barnard professor with the skills of a storyteller, made American history everyone's favorite subject in the early 20th century with a text, *An American History*, that was widely read and anything but dull.[7] Why aren't our great writers writing school texts?

Perhaps because, in the past, schools routinely stacked books

*For more on the history of content-poor curricula in the elementary grades, see "Content on the Cutting-Room Floor" in the Summer 2014 issue of *American Educator*, available at www.aft.org/ae/summer2014/wattenberg.


into two piles: fiction was labeled literature, and nonfiction was not. Yale's wonderful writing guru William Zinsser had this to say on that subject: "Those of us who are trying to write well about the world we live in, or to teach students to write well about the world they live in, are caught in a time warp, where literature by definition consists of forms that were certified as 'literary' in the nineteenth century: novels and short stories and poems."[8]

Fiction, according to my dictionary, is an invented story that includes literature, narrative, and creative writing. But nonfiction, with stories that are not invented, can be all of those.

No one wants schools to give up on fiction. First-graders really believe rabbits can talk; their middle school siblings understand that Harry Potter is fantasy but revel in the world he inhabits; and lucky high school readers experience the transformative thoughts that come with immersion in a great novel. There is no reason to eliminate those delights. What is needed is a balance that brings true stories into the literary fold, along with an awareness that reading informative writing takes different skills than reading fiction.

## "Field Days for Faraday and Maxwell"

*Excerpt of Chapter 19 (from* Reading Science Stories*)*

Michael Faraday, born in 1791, is an English blacksmith's son who will never get a chance to go to high school or to a university. His pious family has little money, and all the children must help out. At 13, he finds work as an errand boy for a London book dealer. That has advantages. There are lots of books around, and Michael is able to read and learn on his own.

In London, young Faraday joins a group of working men who are fascinated with the new sciences; they do experiments and share ideas. Faraday wants to become a good writer; he searches out and finds help with grammar and style. He keeps journals of his scientific experiments.

Then Faraday gets a chance to work at the prestigious Royal Institution (founded by Count Rumford). He goes for it, even though it means a cut in salary. He is fascinated with the new science of electricity, and England's most brilliant experimenter, Sir Humphrey Davy, is at that institution. Faraday is soon doing his own experiments, and before long, he and his ideas dominate the field.

James Clerk Maxwell, born in Scotland in 1831, is brought up on a country estate, Glenlair, among the lakes and hills of Galloway (in southwest Scotland). His childhood is filled with books, horses, fishing, swimming, and games. It is idyllic, until he is eight, when his mother dies of cancer. "I felt her loss for many years," he writes later. Still, he adores his father, who loves him back.

He is a boy who is full of questions and likes to putter and take things apart. "What's the go o' that? What does it doo?" he asks his dad in their Scottish way of talking.

> Maxwell took Faraday's intuition and turned it into four equations that power the world.

When James is 12, he gets a toy that some call a "devil-on-two-sticks." It's a popular Chinese toy first brought to Europe by mariners around 1790. In China, its name is Fong Lai, which means "thunder wind," perhaps because when it spins fast, it makes a humming noise like a strong wind. In Europe, it was first called diavola, from Greek words meaning "throw" and "through." But diavola sounds a lot like the Spanish word for "devil," which is diabolo, and since this toy is a devil to tame, that becomes its name. The "devil" seems to defy gravity—but clearly it follows rules. Controlling the "devil" means experimenting, practicing, and thinking; James becomes good at these things.

When Maxwell grows up, he becomes a professor at King's College in London and then the first head of the soon-to-be-famous Cavendish Laboratory at Cambridge. But for relaxation, he plays devil-on-two-sticks all his life; it seems to help him solve problems. For someone who likes to play with ideas and objects, electricity and magnetism are irresistible.

These two, Faraday and Maxwell, will become a scientific team, although they never actually work together.

Faraday, who becomes the director of the Royal Institution, makes it clear that electricity and magnetism are different phases of the same force. Maxwell learns

You read nonfiction to learn something you don't know, so you need to pay attention in a way that often isn't necessary with made-up stories. I almost always read a work of informative writing with a pencil or marker in hand, and I read it more than once and take notes if I want to retain it in my head.

Nonfiction demands much of the reader, and it returns the favor by stretching the mind. I'm encouraged by the Common Core State Standards. Adding narrative nonfiction to school booklists means exposing students to essential information about our world, along with some great writing. (Check out *The Boys in the Boat* by Daniel James Brown, or *The Wright Brothers* by David McCullough, for examples of absorbing nonfiction. If you teach physics, and your students can handle calculus, check out *Spacetime Physics* by Edwin Taylor and John Wheeler for a great textbook. It begins with a parable.)

Reading informational writing is usually tougher than reading fiction. It's a skill that each of us develops for ourselves. We need to make that clear to students, helping them acquire different techniques and speeds for different materials, and understand that what works for one reader may not work for another. Something else: as readers, we need to evaluate and ask, "Is this book worth my time?" Maybe it isn't.

Today, many schools surround students with books and let them make their own choices. That makes sense. It also makes them part of the reading process, especially if their reading leads to writing of their own. ☐

## Endnotes

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that moving magnets create electric current, and that moving electrical charges create magnetic fields. The whole idea of electromagnetic fields is something new. Maxwell takes the idea seriously and goes with it. (Most people think it's curious, but no more than that.)

Faraday has become the century's outstanding experimenter. His experiments have led him to come up with brilliant hypotheses, but someone needs to prove his thoughts mathematically. Faraday never studied math in school. Without mathematics, it's hard for anyone to apply or verify scientific knowledge.

Maxwell is a skilled mathematician. He will provide the mathematics that links electricity and magnetism, and coin the word electromagnetism (EM). He comes along at just the right time.

Maxwell's Cambridge University thesis (which he must prepare in order to graduate) is about Faraday's experiments in electromagnetism. That gets him started. He concentrates on electromagnetism for 10 years and shows, through mathematical formulas, that electricity and magnetism do not exist in isolation from each other. Where one is, the other will be found. He gives scientists four formulas, called "Maxwell's equations," that link the two phenomena.

"Every problem involving electricity and magnetism (at the level of classical physics) can be solved by using Maxwell's equations," astrophysicist John Gribbin will write more than 100 years later. "Maxwell's work was, indeed, the greatest step forward in physics since Newton's work."

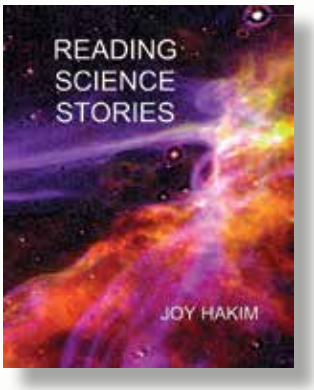
Newton's mathematical formulas made gravity understandable and usable; Maxwell's equations do the same for electromagnetism.

What Maxwell realizes is that light is electromagnetic and that it travels in waves. There is something else. When Maxwell understands that electromagnetic waves travel at the same speed as light, he immediately infers that light is electromagnetic. Then he confirms it mathematically. This is a huge step. Earlier scientists wondered about light, but they didn't know that it is electromagnetic.

Light is made of undulations. In simple words: An electromagnetic wave is composed of waves that are at right angles to each other. One is the electric field; the other is the magnetic field. A magnetic field creates an electric field that creates a magnetic field and on and on—each field is always at right angles to the previous field. (In contrast, sound waves move in a straight path, usually described as longitudinal.) In a letter to his cousin, Maxwell describes the idea of waves traveling across fields as "great guns." That's an understatement. Faraday conceived of those waves; Maxwell proves them mathematically.

To sum up: Maxwell's mathematics, based on Faraday's ideas, lays the foundation for an electromagnetic revolution, and that leads to an electrically powered world beyond imagining in the 19th century. It's the world of cellphones and computers that we now inhabit. Today, Michael Faraday and James Clerk Maxwell are ranked with the greatest scientists of all time.

–J.H.




*Reading Science Stories*, by Joy Hakim, is available as an e-book and offered at a 25 percent discount to *American Educator* readers until March 1, 2017. To order, visit **https://secure.mybookorders.com/Orderpage/1672** and use discount code AmEd16. For more about Hakim and her other work, see www.joyhakim.com.

# Understanding the New Federal Education Law

THE REAUTHORIZED Elementary and Secondary Education Act, recently known as No Child Left Behind (NCLB) and now known as the Every Student Succeeds Act (ESSA), is a long-overdue reset of the federal role in education policy.

This new law meets the goals set forth by the AFT: continuity of targeted funding, ending the federal government's involvement in teacher evaluation, ensuring that paraprofessional requirements remain intact, and ending the test-and-punish accountability system codified by NCLB. Ultimately, it provides an opportunity for a public education system that is much more focused on teaching and learning, and that gives states and educators more latitude while maintaining federal funding for the students who need it most.

Reauthorization came about with extensive AFT lobbying and grass-roots activism. These efforts included meetings between AFT officers and members of Congress, including one-on-one meetings with education committee chairs and ranking members, House and Senate leadership, and rank-and-file members. AFT President Randi Weingarten also met with President Obama and former Secretary of Education Arne Duncan, and maintained close communication with senior White House officials.

Additionally, AFT leaders and members testified in front of Congress and at congressional district-level town hall meetings, took more than 100,000 online actions related to the reauthorization, and submitted 20,000 comments to Congress.

The results paid off. While not perfect, there is much to applaud in this overhaul. ESSA:

- Protects the Elementary and Secondary Education Act's original intent of mitigating poverty and targeting resources to students in need, and it adds an early childhood investment.
- Prohibits the federal government from mandating or prescribing the terms of teacher or principal evaluation. The receipt of federal funds can no longer be conditioned on using test scores in teacher evaluation.
- Maintains paraprofessional certification requirements, which help prevent school districts from hiring paraprofessionals with little educational experience or professional training.
- Ends adequate yearly progress requirements and mandatory punitive sanctions, and provides states the opportunity to improve tests and create an accountability system that is less test-based, allowing joy to return to teaching and learning.

PHOTO COURTESY OF THE WHITE HOUSE

ESSA opens the door for the following much-needed changes: putting the emphasis in student learning on the things that matter most to parents and educators, allowing for interventions that will help struggling schools succeed, and empowering and supporting teachers to stoke students' curiosity and help them gain the skills and knowledge to pursue their dreams. Just as important, this new law is an opportunity for states to reset their accountability systems so that they both measure and reflect a broader vision of learning that values not only academic outcomes but also opportunities to learn, student engagement, and supports for educators and students alike.

Within parameters, states will set their own accountability systems, which no longer have to follow a rigid "adequate yearly progress" construct. States will still have to disaggregate and report student test scores by subgroup, but accountability systems can include nontest measures like working conditions, school climate and safety, and educator engagement.

Also, English language learners can have up to three years to take the language arts assessments in their native language before taking such tests in English. States can appropriately delay inclusion of English learners' test scores in accountability systems while they are first learning English, and can include former English learners for four years as part of the English learner subgroup.

States will set their own interventions for struggling schools. The federal government won't specify sanctions (school closings, teacher firings, forced transfers, etc.) in return for money. Also, states will set their own content standards and aligned assessments, and the federal government cannot require that states adopt the Common Core State Standards or administer PARCC or Smarter Balanced tests.

Seven states will be allowed to develop a performance assessment system like the one used by the New York Performance Standards Consortium. (For more on the Consortium, see page 4.) States will also be provided funds to audit their testing policies to decrease unnecessary tests.

In addition, ESSA expands collective bargaining protections to include both school improvement initiatives and teacher quality provisions. And class-size reduction remains an allowable use of funds, while community schools receive their own funding.

ESSA begins to take effect at the start of the 2016–2017 school year, with full implementation expected during the 2017–2018 school year.

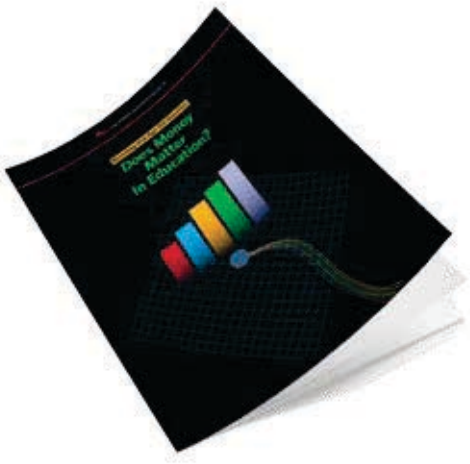
Seeking additional information or answers to questions about the new law? Visit **www.aft.org/essa** to learn more, or email the AFT government relations department at **essafacts@aft.org**.

–AFT GOVERNMENT RELATIONS DEPARTMENT

# The Question of Money and Education

By Bruce D. Baker

INCREASINGLY, political rhetoric adheres to the unfounded certainty that money doesn't make a difference in education, and that reduced funding is unlikely to harm educational quality. Such proclamations have even been used to justify large cuts to education budgets over the past few years. These positions, however, have little basis in the empirical research on the relationship between funding and school quality.




In an Albert Shanker Institute–commissioned report from which this article is drawn, I discuss major studies on three specific topics: (a) whether how much money schools spend matters, (b) whether specific schooling resources that cost money matter, and (c) whether substantive and sustained state school finance reforms matter. Regarding these three questions, I conclude:

## DOES MONEY MATTER?

**Yes.** On average, aggregate measures of per-pupil spending are positively associated with improved or higher student outcomes. The size of this effect is larger in some studies than in others, and, in some cases, additional funding appears to matter more for some students than for others. Clearly, there are other factors that may moderate the influence of funding on student outcomes, such as how that money is spent. In other words, money must be spent wisely to yield benefits. But, on balance, in direct tests of the relationship between financial resources and student outcomes, money does matter.

## DO SCHOOLING RESOURCES THAT COST MONEY MATTER?

**Yes.** Schooling resources that cost money, including smaller class sizes, additional supports, early childhood programs, and more-competitive teacher compensation (permitting schools and districts to recruit and retain a higher-quality teacher workforce), are positively associated with student outcomes. Again, in some cases, those effects are larger than in others, and there is also variation by student population and other contextual variables. On the whole, however, the things that cost money benefit students, and there is scarce evidence of more cost-effective alternatives.

## DO STATE SCHOOL FINANCE REFORMS MATTER?

**Yes.** Sustained improvements to the level and distribution of funding across local public school districts can lead to improvements in the level and distribution of student outcomes. While money alone may not be the answer, more equitable and adequate allocation of financial inputs to schooling provides a necessary underlying condition for improving the equity and adequacy of outcomes. The available evidence suggests that appropriate combinations of more-adequate funding with more accountability for its use may be most promising.

While there may in fact be better and more efficient ways to leverage the education dollar toward improved student outcomes, we do know the following:

- Many of the ways in which schools currently spend money do improve student outcomes.
- When schools have more money, they have greater opportunity to spend productively. When they don't, they can't.
- Arguments that across-the-board budget cuts will not hurt outcomes are completely unfounded.

* * *

In short, money matters. As a result, policymakers would be well-advised to rely on high-quality research to guide the critical choices they make regarding school finance.

Yet—despite the preponderance of evidence that resources do matter and that state school finance reforms can effect changes in student outcomes—not only has doubt persisted, but the rhetoric of doubt seems to have escalated. In many cases, direct assertions are made that schools can do more with less money; that money is not a necessary underlying condition for school improvement; and, in the most extreme cases, that cuts to funding might actually stimulate improvements that past funding increases have failed to accomplish.

The fact is, schools and districts with more money clearly have a greater ability to provide higher-quality, broader, and deeper educational opportunities to the children they serve.

Without funding, broadly endorsed efforts that are also viewed as tradeoffs (like focusing on teacher quality versus teacher quantity) and innovations (like online learning) are suspect. For example, one cannot trade spending money on class-size reductions for spending money to increase teacher salaries to improve teacher quality if funding is not there for either—if class sizes are already large and teacher salaries noncompetitive. While these are not the conditions faced by all districts, they are faced by many.

It is certainly reasonable to acknowledge that providing more money, by itself, is not a comprehensive solution for improving school quality. Clearly, money can be spent poorly and have limited influence on school quality. On the flip side, money can be spent well and have substantive positive influence. *However, money that's not there can't do either.* The available evidence leaves little doubt: sufficient financial resources are a necessary underlying condition for providing quality education.

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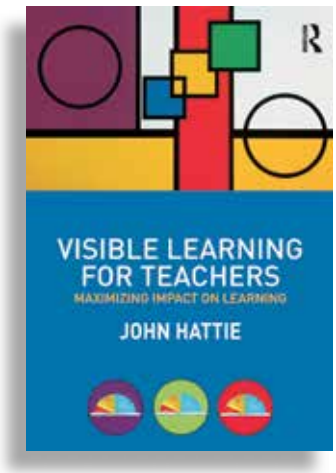
*Bruce D. Baker is a professor in the Graduate School of Education at Rutgers University.* *This article is excerpted from the Albert Shanker Institute report* Does Money Matter in Education?, *which is available at www.shankerinstitute.org/resource/does-money-matter.*

## VISIBLE LEARNING FOR TEACHERS: MAXIMIZING IMPACT ON LEARNING




The teaching philosophy of education professor John Hattie can be summed up in three words: "Know thy impact." In his book *Visible Learning for Teachers: Maximizing Impact on Learning* (Routledge), Hattie distills more than 15 years of research on teaching and learning to identify effective practices that educators and schools can use to help students reach their potential.

Because "teachers' beliefs and commitments are the greatest influence on student achievement *over which we can have some control*," as Hattie writes, the book outlines which interventions work best. It begins with a helpful definition of effect size, as well as a chart describing the instructional practices (for example, direct instruction, vocabulary programs, within-class grouping) that have high, medium, or low impacts on student learning.

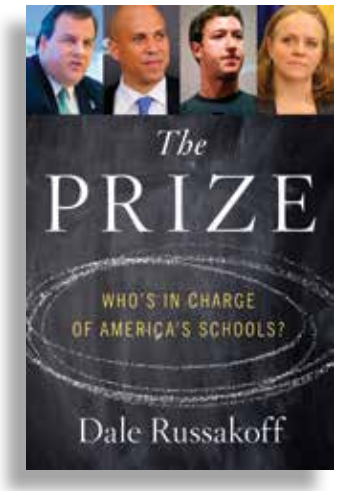
The bulk of the book focuses on the sequence of decisions that educators routinely make in preparing, starting, and ending lessons, as well as in gauging student learning and giving feedback. And it suggests ways educators can improve in these areas.

The final chapter examines the practices (for example, holding high expectations for all students, offering a rich and engaging curriculum, establishing positive relationships with parents) that teachers, school leaders, and school systems must engage in to help children succeed. Such practices enable students to "become their own teachers," Hattie writes, which in turn allows them to "exhibit the self-regulatory attributes that seem most desirable for learners (self-monitoring, self-evaluation, self-assessment, self-teaching)."

While largely focused on education research, the book does acknowledge the importance of passion. "It is among the most prized outcomes of schooling and, while rarely covered in any of the studies reviewed in this book, it infuses many of the influences that make the difference to the outcomes," Hattie writes. "It requires a love of the content, an ethical, caring stance deriving from the desire to instil in others a liking, or even love, of the discipline being taught, and a demonstration that the teacher is not only teaching, but also learning." In short, effective teaching and learning require passion—even if there's no precise way to measure it.

*Routledge is offering a 20 percent discount to* American Educator *readers on* Visible Learning for Teachers *through June 30, 2016. To order, visit* ***www.bit.ly/1UMq24i*** *and use discount code VLT20.*

## THE PRIZE: WHO'S IN CHARGE OF AMERICA'S SCHOOLS?




In *The Prize: Who's in Charge of America's Schools?* (Houghton Mifflin Harcourt), journalist Dale Russakoff chronicles the $100 million gift Facebook founder Mark Zuckerberg gave to New Jersey's Newark Public Schools in September 2010. The gift, which Zuckerberg announced to much fanfare on *The Oprah Winfrey Show*, was supposed to transform one of the poorest and lowest-performing school districts in America. Russakoff's well-researched account shows that it didn't.

The author admits her initial optimism about the gift, which Cory Booker, the city's mayor at the time, had solicited. She hoped to document how the money "would interact with and perhaps mitigate some of the forces that had dragged the city down for so long," she writes. But "the story that emerged was less promising than I expected."

For four and a half years, she followed the money and interviewed all those involved. In time, she learned that the reformers who wanted to improve the district with outside, highly paid consultants "never really tried to have a conversation with the people of Newark," she writes. In fact, residents learned of the gift at the same time the rest of America did—if they happened to be watching *Oprah*.

Russakoff provides details of where the gift went—to charter schools, consultants, and Teach for America, to name a few recipients—in a helpful appendix. She concludes with a chapter aptly titled "No Excuses," the mantra of reformers across the country, not just in Newark, who believe that outside influences, such as poverty and crime, are used only as excuses for why children don't succeed. But Russakoff's book shows that even a wildly ambitious philanthropic experiment cannot fix deeply entrenched societal problems that impede student achievement.

By the book's end, Russakoff notes the election of Ras Baraka as the city's new mayor and takes a slightly more hopeful tone. Baraka, she writes, seemed on track to implement "some of his own brand of reforms—like community schools, with social services for families and neighborhoods as well as students—financed with some of the Zuckerberg bounty."

In addition, dollars from the gift had also started going to "the mayor's summer youth-employment program" and "a citywide campaign to increase the college graduation rate," prompting Russakoff to observe that "the voices of Newark, it appeared, were beginning to be heard."

# Instructional Materials to Support Standards

EDUCATORS SEEKING high-quality instructional materials to help improve teaching and learning in their classrooms can turn to Student Achievement Partners (SAP). The nonprofit organization, which led the writing of the Common Core State Standards, offers free information and resources on its website (**www.achievethecore.org/about-us**). Its materials are a great support to educators looking to ensure their students are college and career ready and help them reach their full potential.

Many of the resources available on the site have been shaped and reviewed by members of the American Federation of Teachers thanks to the union's partnership with SAP. As a result, the materials reflect teacher voice and all that members have said they need to help them teach their students.

Registration is quick, easy, and free. Once signed in, you will have access to high-quality tools and resources such as:

**Instructional Practice Guide: Coaching Tool (www.bit.ly/1X8HjGJ)**
This tool assists teachers, and those who support them, in understanding Common Core–aligned instruction through non-evaluative observations. The purpose of the Coaching Tool is to encourage conversation between instructional coaches and teachers and to encourage individual teachers' self-reflection.

**Instructional Practice Guide: Lesson Planning Tool (www.bit.ly/1salKEG)**
This tool provides guiding questions and supports to help teachers create lessons aligned to the Common Core. For example, English language arts teachers will be guided through the process of creating a lesson on close reading, while math teachers will focus on grade- or course-level standards in developing lessons.

**Teaching the Core Video Library (www.teachingthecore.org)**
The library is a free, searchable database of lessons annotated to highlight moments of exemplary Common Core–aligned instruction. Each videotaped lesson includes:

- A lesson plan and materials;
- Examples of student work;
- An interview with the teacher; and
- Educator-authored descriptions of specific Common Core lesson elements, as defined by the Coaching Tool.

These lessons have been carefully reviewed and annotated by experienced educators and content experts, including AFT members, using SAP's Instructional Practice Guide.

**Achieve the Core's Blog, *Aligned* (www.achievethecore.org/aligned)**
*Aligned* is a blog dedicated to the conversation about Common Core–aligned instructional materials. It also features discussions of educational trends that inform the way educators think about the alignment of instructional materials.

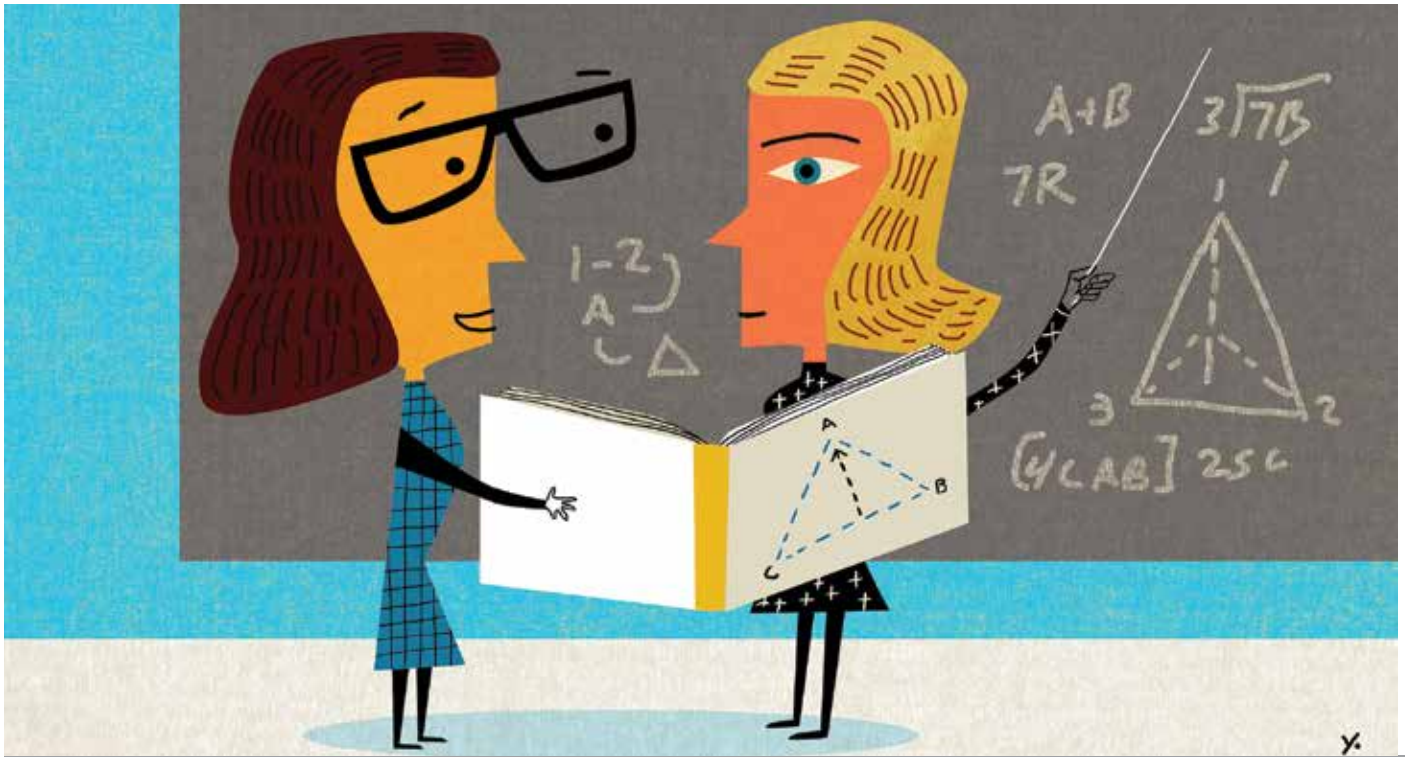
## Become a Core Advocate

Do you believe in the potential of the Common Core? Are you eager to support your colleagues and communities in understanding and advocating for these standards and the shifts in instruction and assessment they require? If you answered yes to these questions, consider becoming a Core Advocate.

Through its Core Advocate Program, SAP provides robust training to educators from across the country around not only the Common Core but also teacher leadership. After attending an orientation, Core Advocates work to bring a better understanding of the Common Core back to their own schools and communities and even to improve understanding at the national level.

This spring, at a May 14–15 conference in Denver, Core Advocates from across the country will come together for workshops and keynote speakers, plus a few surprises. For more information on the application process and how to receive complimentary registration, travel, and housing, send an email to the AFT's educational issues department at **edissues@aft.org**.

–AFT EDUCATIONAL ISSUES DEPARTMENT




JAMES YANG

sharemylesson
POWERED BY AFT

# Building a Classroom Community

BETWEEN TEACHING academic content and ensuring that students acquire the social and emotional skills to reach their full potential, educators have much to accomplish on a daily basis. Many new teachers, as well as some experienced ones, may feel overwhelmed as they make sure students are learning everything they need to know to succeed in school and beyond.

As educators know all too well, the instruction of students involves more than teaching lessons, building knowledge, and helping students meet academic standards. Building a classroom community is just as important. By fostering strong relationships among students, teachers can make a significant impact on student success.

As educator, author, and blogger Julia Thompson says, "The benefits of a classroom community … clearly outweigh any potential problems. Students who feel a sense of connection to their classmates … and to their teachers are much more likely to behave with courtesy and self-discipline." These connections, in turn, will help them succeed on mandated exams and develop key communication and life skills.

While every classroom is different, it is those differences in the personalities of teachers and students that can make for an incredible community of learners. The AFT's own Share My Lesson (**www.sharemylesson.com**) offers the following helpful resources that outline the basic steps for educators to take so they can build a community of respectful learners:

- Get to know your students and connect with them on a meaningful level (**www.bit.ly/1WVcpkd**).
- Lessen the emotional distance between you and your students in the classroom (**www.bit.ly/21DB1F5**).
- Encourage your students to get to know each other (**www.bit.ly/1pnUHvt**).
- Guide your students as they learn to recognize their commonalities, and engage them in shared activities (**www.bit.ly/1L6akl8**).

Building classroom communities can support effective instruction. To that end,

Share My Lesson has launched a blog series written by Thompson, available at **www.sharemylesson.com/blog**, to help educators implement these strategies in their own classrooms. Each blog post suggests easy-to-use tips that teachers can follow as they seek to create respectful classroom communities.

If you have ideas or strategies for building classroom communities, let us know! Just send an email to **share@aft.org**.

–THE SHARE MY LESSON TEAM

## RESOURCES

### A LOOK AT ESSA

The U.S. Department of Education is tackling key questions surrounding implementation of our nation's new education law, the Every Student Succeeds Act (ESSA), and has released guidelines to address ways the department is prepared to help states identify and eliminate low-quality, redundant, or unhelpful testing. The department clarified that, aside from providing technical assistance and feedback, monitoring educator evaluation is beyond the scope of the department. Timelines also are laid out—for the most part, what is in place for states and districts in 2015–2016 can remain so in 2016–2017—giving a year for all stakeholders to work together and fashion new accountability systems and intervention strategies. (Additional details about ESSA can be found on page 38 of this issue.) The federal guidelines and other ESSA-related resources are available at **http://1.usa.gov/1Pm90cf**.

### HUMAN RIGHTS LESSONS

Want to teach students about the sweatshops generating all those label-laden clothes they love? Or inspire them with Nelson Mandela's biography? Or help them advocate for girls around the world persecuted for attending school? Go to the AFT's Teach Human Rights website for lessons in all these areas. Developed by classroom teachers, lessons focus on pressing issues—from child trafficking in the United States to recognizing patterns of hate and genocide. Find them at **www.teachhumanrights.com**, and check out **www.sharemylesson.com** for additional ideas.

### AN INSIDE LOOK AT COMMUNITY SCHOOLS

Interested in learning about community schools? The American Federation of Teachers has published case studies of community schools in Albuquerque, New Mexico, and Saint Paul, Minnesota, that chronicle the history of these schools, explain the role of resource coordinators, and detail wraparound services, such as dental care and housing assistance, offered to students and their families. Find these studies at **http://go.aft.org/AE116res1** and **http://go.aft.org/AE116res2**. Also, a new report by the Coalition for Community Schools, the Center for Popular Democracy, and the Southern Education Foundation, *Community Schools: Transforming Struggling Schools into Thriving Schools*, profiles other successful community schools across the country. Read it at **www.bit.ly/1VznaZp**.

### ALL THE SMALL THINGS

Nanotechnology—science in dimensions down to one-billionth of a meter—can engage students in STEM (science, technology, engineering, and mathematics). To introduce this field, the National Science Foundation and NBC Learn have created "Nanotechnology: Super Small Science," a six-part series of short, free videos. Find them at **http://1.usa.gov/1Q9s9lc**.

## Performance-Based Assessment

*(Continued from page 10)*

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*(Continued from page 18)*

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