

World-Class Ambitions, Weak Standards

An Excerpt from The State of State Science Standards 2012

Since Sputnik shot into orbit in 1957, Americans have considered science education to be vital to our national security and economic competitiveness. The impact of the Soviet satellite launch on American science classrooms was almost immediate. Shirley Malcom, a leader in the field of science education (and presently head of education programs for the American Association for the Advancement of Science), was a young student in Alabama at the time. She described the swift and palpable shift in the way science was taught:¹

We stopped having throwaway science and started having real science.... All of a sudden everybody was talking about it, and science was above the fold in the newspaper, and my teachers went to institutes and really got us all engaged. It was just a time of incredible intensity and attention to science.

The impact on public opinion was just as

The State of State Science Standards 2012, published by the Thomas B. Fordham Institute, is available at www.edexcellence.net/publications/the-state-of-state-science-standards-2012.html.



profound—and national concern over the quality of American science, and science education, has continued for the past half century. According to a 2011 survey, 74 percent of Americans think STEM (science, technology, engineering, and mathematics) education is “very important.” Only 2 percent say it’s “not too important.”²

Yet this strong conviction has not translated into strong science achievement. The 2009 National Assessment of Educational Progress (NAEP) found barely one-third of fourth-graders in the United States at or above the “proficient” level in science, with those proportions slipping to 30 percent in eighth grade and a woeful 21 percent in twelfth grade.³

Why is this? How can it be that, for more than five decades, Americans have voiced so much concern about science education yet made so little progress in delivering it? There are, of course, multiple explanations, starting with the blunt fact that few states and communities have taken concrete action to build world-class science programs into their primary and secondary schools. Without such programs in place to deliver the goods, our Sputnik-induced anxieties remain fully justified some 55 years later.

A solid science education program begins by clearly establishing what well-educated youngsters need to learn about this multifaceted domain of human knowledge.

Here, the first crucial step is setting clear academic standards for the schools—standards that not only articulate the critical science content students need to learn, but that also properly sequence and prioritize that content. In the light of such standards, teachers at each grade level can clearly see where they should focus their time and attention to ensure that their pupils are on track toward college and career readiness. That doesn’t mean it will happen, of course. As we at the Thomas B. Fordham Institute have repeatedly noted, standards alone cannot drive outstanding achievement. But they are a necessary starting point. They are the score for conductors, musicians, instrument makers, and more. They are the foundation upon which rigorous curricula and instructional materials and assessments are built. They are the template for preparing science teachers for our classrooms.

Fordham has a long-standing interest in science standards and a history of reviewing them with care and rigor. We published our first analysis of state science standards in 1998 and a follow-up review in 2005. Unfortunately, the findings from both evaluations were not good. In 1998, just 36 states had even set standards for science, and only 13 of those earned grades from our reviewers in the A or B range. By 2005, though every state except Iowa had

Undermining Evolution

Where State Standards Go Wrong

According to *The State of State Science Standards 2012*, four problems were found frequently among the mediocre to poor standards: *undermining evolution, including vague standards, failing to integrate inquiry skills with content, and avoiding mathematical formulae and equations.* To complement the main article’s study of how high school biology teachers approach evolution (see page 12), the following is an updated version of the report’s discussion of how evolution is undermined.

—EDITORS

“Nothing in biology makes sense except in the light of evolution.” So wrote famed biologist Theodosius Dobzhansky in 1973.¹ And so it is today. Yet controversy continues to envelop the teaching of evolution in American schools. One wonders, indeed, how much progress we’ve made in this realm since the Scopes trial in 1925. Six years ago, our science reviewers noted:²

The attack on evolution is unabated [since 2000], and Darwin’s critics have evolved a more subtle, more dangerous approach. A decade ago, the anti-evolution movement ... argued vigorously

for explicit teaching of the evidence for intelligent design....

The claim now is that evidence against “Darwinism” exists, that curriculum-makers should include it as an exercise in critical thinking, and that “freedom of speech” or “fairness” requires that they do so. The hidden agenda is to introduce doubt—any possible doubt—about evolution at the critical early stage of introduction to the relevant science.

While many states are handling evolution better today than in the past, anti-evolution pressures continue to threaten state science standards. In April 2012, for example, Tennessee passed a law that enables teachers to bring anti-evolution materials into the classroom without being challenged by administrators. This law is similar to the Science Education Act passed in June 2008 in Louisiana, which is ostensibly an “academic freedoms act” meant to give teachers and students legal cover to debate the merits and veracity of scientific theories. In practice, such measures push a pro-creationist agenda—and give cover to those looking to teach intelligent design creationism. Though both acts are freestanding statutes with no

articulated K–12 science standards, the results were equally disheartening: just 19 earned honors grades, and the overall average was barely a C.

This, our third review, provides analyses of the K–12 science standards currently in place in all 50 states and the District of Columbia, as well as the framework that undergirds the NAEP science assessment. The results of this rigorous analysis paint a fresh—but still bleak—picture. A majority of the states’ standards remain mediocre to awful. In fact, the average grade across all

assessment framework. And seven states earn grades in the B range. But this also means that just 13 jurisdictions—barely 25 percent, and fewer than in 2005—earn a B or better for setting appropriately clear, rigorous, and specific standards.

Of course, as one of our reviewers noted in 1998:

When it comes to academic standards ... even a “B” ought not be deemed satisfactory. In a properly organized education system, standards drive

academic achievement. Several states with exemplary science standards still aren’t serious about setting high proficiency bars on their assessments. Others don’t hold students (or their teachers) properly accountable for learning (or successfully imparting) important content. And still others haven’t provided (or directed teachers to) the curricular and instructional resources that teachers need to drive achievement. But, while standards alone won’t drive achievement, they are an important place to start.

Of the 44 jurisdictions that have revised, replaced, or created their science standards since our 2005 analysis, 11 have shown some improvement, and some of that improvement has been dramatic. Kansas, for example, moved from an F to a B, and Arkansas moved from a D to a B. The District of Columbia rose from a mediocre C in our last analysis to a best-in-class A this time.

By contrast, 16 states managed to make their standards worse since 2005. In fact, five of them—Colorado, New Jersey, North Carolina, Tennessee, and West Virginia—dropped from Bs to Ds.

Note, however, that our criteria have changed since 2005. Therefore, changes in a state’s grade could be due to changes in the quality of the standards, changes in our criteria, or both.* On balance, the combination of improvements and worsenings had little impact on our national average. □

(Endnotes on page 40)

*For more information on our grading metric, see Appendix A of the report.

A majority of the states’ science standards remain mediocre to awful. In fact, the average grade across all states is a low C.

states is—once again—a thoroughly undistinguished C. (In fact, it’s a low C.) In 27 jurisdictions, the science standards earn a D or below. Yet this very weakness in what states expect of their schools, teachers, and students in science suggests that a purposeful focus on improving—or replacing—today’s standards could be a key part of a comprehensive effort to boost science performance.

Two jurisdictions—California and the District of Columbia—have standards strong enough to earn straight As from our reviewers. Four other states—Indiana, Massachusetts, South Carolina, and Virginia—earn A-minuses, as does the NAEP

everything else. If they are only “pretty good,” then “pretty good” is the best the system is apt to produce by way of student learning. No state should be satisfied with such a result. Hence, no state should be satisfied with less than world-class standards in a core academic subject such as science.

States looking to improve their standards, however, need not start from scratch. They can look to places like California and the District of Columbia, and also to the NAEP assessment framework, for models of excellence.

Let us repeat that even the finest of standards alone will never yield outstanding

direct link to the states’ academic standards, they do damage by allowing for the introduction of creationist teaching supplements—thereby affecting classroom instruction.³

Tennessee and Louisiana are not the only states that have tried to undermine the teaching of evolution through legislation. In 2011 alone, anti-evolution bills were introduced in seven state legislatures.⁴

Of course, most anti-evolution efforts are aimed more directly at the standards themselves. And these tactics are far more subtle than they once were. Missouri, for example, has asterisked all “controversial” evolution content in the standards and relegated it to a voluntary curriculum that will not be assessed. (Sadly, this marks a step back from that state’s coverage of evolution in 2005.) Tennessee includes evolution only in an elective high school course (not the basic high school biology course). And Maryland includes evolution content in its standards but explicitly excludes crucial points from its state assessment.

Other states have undermined the teaching of evolution by singling it out as somehow not quite as “scientific” as other concepts of similar breadth. A common technique—used to a greater or lesser extent by Colorado, Missouri, Montana, and West Virginia—is to direct students to study its “strengths and weaknesses.”

Far too often, important evolution content is included, but minimally. Some states mention evolution just once in their standards and never revisit it. Others—including Indiana, Iowa, Kansas, Kentucky, Michigan, and Nebraska—unnecessarily delay it until high school.

Even some of the nation’s best standards subtly undermine the teaching of evolution. In California, for example, students are told to “understand science, not necessarily [to] accept everything taught.” In New York, students learn that “according to many scientists, biological evolution occurs through natural selection.” (This is not according to “many” but, in fact, all true scientists.)

Finally, conspicuously missing from the vast majority of states’ standards is mention of human evolution—implying that elements of biological evolution don’t pertain to human life. This marks a subtle but important victory for creationists: even states with thorough and appropriate coverage of evolution (e.g., Massachusetts, Utah, and Washington) shy away from linking the controversial term with ourselves. Only four states—Florida, New Hampshire, Iowa, and Rhode Island—openly embrace human evolution in their current science standards. (Pennsylvania, which referenced human evolution in its previous standards, has omitted it from the more recent version.) □

(Endnotes on page 40)

Weak Standards

(Continued from page 19)

Endnotes

1. Cornelia Dean, "When Science Suddenly Mattered, in Space and in Class," *New York Times*, September 25, 2007.
2. Research!America, *Your Congress—Your Health: National Public Opinion Poll* (Alexandria, VA: Research!America, March 2011).
3. National Center for Education Statistics, *The Nation's Report Card: Science 2009; National Assessment of Educational Progress at Grades 4, 8, and 12* (Washington, DC: Institute of Education Sciences, January 2011).

Undermining Evolution

(Continued from page 19)

Endnotes

1. Theodosius Dobzhansky, "Nothing in Biology Makes Sense Except in the Light of Evolution," *The American Biology Teacher* 35 (1973): 125–129.
2. Paul R. Gross, *The State of State Science Standards 2005* (Washington, DC: Thomas B. Fordham Institute, December 2005), 7.
3. For details on Tennessee's new law, see <http://wapp.capitol.tn.gov/apps/BillInfo/Default.aspx?BillNumber=HB0368>; for details on Louisiana's law, see "Bulletin 741—Louisiana Handbook for School Administrators," published by the Louisiana Board of Elementary and Secondary Education, at www.doa.louisiana.gov/osr/lac/28v115/28v115.doc. Section 2304 stipulates how the Science Education Act is to be administered by school administrators and teachers at the parish and local levels.
4. "Antievolution Legislation Scorecard," National Center for Science Education, April 8, 2011, www.ncse.com/evolution/antievolution-legislation-scorecard.

INTENTIONALLY
LEFT BLANK