

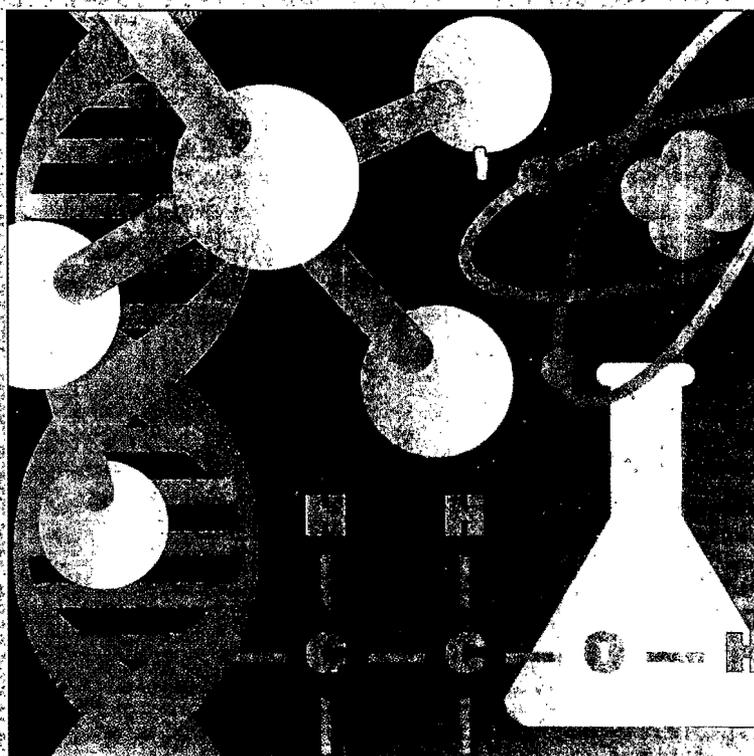
# State Science

An Appraisal  
of Science  
Standards  
in 36 States

March 1998



# Standards



By **Lawrence S. Lerner**

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The Thomas B. Fordham Foundation is pleased to bring you our two most recent reports--on state mathematics and science standards--enclosed herewith. The text that follows is that of the press release announcing them.

## **States Must Have Tougher Math and Science Standards if U.S. Test Scores Are to Improve, New Reports Show**

*In Wake of Dismal TIMSS Results, Expectations for Students Remain Low*

**States Receiving A's for Their Math Standards: CA, NC, OH**

**States Receiving A's for Their Science Standards: IN, CA, HI, AZ, NJ, RI**

**States Earning Lowest Marks: AR, FL, ID, KY, MD, ME, MI, MT, NE, NH, NM, ND, OK, & SD**

WASHINGTON, DC – March 10, 1998 – Most states must demand more of their students in mathematics and science if the United States is to improve its appalling performance on international examinations, according to new reports commissioned by the Thomas B. Fordham Foundation analyzing states' academic standards.

Released two weeks after the latest findings of the Third International Mathematics and Science Study (TIMSS), the reports criticized the low quality of most states' math and science standards. Only California, North Carolina, and Ohio received A's for their math standards, and only Indiana, California, Hawaii, Arizona, New Jersey, and Rhode Island received A's in science [*see attached tables*].

The math standards of 46 states were evaluated, as were the science standards of 36 states. More than a third of them flunked in math, and one quarter of the states received failing grades in science, according to *State Mathematics Standards* and *State Science Standards*, both released today by the Fordham Foundation, a private organization dedicated to educational excellence.

The low quality of state standards is particularly alarming given 12<sup>th</sup> grade TIMSS findings released last month. American seniors ranked 19<sup>th</sup> out of 21 countries in math, and 16<sup>th</sup> out of 21 countries in science. America's most advanced 12<sup>th</sup> graders placed dead last in both subjects when compared to similar students in other nations.

"State standards don't deserve all the blame for this as many are brand new," said Chester E. Finn, Jr., president of the Fordham Foundation. "But it's time to ask whether today's state standards are apt to improve the situation—and it's far from clear that they will."

"Our distinguished analysts found that many states have set the math and science bars too low," Finn said. "Too many of these standards are vague, flimsy, illogical, or just plain sloppy. Too many are based on romantic but erroneous notions of children and learning. Too many bear the fingerprints of trendy 'reformers' and 'experts' rather than genuine mathematicians and scientists. Too many want kids to feel good about math and science, rather than be able to solve problems correctly and conduct valid experiments."

"The good news is that this situation is not terminal," Finn noted. "The solid work of a few states proves that challenging standards can be set – three states earned 'A's' in math, as did six in science. California and Arizona managed the remarkable feats of honors grades in both. The question now is how many others will follow their fine lead."

### **Latest Salvo in the "Math Wars"?**

While most state math standards are disappointing, the country's newest set of standards, from California, is its best. California's hot-off-the-presses standards earned a perfect score, besting even Japan's (which were examined in the Fordham report for purposes of comparison).

The report says of these standards: "Here the 'reform' philosophy of what its opponents sometimes have called 'fuzzy math' is firmly rejected. . . . If teachers and textbooks can be found to carry it through properly, this *Standards* document outlines a program that is intellectually coherent and as practical for the non-scientific citizen as for the future engineer."

California's standards are neither dumbed-down nor "drill and kill." According to the report, the dichotomy between "higher order math skills" and "back-to-basics" is mistaken: "One can no more use mathematical 'concepts' without a grounding in fact and experience, and indeed memorization and drill, than one can play a Beethoven sonata without exercise in scales and arpeggios."

Authors Ralph A. Raimi of the University of Rochester and Lawrence S. Braden of St. Paul's School judged state math standards for their clarity, content, reason, and absence of mathematical error and jargon. Prominent mathematician Henry Alder and renowned psychologist Harold Stevenson advised their work.

According to the report, the most serious failure was found in the domain of mathematical reasoning. "In too many state standards," Raimi explained, "a strained emphasis on 'real-world problem solving' has replaced reasoning with the appearance of relevance, stripping mathematics of its essential core while belaboring the trivial."

Braden added: "There is a mistaken notion that tough standards, like those in California, emphasize basic arithmetic over 'deep understanding.' That couldn't be further from the truth. Good standards ensure plenty of both."

California Governor Pete Wilson said of the Thomas B. Fordham Foundation's "A" grade for its newly adopted mathematics standards, "This is yet again evidence that our State Board of Education did a remarkable job developing the most rigorous, complete math standards in the world. These demanding standards set the bar of student performance very high, which is the key to improving mathematics achievement for all students."

### **Science Standards Also Show Room for Improvement**

Of the five academic subjects that the Fordham Foundation studied, science standards rated the highest. Still, they're not what they should be: while thirteen states earned A's and B's, nine states flunked, seven received D's, and seven earned C's. Fourteen states do not have science standards or did not make them available for review.

Indiana received the top score. Its standards document is a "model of clarity, accuracy, and completeness," the report said. "A student who fulfills the requirements set forth will have received an excellent education."

Lawrence S. Lerner, professor of physics and astronomy at California State University, Long Beach, judged state science standards on the basis of their purpose, expectations, audience, organization, content, quality, and avoidance of pseudo-science and bias. A panel of five scientists and educators advised him.

Why have state authorities fared better with their science standards? "A kind of consensus has developed around four models that have been in circulation for some years," the report conjectures. "Although these models have been the subject of considerable controversy, that controversy has never reached the level of intensity engendered by the rival models in mathematics."

Lerner points out that standards are a floor, not a ceiling: "Good standards are important because they're the first step on our long journey to scientific prowess."

Lisa Graham Keegan, State Superintendent of Education in Arizona, one of six states to receive an A, explained the importance of strong science standards: "Scientific and technological literacy will be as important in the 21<sup>st</sup> century as basic English literacy was in the 20<sup>th</sup>. If we want our students to become informed citizens and competitive workers, we must ensure that they master the fundamentals of science. We in Arizona are proud to have standards in science and math that will raise expectations for both teaching and learning."

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The Thomas B. Fordham Foundation is a private foundation based in Washington, DC, devoted to quality-based reform of elementary and secondary education in the United States. These two reports are the last of the Foundation's appraisals of state academic standards in the five core subjects identified in the national education goals that the President and governors adopted in Charlottesville in 1989. *State English Standards*, by Sandra Stotsky, was published in July 1997. *State History Standards*, by David Warren Saxe, and *State Geography Standards*, by Susan Munroe and Terry Smith, were released in February 1998. **All are available on the Foundation's web site: <http://www.edexcellence.net>. Copies can be obtained by calling 1-888-TBF-7474 (single copies are free).**