

A Brief History of the California Science Content Standards and the Outlook for Their Future

by Christine Bertrand

Science teachers in California, particularly those newer to the profession, often wonder about our state science content standards—how they came about, who wrote them, and, most often, when they will be updated. There are no short answers, nor is there likely to be consensus on the answers, to the first two questions. As for the third question, the answer is: apparently never.

To help put a context to our state’s science standards and how, if at all, they answer the “depth versus breadth” question, we thought we’d attempt to shed some light on the processes that brought them about and what teachers might look for in the future. CSTA was present and visible during the many months of development of the science standards and, as such, had a front row seat for all the machinations that resulted in the standards we have today. But so did innumerable other participants, and speaking to any one of them about the process will most assuredly present a different interpretation of events. However, all parties would most likely agree that the process was difficult and

at many times acrimonious, and whether or not the resulting set of standards are embraced by all parties to the process most definitely depends on who you talk to.

How Did California's Science Standards Come About?

Early in the 1990s, California's test scores on the National Assessment of Educational Progress (NAEP), the "nation's report card," had been steadily dropping. By 1994, California ranked at the bottom of the scale among all states on some of the subject matter tests, most notably among them, reading. A general consensus was building that schools nationwide needed to engage in a concerted testing regime that was built on standards of what students should know and be able to do by the time they graduated from high school.

The newly-elected California Superintendent of Public Instruction at that time, Delaine Eastin, began an effort in California to develop what she called "challenge standards": Districts were given the opportunity to develop content and performance standards and to set other achievement goals, including increasing their graduation requirements and decreasing their dropout rates, in an effort to improve student achievement. Although the push was strictly voluntary, the thought was also that these "challenge standards" might form the model for the anticipated development of statewide academic standards. But that expectation was not realized.

In 1995, the California legislature passed, and Governor Pete Wilson signed, AB 265, the "California Assessment of Academic Achievement Act." As the title of the legislation implies, the purpose of the act was to "provide a system of individual assessment of pupils that has, as its primary purpose, assisting pupils,

their parents, and teachers to identify individual academic strengths and weaknesses, in order to improve teaching and learning.”¹ However, the legislation was also enacted to “determine the effectiveness of school districts and schools, as measured by the extent to which pupils demonstrate knowledge of the fundamental academic skills, as well as the ability to apply those skills.”¹

Ancillary to the establishment of the testing scheme, the legislation provided for the development of a “set of statewide academically rigorous content standards and performance standards in all major subject areas to serve as the basis for assessing the academic achievement of individual pupils, as well as for schools, school districts, and for the California education system as a whole.”¹ The bill further instructed that the performance standards “shall be designed to lead to specific grade level benchmarks of academic achievement for each subject area tested within each grade level and shall be based on the knowledge and skills that pupils will need in order to succeed in the information-based, global economy of the 21st century.”¹

It is evident, then, that the legislation which brought about the state’s content standards was very much about testing and accountability and not so much about academic knowledge, educational content, or pedagogy. In fact, the academic content standards required to be developed by the state are considered only models which districts are under no obligation to adopt as their own: “The standards adopted pursuant to this section shall be for the purpose of guiding state decisions regarding the development, adoption, and approval of assessment instruments pursuant to this chapter and *shall not be construed to mandate any actions or activities by school districts* (emphasis added).”¹ Later

legislation, AB 2105, specifically clarified that the standards are to be considered models which schools may use as “voluntary benchmarks for the development of local academic standards.” The hammer to get districts to adopt the state standards as their own is, of course, the testing requirement, as the state tests were built around the state standards.

AB 265 also provided for the formation of a Commission for the Establishment of Academic Content and Performance Standards (Academic Standards Commission) to develop the foundation upon which the accountability system would be built—the content standards— and to recommend to the State Board of Education the standards for reading, writing, and mathematics first, and then the “other core curriculum areas”—science and history-social science. Consequently, the reading/language arts and math standards were begun in 1996 and adopted in 1997, and the science and history/social science standards were begun in 1997 and adopted in 1998.

The commission consisted of the Superintendent of Public Instruction (SPI) and 20 members appointed as follows: Eleven by the governor, six by the SPI, one appointed jointly by the governor and the SPI, and one each appointed by the Senate Rules Committee and the Speaker of the Assembly. (Later legislation, SB 430, replaced the jointly-appointed member with an additional member appointed by the governor only.) Although the legislature expressed its intent that the commission include parents, classroom teachers, business representatives, and “individuals with expertise in pupil assessment or expertise in subject matter areas included in the statewide pupil assessment program,”¹ the intent was not a mandate of the legislation and, in fact, the commission as initially configured included no current classroom

teachers. Later configurations of the commission, and the one in effect when the science standards were being developed, consisted of four classroom teachers, a couple of former teachers, several individuals from higher education institutions, some business representatives, and one notable scientist.

It should be noted by the dates above that the California standards movement predated by several years the federal No Child Left Behind (NCLB) Act. Indeed, much of California's standards and assessment program, including standardized tests, performance level indicators, rewards and sanctions, were in place and being implemented in the state by the time NCLB was passed in 2002 and were well established by the time NCLB's program mandates became public in subsequent years. Thereafter, our state leaders have found themselves in a constant struggle trying to make California's accountability system mesh with the requirements of the federal law.

One example of trying to fit our round peg into NCLB's square hole arose in the testing of science. California's high school standards were developed as a 9-12 grade span, rather than as subjects assigned to a specific grade, this intentionally to allow districts the flexibility to construct a science program that made sense for their students. Many districts were following high school sequences that deviated from the "traditional" biology-chemistry-physics sequence of courses, and many districts offered a rigorous integrated science approach. Our state testing program, STAR, required that students enrolled in a standards-based course would take the end-of-term exam for that subject, regardless of what particular grade they were in, 9, 10, 11, or 12.

When NCLB came along, however, the federal law required that all students in a district be tested in the same subject in some

grade during grades 9-11 and, furthermore, that the participation rate for the test must be at least 95 percent of students. Because of California's flexible high school grade span standards, it was virtually impossible to find a grade at which 95 percent of students would be taking the same course. The State Board of Education, therefore, decided to introduce the NCLB-required high school test at 10th grade and to have it encompass the high school biology and middle school life science standards. Although the board reasoned that a 10th grade biology test would give the best chance of reaching the 95 percent participation rate, this decision was inconsistent with the state's grade span standards and negated the purpose of allowing flexibility in the high school program. In many districts, the new mandate necessitated the restructuring of their entire science program to ensure that their students had the required biology background by 10th grade.

Who Wrote the Standards?

This question is one of those to which the answer is, "It depends on who you ask." Ostensibly, the standards were written by consultants to the Academic Standards Commission in private writing sessions conducted over the course of a year, more or less, and were approved by the commission in public meetings with ample opportunity for public input. However, the process that resulted in the standards we now have was not so straight-forward nor so open and clear.

Trouble started early on when the Academic Standards Commission initially awarded the consulting contract to a group of science educators who had written a winning proposal. The decision was immediately criticized and appealed by a second group of individuals who, although having submitted an incom-

plete proposal, were willing to provide their services free of charge. Although both teams counted Nobel prize-winning scientists among their advisors, the two groups became identified as the “educators” and the “scientists,” and what media as was paying attention at that point derided the decision of the commission to reject the free services of Nobel laureates in helping write the standards in favor of what they derogatorily termed “educrats.”

The make-up of the two consultant groups was not the real issue, however. The real problem was the differing fundamental belief of each group about the way science should be taught and the role of scientific inquiry in K-12 science education. The “educator” group believed that science content could not be separated from scientific process, since science is both knowledge and a way of knowing. The other group, on the other hand, felt strongly that students must have a background in science fact, delivered primarily through direct instruction, before they can engage in any meaningful science experimentation. The former group subscribed to the National Science Education Standards, developed by the National Research Council of the National Academy of Sciences, while the latter group disdained the national standards and questioned their validity and the scholarship that brought them about.

The resolution to the consultant dilemma was the creation of an unhappy hybrid of having one consultant from each group act as facilitators in bringing the best ideas from each group to the table in an effort to devise a balanced curriculum. Bonnie Brunkhorst, professor of biology and science education at California State University-San Bernardino, was tapped to lead the “inquiry” position, and Stan Metzenberg, biology professor from California State University-Northridge, led the the “direct

instruction” position. While it might have appeared to be a good solution in theory, it proved early on to be all but unworkable in practice. It was clear that one of the two groups—the direct instruction group—had the upper hand and the ear of influential members of the State Board of Education, which would have the final say in what got adopted.

The fact of the matter is that the standards development process was very much a political endeavor having roots in the language arts battles over “whole language” versus “phonetics” and in the so-called math wars between “basic skills” and conceptual understanding, to put it in perhaps simplistic terms. The basic skills/phonetics proponents were largely the same group of people who promoted direct instruction for science. Since the math and English/language arts standards were written the year before the science (and history/social science) standards, by the time work began on the science standards, commissioners were already battle-scarred.

The math standards that had been developed by the commission were somewhat aligned to the National Council of Teachers of Mathematics’ math standards and promoted conceptual understanding. One of the commissioners on the “basic skills” side of the fence threatened to submit a minority opinion to the state board if the commission adopted the NCTM-inspired math standards. Not satisfied just being the only “no” vote on the commission against the standards, he heavily lobbied members of the State Board of Education, a majority of whom were already in the “basic skills” camp. The state board ended up rejecting the commission’s math standards and directed two of its members to rewrite them, emphasizing basic skills. It is in this context that the commission began work on the science standards.

Meetings became battlegrounds for each side's point of view, and civility was often at a low ebb. Brunkhorst was subjected to sometimes vicious personal attacks and questions about her credentials. Attempts to inject conceptual understanding, inquiry, age-appropriateness, even scaffolding of standards were ridiculed as being "fuzzy," "touchy-feely," watered-down science. Esteemed national science experts² who appeared before the commission to advocate for more inquiry and less direct instruction were met with hostility and disrespected by some commissioners. Very little compromise was achieved in the standards document, and what compromise there was came as a result of significant struggle and at great personal cost.

To the proponents of inquiry science, the standards present a laundry list of often-unrelated facts to be memorized by students and regurgitated on multiple-choice tests. The repeated use of the verb *know*, as in "Students know that . . .," is particularly problematic to this group, as it doesn't connote any deep understanding of a science concept or analysis and synthesis. The direct instruction group, however, would say, and has said, that the way the standards are written is simpler and makes it easier to write test questions for.³ When it became clear to the inquiry group that there was no hope of having science process skills integrated into the content standards themselves, they settled for having investigation and experimentation (I&E) standards added as a separate list of standards. The direct instruction group objected to including the I&E standards at all, but in the end the strand was added as a compromise position, perhaps the only compromise in the entire document.

Are the standards conducive to deep understanding? One could argue that the sheer number of standards prohibit being able

to achieve anything near depth. No teacher can cover all the standards in any depth at all. On the other hand, if time were not an issue, the standards *could* be taught incorporating investigation and experimentation activities and having students engage in real scientific inquiry to deeply understand a concept. Unfortunately, time is always an issue.

What's in Store?

There is currently no plan or momentum to review and possibly revise the standards for any of the core subjects. The legislation that authorized the creation of the standards and the formation of the Academic Standards Commission does not address periodic review of the standards; indeed, the commission no longer exists, and, according to California's Legislative Counsel, the State Board of Education doesn't have the authority to review or revise the standards.

Over the past several years, legislation has been introduced no fewer than five times⁴ which would have required the review and revision, as necessary, of the content standards, but the bills have either been held up in committee or vetoed by the governor. While there are various theories as to why the governor would not want to authorize the review and updating of the standards—from the cost of doing so to the necessity of doing so—in fairness, the review would be sure to be just as messy, political, and acrimonious a process as the original development process was. There is still little agreement among the various factions in the state today about what should be included in the standards, how they should be presented, how they should be sequenced, and what represents student mastery. Apparently no governor wants to reopen that particular can of worms. Meanwhile, we're

looking at science standards that don't address any of the scientific developments that have occurred in recent years and won't address them for many more years to come.

One thing to look out for, however, is the movement toward developing national "common core" standards. The National Governors Association and the Council of Chief State School Officers are working on common core standards for math and English-language arts and are expected to continue to work on common standards for science and history in the future. Additionally, Secretary of Education Arne Duncan and the federal Education Department have made a state's adoption of national standards a centerpiece of their Race to the Top (RTTT) program, wherein states compete for federal education dollars. In this way, states are given an added incentive to adopt the national common core standards.

Governor Arnold Schwarzenegger has made it clear that California plans to compete mightily for the Race to the Top money and, to that end, has introduced legislation to meet RTTT's priorities, including allowing student achievement data to be used to make decisions about teachers' evaluation and compensation. The governor has also indicated, however, that, although California embraces the idea of common core standards, California will not water down its standards in the pursuit of that particular goal. It will be interesting to see how closely California's standards mesh, or not, with the national common core standards, once they are released, and to see if, then, our state standards will be subject to review and possible revision.

Stay tuned . . .

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