

The Politics of California School Mathematics: The Anti-Reform of 1997-99

The authors tell the story of a powerful group of parents and mathematicians in California who manipulated information and played off of the public's perception of our "failing schools" to acquire political clout. Through this telling, they hope that other states will be able to adopt a more rational course as they reconsider their policies.

[By Jerry P. Becker and Bill Jacob](#)

THE FEBRUARY 1999 issue of the Kappan featured a special section devoted to the recent controversies in mathematics education. Together, these articles offer an excellent background to the key issues surrounding those controversies. The discussions make clear why the traditional drill-and-practice curriculum has failed to help most students, and they explain what researchers have identified as necessary factors to improve student understanding. The authors examine why proposed changes are slow to be implemented, and they note that much of the criticism of the reforms is based on superficial understanding. Furthermore, they explain why citing poor test scores in criticizing reforms is not reasonable. The special section also included an article describing the new curricula funded by the National Science Foundation, an article documenting the success of one of those curricula, and two articles offering contrasting views of California's new math standards.

Collectively, these articles provide compelling reasons why educators must move forward with mathematics education reform. Nevertheless, the state board of education in California has mandated extreme steps in the opposite direction.

Taking the February 1999 *Kappan* as background, we wish to outline here some of what has occurred in the nation's most populous state. It is a story of a powerful group of parents and mathematicians who manipulated information and played off of the public's perception of our "failing schools" to acquire political clout. We will tell this story using the public writings of those who have prevailed in the debate. We will also substantiate many of the claims made in some of the articles in the February *Kappan* and so bring specificity to the discussion and allow readers to see what the policy documents in California actually say. Through this examination, we hope other states will be able to adopt a more rational course as they reconsider their policies.[1](#)

Background

Like other states, California has a state board of education. Its members are appointed by the governor, subject to the approval of the state legislature. There is also a state superintendent of public instruction, who is elected by popular vote and heads the California Department of Education, whose function is to provide administrative support for the state board and the state's education programs. In California, however, all decisions involving school curriculum standards, frameworks, and adoptions of instructional materials fall under the purview of the state board, not the state superintendent.

During 1997, the Standards Commission -- whose members are appointed directly by the governor, the state superintendent, and the legislature -- drafted California's first K-12 language arts and mathematics standards. State law requires that what the commission develops be approved by the state board. As Michael Battista noted in his February 1999 *Kappan* article, the commission approved "middle-ground" mathematics standards in September 1997, but, at the request of two state board members, these standards were substantially revised

by four Stanford University mathematics professors prior to their December approval. Although California's public meeting act requires that any committee of more than two appointed by a state board member must give public notice of its work sessions, the revisions were drafted in secret and were approved without input from K-12 educators or the public.

In addition to mathematics standards, California has a separate mathematics framework. A separate framework committee was appointed by the state board and met publicly to draft a new mathematics framework. At the direction of its chair, this philosophically divided committee avoided discussions of pedagogy and devoted much of its effort to listing topics on a grade-by-grade basis. The committee quickly learned that restricting discussion to content does not forestall controversy. And because the state board required that the standards describe the content, most of the framework committee's work had to be tossed out during the 1998 framework revision.

Although the framework committee had primary responsibility for revising the framework, the revision was carried out by several groups of advisors appointed by the state board, all working without the required public notification. The most substantial policy changes were introduced during the final writing stages and included no serious input from K-12 teachers or mathematics education professionals. Although introductory chapters proclaim a balance of basic skills, conceptual understanding, and problem solving as the aims of the framework, the heart of the document is devoted to reinforcing the instruction and rote skills approaches of the past.

During 1999, several major legislative initiatives were tied to the framework and the standards. A \$1 billion textbook adoption was completed over the summer,² and approved texts were supposed to include the content of the standards. In the

fall, the state board chose three "approved providers" who will instruct teachers in the "research-based approaches" of the framework as part of a \$43 million professional development allocation to schools. Finally, the new statewide testing program, called STAR (Standardized Testing and Reporting), included augmentations to the 1999 version of the Stanford 9 exam to reflect the more specialized content in California's standards.

The Mass Media's Myth of Failed Reform

The rapid changes in California's mathematics policy followed a persuasive (albeit deceptive) campaign alleging the failure of the current reform movement in mathematics education. Those arguing for a return to the past ignore the compelling evidence that the drill-and-practice classrooms have shortchanged students for decades, and they fail to note that, for the most part, today's students with unacceptable test scores have not experienced the reformed mathematics curricula. In California, the claim that the 1992 framework had failed its elementary students was widespread by early 1995, in spite of the fact that curricula aligned with the framework would not be available to teachers until fall of that same year.³ Indeed, very little "reform" mathematics was actually taking place.⁴ These concerns about the "failed reform" led the state legislature to enact a new law (AB 170) in 1995, requiring the state board to adopt instructional materials that are "based on the fundamental skills, . . . including basic computation skills."

How is this possible? While the media have tried to make sense of the debate that surrounded the controversial developments, it seems that they would not or could not get to the heart of each side's position. Typical news reports stated that the controversy was over "the best way to teach math" and that the arguments over teaching were about such issues as "use of real-world problems versus an

emphasis on skills" or "integrated versus traditional curriculum." While on the surface such media reports are not incorrect, as Battista notes, they miss the central issues.⁵ Moreover, articles on low test scores also described "recent" reform materials in a way that left those who failed to read carefully with the impression that the new materials were the root cause of the problem rather than a proposed solution.

We believe that what Battista calls the "myth of coverage" accurately summarizes California's framework discussions: "If mathematics is 'covered,' students will learn it." The 1997 framework committee decided not to "prescribe pedagogy" in its document⁶ and spent most of its time listing procedural skills for mastery at each grade. But even with pedagogy off the table, the committee members could not agree on content, nor could they even agree on a format to discuss how to balance skills with problem solving, as requested by the state board. In their written "committee homework" (which is available in public documents) on "how to balance K-6 mathematics," two northern California mathematics professors offered contrasting views: "The curriculum should include extended projects or capstone problems that require the student to synthesize and integrate concepts and calculational techniques" and "I suggest that our goals and expectations of elementary school children should be pretty much limited to arithmetic."⁷ The latter view prevailed. How mathematical questions could be posed in the framework was particularly problematic. For example, the committee majority rejected an area problem on a geoboard for two reasons: It "prescribed manipulative pedagogy," and "the appropriate tools for geometry are the straightedge and compass." The heart of the debate was whether to write about sense-making curricula or instead to apply the myth of coverage and describe procedures in detail. The California press never understood this.

To observe that the two versions of the standards were the foci of unabated interest across the land and for many months is an understatement. For example, the National Council of Teachers of Mathematics (NCTM) devoted the front page of the February 1998 issue of its *News Bulletin* to unflattering comments about the state board's revised standards. Hung-Hsi Wu reported that "the reaction to the revision was swift and violent."⁸

The press reports on the standards debate usually reduced the question to high standards versus low standards. Delaine Eastin, the state superintendent, was widely quoted as saying that the state board had "dumbed down" the standards. Here again, while publicizing each side's favorite one-liners, the press failed to ferret out the basic differences. Central issues included the state board's consistent removal of such terms as "estimate" or "explain," which it replaced with "calculate"; the removal of the study of patterns from the "algebra and functions" strand in elementary school; and the complete removal of all exemplars that were designed to help K-12 educators (and textbook authors) understand how topics can be approached at a given grade level. The press never seemed to examine why both sides would claim that their views represented "high standards." Does moving rote mastery of computational skills to a lower grade level raise standards? Does adding an expectation that students explain what a numerical procedure means in geometric terms raise standards?

Selected Mathematicians' Views

A unique feature of California's new school mathematics policy is the influential role of university mathematicians. Four Stanford University mathematics professors substantially revised the standards in 1997, and three mathematics professors wrote the sample problems for the framework in 1998. Two math professors wrote key sections of the framework's discussions for teachers and

then, on 22 September 1999, led the department of education presentation for publishers, explaining what was expected of them when they submit materials for adoption in August 2000. Two other mathematics professors judged (and extensively rewrote) the curriculum for the professional development providers, for which \$43 million will be available during 2000-01. To our knowledge, none of these mathematicians ever taught in K-12 schools, and, throughout their work on policy, there was never a publicly scheduled session for them to interact with K-12 teachers. Mathematics professors also ran the Math Content Review Panels for the billion-dollar materials adoption that was completed by the state board during summer 1999. Through these actions, the state board made it clear whose voice would count and whose would be ignored. In order to understand California, it is important to consider the privileged views of the math professors.

Mathematics professor Hung-Hsi Wu of the University of California, Berkeley -- also a key mathematician in the framework rewrite -- wrote a paper describing his assessment of the standards revision. He regards the original standards as a thoughtful document that showed that a lot of care was put into the setting of goals.⁹ But overall, Wu focused in his paper on the importance of "getting the mathematics right." He felt that there were many errors that needed correction and topics that were omitted, and he believed that there was an ambiguous mixture of pedagogical statements with content statements. For example, Wu strongly objected to a grade 4 geometry standard that read: "Students understand and use the relationship between the concepts of perimeter and area and relate these to their respective formulas." He argues that the trouble is "that there is no relationship whatever between perimeter and area, or between volume and surface area, unless it be the isoperimetric inequality. However, the latter would be quite inappropriate for students at this level." About such perceived errors, Wu uses strong language: "I very much regret to say that this

kind of mathematics standards would guarantee the deterioration of mathematics education for a very long time."[10](#)

While this standard may constitute an error in the eyes of a research mathematician, a fourth-grade teacher explained to us how she interprets it: "We want students to understand at their level that perimeter 'goes around' and area 'covers,' and then to be able to explain, for example, in the case of a rectangle why $2 \times l + 2 \times w$ can be understood as measuring the 'going around' while $l \times w$ counts covering (say by square tiles)." We think a teacher could learn more about this topic from the clarifications and examples in the original standards (eliminated by the state board). So we find a serious breakdown of communication between those members of the mathematics community who value precise abstract constructions and those members of the K-12 education community who have learned to interpret the informal presentations of ideas that children use as they develop mathematical thinking.

The beliefs of mathematicians about problem solving and conceptual understanding are illustrated through their discussions of inappropriate curricula. In the framework, a mathematician author wrote the following about a kindergarten problem:

"The students are given a picture that shows in succession a rectangle, triangle, square, rectangle, triangle, square, blank, triangle, square. The students are asked to fill in the blank.

While this problem may seem to be a reasonable one (and an example of problems that all too commonly appear in the mathematics curricula of the lower grades), it cannot be considered a problem in mathematics. From a mathematical

point of view, there is no correct answer to this problem unless more data are supplied to the students. Mathematics is about drawing logical conclusions from explicitly stated hypotheses.[11](#)"

We must remember that this is a discussion about teaching mathematics in kindergarten! The belief that mathematics must include showing why all hypotheses are true begins at this early age. Moreover, the author is concerned that, if students do not use formal mathematical language and reasoning to support answers, their learning may be in jeopardy. The passage continues with the following statement repeated as a sidebar to emphasize its importance:

"But if students were to start thinking that every mathematical situation always contains a hidden agenda for them to guess correctly before they can proceed, then both the teaching and learning of mathematics would be tremendously compromised."

Particularly striking is the choice of words "hidden agenda." It illustrates the distrust that pervades the debate. We wonder why the framework failed to be mathematically correct in terminology and did not say "missing hypotheses." The discussion also highlights this professor's view of the importance of mathematical precision throughout instruction. Use of a problem that might require students themselves to think and decide upon implicit or additional assumptions is rejected as inappropriate for developing mathematical reasoning. Instead, by grade 7, students are expected to know how to provide a 16-step, two-column

proof of such algebra facts as "A number satisfies $x - 1/4 \cdot (3x - 1) = 2x - 5$ when and only when $x = 3$." [12](#)

In the public presentation, the two mathematics professors had an opportunity to explain the overarching themes behind their revision of California policy. One discussed why extensive practice with the standard long division algorithm is so important. He explained that students learning differential equations at Stanford University lacked adequate proficiency with long division of polynomials, which they needed for their Laplace transform problems. Apparently this difficulty is the fault of their elementary teachers, who, when these Stanford students were in their classrooms, would have used the same parrot math California has now resuscitated. Later, the importance of proof in grade 7 as preparation for algebra was emphasized. For example, the other professor rigorously proved that $(-2/5) \times (7/4) = -[(2/5) \times (7/4)]$. The identical proof was repeated a second and third time in response to questions from the audience. After his second time through, some members of the audience were not convinced, and the professor remarked, "I'm puzzled as to why this is difficult. I'm not trying to make fun of you." In this way publishers learned why formal reasoning across the grades is so essential to marketing their products in California.

The mathematicians also recorded their beliefs in their work on the Content Review Panels for the 1999 adoption. Most mathematics programs eventually approved by the state board were required to align their content with the standards, and all the programs selected emphasize drill and practice of skills as a basis for instruction. One program -- Connecting Math Concepts (not part of the Connected Mathematics series) -- had been firmly rejected by the Review Panels in April because it failed to meet the standards. But the state board approved it anyway, which stirred some controversy because Douglas Carnine, one of the

program's primary authors, has had a long-standing collaborative relationship with several board members.[13](#)

Another program (Everyday Mathematics) entered into extensive negotiations with the state department after it learned that its Content Review Panel had failed to reach consensus. Eventually, it was rejected after a mathematics professor prepared a second content review two weeks before the state board's vote. His criticisms are revealing, including, for example, that "students are never required to use the standard long division algorithm" as required by California's grade 5 standards. Inspection of the program reveals that students do indeed study a minor variant of the standard division algorithm that illustrates that repeated subtraction enables one to calculate a long division. And even though many students understand this process far better than the conventional approach, it is now unacceptable for California's students. Parrot math has scored a significant victory.

Finally, the content expertise of mathematics professors has given them authority to design professional development for elementary teachers. One program approved by the state board was completely rewritten by its math professor reviewer, and, in grades 4 and 5, the natural numbers are explained using the five axioms of Peano:

- "1. There is a first counting number, i.e., one or *uno*.
2. Every counting number has a successor.
3. No two counting numbers have the same successor.
4. One is not the successor of any counting number.
5. The successors of one exhaust the counting numbers."

Teachers then learn, "From these five assumptions alone, it is possible to deduce many of the important properties of number." With such a rigorous foundation, the state board believes that its fourth- and fifth-graders can go on to be more proficient with the 1950s-style addition, subtraction, multiplication, and division. To make sure, the teachers attending the sessions will be given pretest and posttest drills on these same computations, along with diagrams showing exactly how to line their numbers up in the neat columns that are required for calculation.

Curriculum and Assessment

Many of the concerns that some mathematicians have stem from the introduction of curricula that have problem solving as a basis for instruction.¹⁴ Distrust of such curricula has provoked a great deal of the controversy in California. In a supplemental adoption (September 1997), the state board rejected two programs highly recommended by the Curriculum Commission, citing mathematical errors and other problems as its reasons.¹⁵ Examples of mathematical errors noted by the board included writing "ratios instead of fractions" and a number theory mistake that "30 divides the product 36×45 ," which the state board explains in its written report is an error because "30 is not a factor of either 36 or 45." Other than noting a few typographical errors, the state board's written objections to the mathematical content are fallacious and appear to be based on a view that mathematics cannot be learned in any way other than a rigid sequence of activities. The state board's public discussion leading to the rejection of Connected Mathematics centered on a problem that included a "pizza pirate," which was cited as explicitly violating the state's patriotism and morality code (Ed. Code 60200.5).¹⁶

We feel it is important to note that the American Association for the Advancement of Science recently issued a report (see <http://project2061.aas.org/matheval/index.htm>) in which the Connected Mathematics series of books is cited as an exemplary middle school program. Yet, by contrast, the group known as Mathematically Correct, two of whose founders were appointed to the 1997 framework committee in California, gave the program an F (see <http://www.mathematicallycorrect.com/books7a.htm>). If you believe in sense-making curricula, you will rate the Connected Mathematics series highly; if you believe that learning mathematics consists mainly of learning procedures by rote, you will give it an F.

In early October 1999, the U.S. Department of Education (ED) endorsed 10 K-12 mathematics programs, describing them as "exemplary" or "promising." This announcement greatly distressed supporters of the new California framework because they had vigorously opposed three of the exemplary programs during the California debate.¹⁷ But this group is not short on political (or financial) clout. According to *Education Week*, they received \$67,000 from David Packard's Los Altos-based Packard Humanities Institute to take out a full-page ad in the *Washington Post* protesting ED's endorsement and including a letter signed by university academics. Packard's institute actively supports school districts in California that implement SRA's Open Court reading program, and Packard made California headlines in October 1998 by contributing \$500,000 to Gloria Tuchman's campaign for state superintendent of public instruction. Tuchman based her losing campaign on opposition to bilingual education and support of back-to-basics education. Throughout this clamor, the mathematics professors continually proclaimed that their content expertise provided them with a better understanding of how to teach mathematics than those who actually teach K-12 students.

California developed its own statewide testing program during the early 1990s (the California Learning Assessment System/CLAS), and this performance-based assessment was field-tested in 1993 and administered statewide in 1994. But some of the free-response questions on CLAS were considered controversial,[18](#) and Gov. Pete Wilson vetoed funding for the program, resulting in a three-year gap in the state's testing program. California's new STAR assessment is tied to the standards. What will this bring? In his discussion on testing, Battista notes that "most school districts rely heavily on standardized tests and state 'proficiency' tests as bottom-line measures of their students' progress in learning." This has become state policy in California. For example, in the framework's assessment chapter we find:

"But certain methods, like timed tests, play a more basic role in mathematics assessment than they do in other areas of the curriculum in measuring conceptual understanding and skills and in checking whether students have an adequate knowledge base -- whether they understand the material to the depth required for future success.[19](#)"

So Battista's concern that "most school programs teach students how to solve by rote the specific types of problems that appear on these tests"[20](#) has become an official guideline in California. Reference to free-response test items that require teachers to focus on students' mathematical thinking has disappeared.

But California was not to be satisfied with an off-the-shelf multiple-choice test. Although the state board selected the Stanford 9 exam, special problems were added in 1999 to ensure alignment with the standards. A necessarily confidential

committee created these problems, and, in order to get an idea of what they might look like, we consider here some of the sample problems added to the 1999 framework by mathematicians. At the third-grade level, a mathematics professor provided the following:

"When temperature is measured in both Celsius (C) and Fahrenheit (F), it is known that they are related by the following formula: $9 \times C = (F - 32) \times 5$.

What is 50 degrees Fahrenheit in Celsius? (Note explicit use of parentheses.)[21](#)"

This is certainly a challenging algebra problem for *third*-graders. (The grade level is not a typographical error.) But we wonder how students who are just beginning to develop the concept of multiplication are supposed to understand its symbolism in any meaningful way. Perhaps parrot math has a way to get there, but the California framework, in which university mathematicians played a key role and which is now the state's official math policy document, gives no clue.

California's new emphasis on procedural algebraic skills prompted Gov. Gray Davis to endorse using the algebra standards as the basis for the state's new High School Exit Exam (HSEE). Earlier, state board member Janet Nicholas had promoted this approach, stating that it was supported by mathematicians. In contrast, the HSEE committee advocated using a combination of standards in number, algebra, geometry, probability, and statistics -- reflecting needs of average citizens. The committee had also heard from civil rights attorneys who stated that, because of California's lack of certified mathematics teachers in poor neighborhoods, reliance on specialized skills (such as those included in the algebra 1 standards) would most definitely lead to lawsuits. Mathematics

educators oppose the exclusive use of algebra in the exam largely because it will encourage teachers to teach symbolic manipulation mindlessly by rote when the priority should be helping students make sense of the mathematics they need in daily life.

At its December meeting, the state board learned that not a single publisher had responded to the request to develop the exam. Reasons cited included short time frame, uncertainty of topics, and the fear of lawsuits. It was viewed as "an impossible task," the *Los Angeles Times* reported, adding a comment by Robert Schaeffer of FairTest: "It shows that politicians have gone so overboard in their testing craziness that even the test manufacturers can't keep up with them."[22](#)

Research

California law requires that state-adopted instructional materials "incorporate principles of instruction reflective of current and confirmed research" (CA Education Code 60200c-3). But even in such an apparently noncontroversial area, California has opened new categories of dispute. For example, the state board invited E. D. Hirsch, Jr., to speak on this issue in April 1997. In the written version of his comments, Hirsch ridiculed "mainstream educational research," as found in "journals such as the *Educational Researcher*," explicitly stating, "This is a situation that is reminiscent of what happened to biology in the Soviet Union under the domination of Lysenkoism, which is a theory that bears similarities to constructivism."[23](#)

After some explanation, Hirsch continues, "I shall briefly outline the conflicts between educational Lysenkoism and mainstream science in testing, math, and early education." Citing math education experts John Anderson, David Geary, and Robert Siegler on the matter of what research shows that math students need, he goes on, "They would tell you that only through intelligently directed and

repeated practice, leading to fast, automatic recall of math facts, and facility in computation and algebraic manipulation can one do well at real-world problem solving."[24](#) Hirsch received a standing ovation from the state board, and then the board moved forward in line with his recommendations.[25](#)

In spite of the state board's instructions to base the framework on research, the framework committee never discussed any research articles. Instead, in July 1997 state board member Janet Nicholas announced a contract award to Douglas Carnine, a professor at the University of Oregon, to provide a review of high-quality mathematics research on which the framework's instructional strategies would be based. In the resulting document, known as the Dixon report, which Carnine presented to the board in March, we find, "From a total of 8,727 published studies of mathematics in elementary and secondary schools, only 110 passed the multi-level evaluation criteria we developed to identify high-quality studies."[26](#) All the studies are experimental, most consider interventions over very short intervals, many deal with learning-disabled students, and some use "instructional booklets" in order to eliminate teacher/pupil or pupil/pupil interaction (which were considered "confounding variables").

The American Educational Research Association's Special Interest Group for Research in Mathematics Education has written a public letter to the state board (signed by 73 researchers) protesting the poor design of the Dixon report. But despite numerous errors (e.g., incorrect reporting of grade levels, content, or experimental design), the state board included in the framework the main recommendations of the report in the chapter on instructional strategies.

In describing opponents of math reform, Battista wrote: "Because they don't agree with the findings of specialists, they seek out researchers in other areas to buttress their case. For instance, there are educational and cognitive

psychologists who occasionally conduct research on the learning of mathematics. Unfortunately, they usually apply general, essentially behaviorist theories that ignore both the methods and the results of modern mathematics education research."[27](#) We see this as the California story in a nutshell. We note in passing that Carnine played a key role in California's Reading Program Advisory, a detail that reinforces the parallels O'Brien draws between the California reading and math experiences.[28](#) Indeed, the development of the frameworks in both these areas involved many of the same players![29](#)

Concluding Remarks

In 1987, the state department published the *Mathematics Model Curriculum Guide*, which included 88 pages devoted to "teaching for understanding" with classroom examples.[30](#) This document clarified many themes from the 1985 framework and proved to be quite influential, both for teachers interested in change and for textbook developers. Also at that time, "replacement units" were made available to teachers so that they could try out some of the new approaches to teaching math. But policy that includes "teaching for understanding" as its centerpiece has vanished from the California mathematics education landscape, and mastery of procedural skills is now the order of the day in the state's standards, framework, standardized assessments, and professional development.

California's return to the past is an accomplishment that makes those opposed to reform especially proud. Wayne Bishop, a mathematics professor and a vocal and strong supporter of the new California policies, put it this way in his February 1999 *Kappan* article: "There is nothing in the precollegiate mathematics curriculum 30, 40, or even 50 years ago that is not relevant today or that competent schools do not still require. Conversely, there is almost nothing in a

good precollegiate course of study today that would have improved a good program of 50 years ago."[31](#) When Bill Jacob denounced the 1997 framework draft at the committee's final meeting, saying it was a return to the curriculum of the 1960s, he was corrected by another math professor on the committee who told him that the framework represented the curriculum of the 1950s and that he was proud of it! With \$500 million already appropriated for the new materials, we think all citizens should be concerned that California's students will begin the 21st century preparing for the job market just as their grandparents did.

In spite of California's politics, we believe that there is a compelling need to move mathematics education reform forward. For example, as U.S. mathematics educators continue to deal with the "backlash" to reform, other important issues must still be addressed, among them how precise mathematical language and logical arguments (from informal reasoning to formal proof) are developed, how "real-world" problems can help enhance mathematical understanding, and how simultaneously to avoid a possible overemphasis on real-world applications where the distractions of the context can sometimes obscure the mathematics.

Beyond the curricular issues, there still remain issues of teacher preparation. There is insufficient support for the professional development of teachers, and there is an urgent need to revamp preservice teacher preparation programs.[32](#) Using the new curricula requires greater teacher understanding of both the mathematics and the various approaches students take to learning. In addition, there are those who feel a need to examine further under what circumstances cooperative learning is effective and, more generally, how constructivist thinking is influencing, or should influence, approaches to teaching.[33](#)

We note, too, that U.S. Secretary of Education Richard Riley has expressed serious concern about the deep divisiveness that evolved during the California

debate. In a talk delivered at the January 1998 meeting of the American Mathematical Society in Baltimore, he stated forcefully "the need to bring an end to the shortsighted, politicized, and harmful bickering over the teaching and learning of mathematics. I will tell you that if we continue down this road of infighting, we will only negate the gains we have already made, and the real losers will be the students of America."³⁴ Referring to the California "math wars," he continued, "Let me say right now that this is a very disturbing trend, and it is very wrong for anyone addressing education to be attacking another in ways that are neither constructive nor productive. It is perfectly appropriate to disagree on teaching methodologies and curriculum content. But what we need is a civil and constructive discourse." However, Riley now finds himself under political attack by some of the very mathematicians who attended his talk. So we wonder whether the California "math wars" have served a useful purpose. Perhaps they have provided a lesson on how not to carry out the reorganization of mathematics curricula for our schools and students.

Finally, in April 2000 the National Council of Teachers of Mathematics will release the final version of its Standards 2000 document, outlining a balanced view of teaching for understanding that pays adequate attention to both skills and problem solving. The same mathematicians who helped create the new policies in California and who attacked the U.S. Department of Education's list of exemplary and promising programs may well launch an attack on NCTM. Perhaps we will hear again about lack of mathematical precision, lack of skills (with emphasis on "standard algorithms"), mathematical errors, inappropriate calculator use, low standards, and the "research" that supports the critics' views. But we need to be vigilant and careful and not be fooled by their seemingly impressive credentials and writing. We need to look carefully at the details. While there is always room for improvement in any endeavor, instead of joining forces with teachers and contributing to the process, these critics may once again

interfere with efforts to reach more students in order to secure their vision of 13 years of precalculus symbol manipulation. Content knowledge is no substitute for knowledge of how students' understanding develops, but this point seems lost on these critics. We ask readers to examine the NCTM document. We are convinced they will see the same merit in it as we do.

1. In Massachusetts, several key players from California's back-to-basics movement have been collaborating with Deputy Commissioner Sandra Stotsky on last-minute revisions of that state's mathematics framework. The approaches bear similarities to what happened in California. In particular, the voice of research mathematicians is valued more highly than that of teachers. In an e-mail message directed to mathematics professor James Milgram of Stanford University (whose response is dated 27 October 1999), Stotsky requested advice on the draft of the Massachusetts framework as follows: "Jim, I (and the DoE) will appreciate anything you have to say in any form you wish to say it. The comment form is there to guide people in the field, particularly teachers. But you are free to offer comments in your own way because the remarks from academics will be considered separately from those from teachers and administrators in the schools." We wonder if, as in California, the Massachusetts framework will be rewritten by a select few university mathematicians outside the public process and with little input from teachers.

2. The special adoption (AB 2519) will provide \$250 million per year for the four years 1998-2002 in mathematics, language arts, science, and social studies. This exceeds -- and is in addition to -- California's yearly textbook appropriation.

3. California law required 30 months between setting criteria and adoption. The instructional materials approved in October 1994 by the state board were aligned

with the 1992 framework criteria, and state funding for the purchase of these materials was available for the 1995-96 academic year.

4. For further discussion, see Thomas C. O'Brien, "Parrot Math," *Phi Delta Kappan*, February 1999, especially pp. 435-36.

5. Michael T. Battista, "The Mathematical Miseducation of America's Youth: Ignoring Research and Scientific Study in Education," *Phi Delta Kappan*, February 1999, especially pp. 431-33.

6. This committee approved its draft by a vote of 13-9 in August 1997. The second author voted in opposition. The document approved by the state board in December 1998 was completely different.

7. Curriculum Frameworks and Instructional Resources Office, "Mathematics Framework Committee Homework," California Department of Education, Sacramento, 1997 (public documents available at each meeting).

8. Hung-Hsi Wu, "Some Observations on the 1997 Battle of the Two Standards in the California Math War," mimeographed, University of California, Berkeley, 1998, p. 1.

9. *Ibid.*, p. 2.

10. *Ibid.* p. 4.

11. *Mathematics Framework for California Public Schools, Kindergarten Through Grade 12* (Sacramento: California Department of Education, 1999), p. 110.

12. *Ibid.*, pp. 154-56.

13. At the November meeting of the state board, there was discussion about this program, and it was eventually downgraded from a basic to a partial program.

14. For further discussion of what this means, see Harold L. Schoen et al., "Issues and Options in the Math Wars," *Phi Delta Kappan*, February 1999, pp. 444-53.

15. The programs were *Investigations in Number, Data, and Space* and *Connected Mathematics*, both published by Dale Seymour and both NSF-funded projects.

16. In this problem, a "notorious pizza pirate" repeatedly steals half the pizza from a school freezer on successive nights, and to solve the problem students must calculate $1/2 \times 1/2 \times 1/2 \times 1/2$. Ed Code 60200.5 reads: "Instructional materials adopted under this chapter shall, where appropriate, be designed to impress upon the minds of the pupils the principles of morality, truth, justice, patriotism, and a true comprehension of the rights, duties, and dignity of American citizenship, and to instruct them in manners and morals and the principles of a free government." For more details on the 1997 adoption, see Bill Jacob, *Instructional Materials for K-8 Mathematics Classrooms: The California Adoption, 1997, Contemporary Issues in Mathematics Education*, edited by Estela Gavosto, Steven Krantz, and William McCallum, *Mathematical Sciences Research Institute Publications*, no. 36 (Cambridge: Cambridge University Press, 1999), pp. 109-22.

17. The three programs were Connected Mathematics, the Interactive Mathematics Program (IMP), and College Preparatory Mathematics (CPM).

18. Discussion of the problems with CLAS also surfaced in the state board's rejection of the Dale Seymour *Investigations in Number, Data, and Space* second-grade program, where a sorting activity based on a student-generated list of "scary things" (e.g., spiders and loud noises) was viewed as a potential "invasion of privacy."

19. *Mathematics Framework for California Public Schools*, p. 197.
20. Battista, p. 432.
21. *Mathematics Framework for California Public Schools*, p. 38.
22. Martha Groves and Richard L. Colvin, "High School Exit Exam for State Hits Roadblock: Education Panel Can't Decide About Including Algebra: Citing Time Pressure, Publishers Refuse to Develop the Test," *Los Angeles Times*, 10 December 1999, p. 1.
23. E. D. Hirsch, Jr., "Address to Cal State Board, April 97," mimeographed, California State Board of Education, Sacramento, 1997, p. 3.
24. *Ibid.*, p. 6.
25. David Geary, who was cited by Hirsch, subsequently played a major role in rewriting the framework.
26. Robert Dixon et al., "Report to the California State Board of Education and Addendum to Principal Report -- Review of High-Quality Experimental Research," mimeographed, California Department of Education, Sacramento, March 1998.
27. Battista, p. 431.
28. O'Brien, p. 435.
29. For details on how a poor research base was authenticated for use in developing the math framework, see Bill Jacob and Joan Akers, "'Research Based' Mathematics Education Policy: The Case of California 1995-1998," preprint, available by request from jacob@math.ucsb.edu, University of California, Santa Barbara, 1999.

30. *Mathematics Model Curriculum Guide, Kindergarten Through Grade 8* (Sacramento: California Department of Education, 1987).
31. Wayne Bishop, "The California Mathematics Standards: They're Not Only Right; They're the Law," *Phi Delta Kappan*, February 1999, p. 440.
32. See, for example, *To Touch the Future -- Transforming the Way Teachers Are Taught* (Washington, D.C.: American Council on Education, 1999).
33. Jeremy Kilpatrick, "Confronting Reform," *American Mathematical Monthly*, December 1997, pp. 955-62.
34. Richard W. Riley, "The State of Mathematics Education: Building a Strong Foundation for the 21st Century," speech delivered at the annual meeting of the American Mathematical Society and the Mathematical Association of America, Baltimore, January 1998. The text is available in *Notices of the American Mathematical Society*, vol. 45, 1998, pp. 487-90, and from the American Mathematical Society website, <http://www.ams.org/notices/199804/riley.pdf>.

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