

# Objections to the Proposed California Mathematics Framework

Norm Matloff  
Professor of Computer Science (formerly Statistics)  
University of California, Davis\*

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## *Summary:*

I wish to strongly object to the proposed California Mathematics Framework (CMF), which is now being considered for adoption by the state government. First, I am concerned that the CMF is based on faulty data. Second, and my main point, the *CMF's plan to replace solid math courses by data science are egregiously misguided.*

## *My background:*

I am a data scientist. I teach and do research in that field. Significantly in light of the fact that the focus of the CMF is education, I am an accomplished *communicator* in data science: I am a recipient of my university's Distinguished Teaching Award, and have published several books in the data science field, one of which was the recipient of the Ziegel Award. I have served in an editorial capacity in two data science journals, including as Editor-in-Chief of the *R Journal*.

And, related to the CMF's professed goal of improved education for children of color, immigrants and so on, I wish to point to my lifelong passion for social justice. I have participated in a number of university programs to increase our minority population, and have served as chair of our university Affirmative Action Committee. I was humbled to be selected for my university's Distinguished Public Service Award. I am a former English As a Second Language teacher, and have even taught a brief volunteer course in probability for 6th-graders.

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\*Affiliation stated for identification purposes only.

*The CMF is based on faulty data*

The first edition of the CMF relied heavily on the experience of the San Francisco Unified School District (SFUSD). The SFUSD analysis was so poor, even overtly dishonest in at least one instance, that all mention of SFUSD has been excised in the current version. Yet the SF data clearly continues to play a central role in the CMF. SF was mentioned *46 times* in the original CMF, yet the substance of the CMF remains as before. Are we to believe that the SF experience, so prominent in the CMF before, now has no influence on *the same recommendations* in the current version? That sleight-of-hand itself renders the CMF report unreliable.

Others have provided detailed analyses of the SFUSD data, noting for instance SFUSD's claim that their CMF-style curricular change resulted in increased pass rates in Algebra 2. The fact, later conceded by SFUSD, is that the pass rate increased because *the district changed the rules for passing*. The district's "declaring victory," claiming an improved pass rate without stating that the bar for passing had been lowered, is unconscionable.

Putting that aside, as a longtime minority activist, I was appalled to learn of a tragic consequence of the SFUSD curricular change: Statewide test scores for low-SES (socioeconomic status) children in the SFUSD declined following the curricular change, whereas they had been rising before the change. Low-SES scores rose statewide during the same period in which the SF scores went down.

*On the role of data science:*

The CMF proposes replacing the Algebra 2 requirement, solid math, with data science. The message sent by CMF is essentially, "Data science is the wave of the future, the path to good jobs." An important subtheme is making math curricula more applications-oriented. Professor Jo Boaler has even advocated abolishing the requirement that children learn their number facts, notably multiplication tables.

I find the CMF egregiously misguided in all of this. Several comments:

- Quite contrary to the notion that data science (DS) could *replace* algebra, it crucially *relies on* algebra and the higher-level math courses that follow it. The pathway to those data science jobs requires calculus and later linear algebra.
- Even data literacy for non-DS jobs requires, for instance, understanding of the slope of a line. The consumer of a time-trend graph, for

example, needs to understand that a high slope—say graphing the number of new Covid-19 cases over time—means a very rapid increase. And it’s not just a matter of jobs; skill at viewing such graphs is vital to having an informed citizenry.

- Even the CMF coverage of Statistics, the centerpiece of their data science push, has been watered down. Coverage of the binomial and geometric distributions, and Bayes’ Rule, has been deleted.
- I know from decades of experience that teaching applied material is very difficult. If I teach probability with dice and coin flips, the path is smooth; teaching about factors underlying the probability of loan repayment is *hard*.
- Drill, such as for memorizing “times tables,” and the ability to do mental arithmetic, is in fact crucial. Do we really want adults who, seeing a “10% off” sign in a store, have no idea as to how much they would save? Or do we want to produce adults who cannot count out, say, \$12.37 in change, and are thus unqualified to work as cashiers? Do we want to produce adults who are susceptible to being cheated as consumers by dishonest cashiers? And understanding of math in general, notably in data science, requires students to develop a feeling for numbers, a “sixth sense.” Math is far more than memorization, absolutely, but it does vitally rely on building a foundation first. If the CMF is adopted, we will produce graduates without any number sense.

I say to our California government: Please don’t be fooled. The CMF has been developed by non-STEM people, without the consultation of data scientists, based purely on ideology and faulty data. I share their goal of increased skills in STEM among our disadvantaged children, but CMF would have the opposite effect, tragically harming our most vulnerable kids.