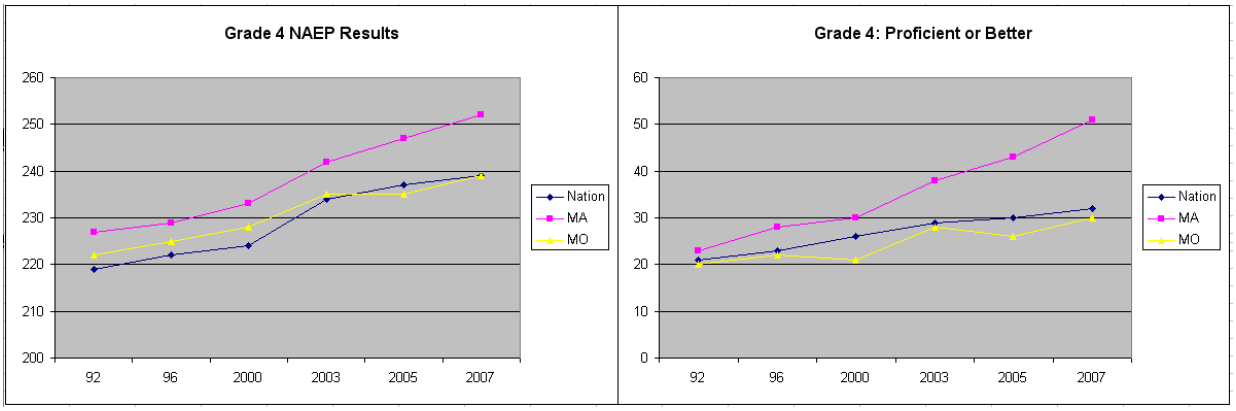
Some Comments on the New Missouri Math Standards

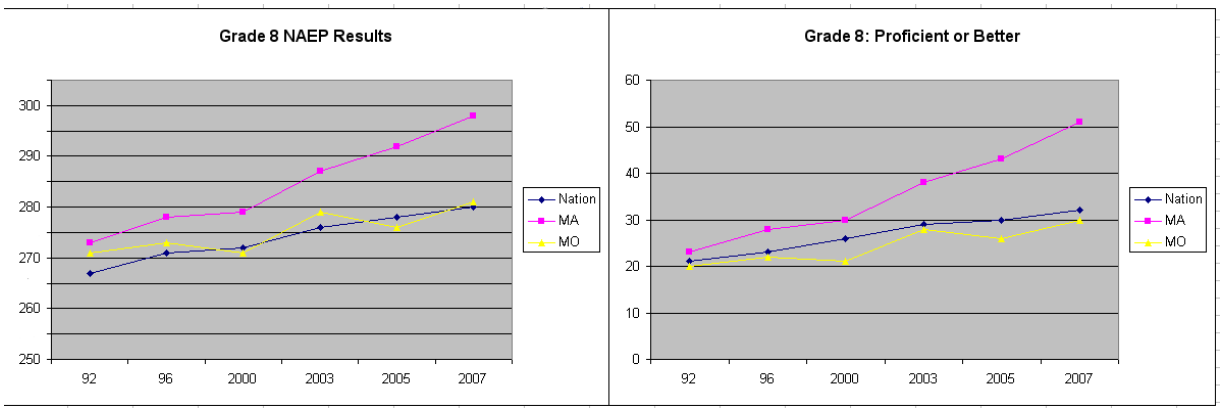
Missouri recently revised their K-12 mathematics standards and successfully aligned their K-7 standards with the best current approaches available: the National Council of Teachers of Mathematics (NCTM) *Curriculum Focal Points*, and the report of the National Math Panel. However, the new standards largely fall apart in the critical grades 8 - 12 where the rubber actually hits the road.

Perhaps a major part of the problem is that the people who are responsible for these new standards are the same people who have guided Missouri's K-12 mathematics for at least the last 10 years. Their past results have been remarkably *average* when compared against national norms, for example "America's Report Card," the National Assessment of Educational Progress (NAEP) exam. And we should remember that the U.S. outcomes in mathematics rank at the bottom among developed countries internationally, so *average* is not something to be desired here.

Here are the comparisons of Missouri's results with the national averages, and the performance of a key state, Massachusetts, that extensively revised their standards about 10 years ago enlisting the aid of top research mathematicians and top high school math teachers in creating standards that anticipated both the NCTM Curriculum Focal Points, and the conclusions of the National Math Panel. First the results for fourth grade:

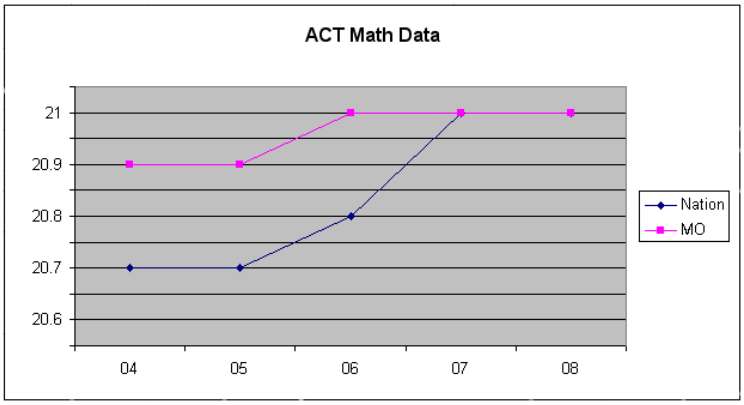


and here are the results for eighth grade:



Note that in all these graphs, but particularly those for eighth grade, Missouri's results were initially at or above the national average, and entirely comparable with those of Massachusetts, but over time they fell relative to the national average, while Massachusetts improved dramatically.†

High school outcomes show the same convergence of Missouri scores to the nations average over the past five years from significantly higher in 2004 to exactly at the national average currently.



At the same time, Missouri's high school graduates were attending two and four year colleges and universities in greater numbers, but their preparation for college became worse in mathematics. Indeed, while 18.1% of first year college students had to take remedial college mathematics courses in 1996, that number increased by over 50% to

- 29.4% in 2005,
- 29.6% in 2006,
- 30.1% in 2007,
- 29.6% in 2008.

It should also be noted that the mathematics remediation rate for Missouri high school graduates attending 2 year colleges was an astounding

- 78.9% in 2006 and
- 79.3% in 2007.

† The long-term trends NAEP exam shows that math outcomes have been essentially flat since the 1970's, so that the apparent improvement in absolute scores over time on the NAEP exam recorded here may well be an artifact of the year-by-year differences in the exam. Consequently, it is more accurate to compare states scores to the national averages, rather than using the absolute scores.

The odds are strongly stacked against college students required to take remedial courses. Once this happens, they become far less likely to graduate, and if they graduate, they are far less likely to be able to major in areas that require strong mathematics backgrounds like engineering, the natural sciences, and economics.

The current Missouri standards in grades 8 - 12 are similar to the previous Missouri standards, and are set at a very low level.

Perhaps a key reason for this poor performance in Missouri is that the people who revised the Missouri math standards probably only have a sketchy knowledge of upper high school and college mathematics. This group includes no research mathematicians and, to my knowledge, does not include any of Missouri's top high school math teachers - those whose students achieve the most success at the college level in math and math related areas.

R. James Milgram
Professor of Mathematics
Stanford University
Stanford, CA