

Before it's Too Late
Teaching mathematics and science at danger
A Report to the Nation from the National
Commission on Mathematics and Science Teaching
for the 21st Century

Abstracted by:

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In an age now driven by the relentless necessity of scientific and technological advance, the current preparation that students in the United States receive in mathematics and science is, in a word, unacceptable.

Recent reports of the performance of our country's students from both the Third International Mathematics and Science Study (TIMSS) and the National Assessment of Educational Progress (NAEP) echo a dismal message of lackluster performance, now three decades old; it's time the nation heeded it—before it's too late.

Four important and enduring reasons underscore the need for our children to achieve competency in mathematics and science: (1) the rapid pace of change in both the increasingly interdependent global economy and in the American workplace demands widespread mathematics- and science-related knowledge and abilities; (2) our citizens need both mathematics and science for their everyday decision-making; (3) mathematics and science are inextricably linked to the nation's security interests; and (4) the deeper, intrinsic value of mathematical and scientific knowledge shapes and defines our common life, history, and culture. Mathematics and science are primary sources of lifelong learning and the progress of our civilization.

Beyond the disturbing news that our young people are not performing well enough in mathematics and science to take firm command of their own futures, five major factors have begun to coalesce that make this a particularly opportune time to focus on strengthening mathematics and science education: (1) reform

efforts have sharply focused the attention of the American people on education as a public issue; (2) the nation now has a surplus of resources to invest in education; (3) a coming demographic shift in the teaching force—two thirds of which will be retiring in the next decade—offers an unparalleled chance to plan for and make changes at the core of education itself; (4) our schools can now put to work what educators have learned in the past generation about curriculum, high standards, effective teaching, assessment, and how children learn; and (5) the rising generation of college graduates is once again showing an interest in teaching as a profession. The nation must capitalize on the convergence of these factors to improve mathematics and science teaching in the United States. We need to act now, before it's too late.

The primary message of this report holds that America's students must improve their performance in mathematics and science if they are to succeed in today's world and if the United States is to stay competitive in an integrated global economy. The Report's second message points in the direction of a solution: the most direct route to improving mathematics and science achievement for all students is better mathematics and science teaching.

Evidence of the positive effect of better teaching is unequivocal; indeed, the most consistent and powerful predictors of student achievement in mathematics and science are full teaching certification and a college major in the field being taught.

Better mathematics and science teaching is therefore grounded, first of all, in improving the quality of teacher preparation and in making continuing professional education available for all teachers. A closer look at the teaching that goes on in mathematics and science classrooms today puts the performance of U.S. students on national and inter-national assessments in sharper focus.

The basic teaching style in too many mathematics and science classes today remains essentially what it was two

generations ago. By contrast, teaching innovation and higher student performance are well documented in other countries, where students' improvements are anchored to an insistence on strong professional development for teachers.

What could be happening in U.S. mathematics and science classrooms is markedly different. The report names an extensive set of characteristics of "high-quality teaching." When they are focused through the lens of exemplary teacher preparation and an integrated system of professional development, an enormous potential for empowering teachers and improving instruction is apparent.

The pressing national need for high-quality teaching described in this report, therefore, demands a vigorous, national response that unifies the efforts of all stakeholders in mathematics and science education. To that end, three wide-ranging, intertwined goals focus the report's call for action at local, state, and federal levels. As an aid to implementation, each goal is accompanied by a coordinated set of well-funded action strategies that identify key stakeholders who should take the lead in implementing each strategy. The estimated annual cost to achieve these action strategies is over \$5 billion. These funds and other resources will come from a diversified set of sources, including all levels of government, higher education, business and industry, professional education associations and teachers' unions, community groups, and the citizenry. The goals and action strategies set forth in the report are as follows:

Goal 1: Establish an ongoing system to improve the quality of mathematics and science teaching in grades K–12. Seven interdependent action strategies are offered to implement this system: (1) each state must immediately undertake a full needs assessment to determine what teachers require, both in their schools and their professional lives, if they are to routinely deliver high-quality teaching; (2) Summer Institutes must be established to address the professional development needs identified; (3) building- and district-level Inquiry Groups can provide venues for teachers to engage in common study to enrich

their subject knowledge and teaching skills; (4) Leadership Training is needed to prepare facilitators for the Summer Institutes and Inquiry Groups; (5) a dedicated Internet Portal must be available to teachers so they can make use of and contribute to an ever-expanding knowledge base about mathematics and science teaching; (6) a nongovernmental Coordinating Council is needed to bring together the above initiatives and those that follow to assess accomplishments; and (7) all states and local districts should initiate reward and incentive programs, both to support exemplary professional development that results in higher student achievement and to increase the attractiveness of teaching as a profession.

Goal 2: Increase significantly the number of mathematics and science teachers and improve the quality of their preparation. Three action strategies are offered for this goal: (1) a direct strategy that identifies exemplary models of teacher preparation whose success can be widely replicated; (2) an overarching strategy of finding ways to attract additional qualified candidates into teaching from among high school and college students, recent college graduates, and people at mid-career; and (3) creating 15 competitively selected Mathematics and Science Teaching Academies to annually train 3,000 Academy Fellows, who will be nationally recruited for a one-year, intensive course on effective teaching methods in mathematics or science.

Goal 3: Improve the working environment and make the teaching profession more attractive for K–12 mathematics and science teachers. Four action strategies address this goal: (1) focused induction programs are required to help acclimate beginning mathematics and science teachers to the profession, create formal mentoring relationships, and introduce teachers to Inquiry Groups; (2) district/business partnerships are needed to provide support for a broad range of efforts that can help create professional working environments for teachers. These efforts can enhance teaching by providing materials, facilities, equipment, and mentor stipends; (3) incentives—whether in the

form of cash awards, salary increases, support for further education, or community-wide recognition—are needed to encourage deserving mathematics and science teachers to remain in teaching and improve their skills; and (4) salaries of all teachers must be made more competitive, but especially for mathematics and science teachers, whose combined preparation and skills command high wages in the private sector.

The report concludes by challenging all Americans directly to take personal responsibility for expressing their views on mathematics and science education to policy- and decision-makers, and to take the initiative to implement the report's action strategies in their own communities.

Reference:

U.S. Department of Education

The National Commission on Mathematics and Science

