



*An American Imperative: Transforming the Recruitment, Retention, and Renewal
Of Our Nation's Mathematics and Science Teaching Workforce*

TEACHING QUICK FACTS

The release of the BHEF report, *An American Imperative*, comes at a critical juncture in American education. American students today have limited interest in studying mathematics and science, and academic achievement in these two foundational disciplines is demonstrably low. This reality challenges our ability to maintain intellectual vibrancy, to hire enough employees for highly-skilled positions and ultimately to ensure that our economy is globally competitive. The following fact sheet documents the existing problem in American education.

TEACHER QUALITY AND QUANTITY

The roots of these issues are the fundamental problems of teacher *quality* and *quantity*. *An American Imperative* addresses these critical problems in the context of these education facts:

- Research shows that the quality of P-12 mathematics and science teaching is the single most important factor in improving student mathematics and science achievement.ⁱ
- Nationally, however, there are simply not enough highly skilled mathematics and science teachers entering the profession or committing to long-term careers. The United States will need more than 280,000 new mathematics and science teachers by 2015.ⁱⁱ
- Shortages are most apparent in high-minority and high-poverty classrooms, where students are less likely to be taught by a teacher who is well-prepared in the subject area.
 - In 2002, 72% of high-minority middle school mathematics classes were taught by teachers who had not majored or minored in mathematics, compared with 55% of low-minority classes.ⁱⁱⁱ
- There is also a critical shortage of minority teachers, which is outpacing the overall mathematics and science teacher shortage.
 - In 2003, 42% of public school students were from minority groups—yet only 16% of their teachers were minorities.^{iv}
- Every school day, nearly 1,000 public school teachers leave the profession and another 1,000 teachers move to other schools.^v
 - Thirty-three percent of all new teachers leave teaching during the first 3 years of their careers; 46% leave in the first 5 years.^{vi}
 - There is an annual attrition of some 394,000 teachers.^{vii}
 - The annual turnover of mathematics teachers (16.4%) is the highest of all subject areas; the rate for science teachers (15.6%) is second-highest.^{viii}
 - Similar to the trends of teacher shortages, the rate of attrition is 50% higher in poor schools versus wealthy ones.^{ix}
- Replacing teachers requires a much more significant, costly and time-consuming investment than retaining them. The cost is estimated at some \$4.9 billion annually in the United States,

factoring recruiting expenses, signing bonuses, subject-matter stipends, and expenses specific to hard-to-staff schools.^x The cost of teacher attrition goes beyond dollars as well, leading to a loss of teacher quality and student achievement.

THREE CORE RECOMMENDATIONS

An American Imperative offers three core recommendations to address specific issues that research has identified as problematic. These are issues are the recruitment, retention, and renewal of teaching resources.

Strengthen teacher recruitment policies in mathematics and science

- The shortage of highly qualified mathematics and science teachers has forced states and school districts to expand their recruitment efforts for qualified teachers—with some seeking candidates from as far away as the Philippines, Germany, Turkey, Nigeria and India.^{xi}
- Starting salaries for mathematics and science teachers have failed to keep pace with occupations requiring a similar educational background.^{xii}
 - Teacher pay, in adjusted dollars, has declined since the 1970s. Adjusting for the cost of living over the past decade, the annual mean salary of classroom teachers has declined by 1.9%.^{xiii}
 - The nation's teaching force is aging; a national survey indicates that 34% of current public high school teachers expect to be retired by 2010.^{xiv}
- The school-aged population is expected to increase by 10% in the next two decades.^{xv}
- A greater number of students are taking more mathematics and science courses because states are increasing mathematics and science requirements for graduation.^{xvi}
- Women no longer provide the captive teacher labor pool that they were prior to 1980.^{xvii}
- Traditional routes to teaching no longer provide a sufficient numbers of new teachers.
 - Alternative routes to teacher licensure have grown dramatically over the past 20 years. Between 2004 and 2005, the number of individuals that entered alternative teaching programs increased from 39,000 to 50,000.
 - In 2006, 48 states and the District of Columbia had alternative licensure programs in place.^{xviii}

Improve the retention of both new and experienced teachers and address the causes of teacher dissatisfaction

- A comprehensive induction program has been shown to reduce the turnover rate of first-year teachers from 41% to 18%.^{xix}
 - 80% to 90% of new teachers who experienced a comprehensive, long-term induction program stay in the field for at least 5 years.^{xx}
 - Comprehensive induction creates a payoff of \$1.50 for every \$1.00 invested.^{xxi}
- A large initial salary differential (\$10,000) has been shown to reduce the number of teachers leaving a district at the end of their first year by 8%.^{xxii}
- 33% of secondary school mathematics teachers and 20% of secondary school science teachers receive out-of field assignments (meaning they are assigned to a subject area or grade level for which they are not prepared). Job satisfaction is greatly influenced by whether or not teachers are assigned to their subject or grade level of choice.^{xxiii}

- The creation and maintenance of learning communities is widely viewed as fundamental to lifelong learning by mathematics and science teachers at all levels.^{xxiv}

Ensure that all mathematics and science teachers participate in renewal activities that support their effectiveness in the classroom

- Typical professional development programs fall short of their twin goals of advancing teacher content knowledge and teaching skills and improving student performance.^{xxv}
- Most professional development opportunities are poorly aligned with curricula, student learning expectations, or state assessments.^{xxvi}
- Often the content of professional development is unconnected to a teacher’s daily work, and little follow-up support is offered.^{xxvii}
- Most renewal programs require that six semester hours of professional development be completed over a period of 5 years.^{xxviii}
- Only seven states (Georgia, Hawaii, Louisiana, New Mexico, Ohio, Tennessee and Utah) possess database systems that can pinpoint which teacher preparation programs produce the graduates whose students have the strongest academic growth.^{xxix}

ⁱ K. Carey, The real value of teachers: Using new information about teacher effectiveness to close the achievement gap, *Thinking K-16*, Winter 2004; S. G. Rivkin, et.al, Teachers, schools, and academic achievement, *Econometrica*, March 2005; The Teaching Commission, *Teaching at risk: A call to action*, 2004; V. Troen, et.al, *Who’s teaching your children?*, 2003.

ⁱⁱ Business-Higher Education Forum, *A commitment to America’s future: Responding to the crisis in math and science education*, 2005.

ⁱⁱⁱ K. Haycock, *Still at risk. Thinking K-16*, Summer 2002.

^{iv} National Center for Education Statistics, *Condition of education 2004*.

^v Alliance for Excellent Education, *Teacher attrition: A costly loss to the nation and to the states*, 2005.

^{vi} Center on Education Policy, *A public education primer: Basic (and sometimes surprising) facts about the U.S. education system*, 2006.

^{vii} Alliance for Excellent Education, *Teacher attrition: A costly loss to the nation and to the states*, 2005.]

^{viii} R.M. Ingersoll, Understanding supply and demand among mathematics and science teachers. In J. Rhoton & P. Shane (Eds.), *Teaching science in the 21st century*, National Science Teachers Association Press, 2006.]

^{ix} Alliance for Excellent Education, *Teacher attrition: A costly loss to the nation and to the states*. 2005.

^x Alliance for Excellent Education, *Teacher attrition: A costly loss to the nation and to the states*, 2005.

^{xi} A. Doolittle, Shortage of teachers forces global search, *The Washington Times*, June 16, 2005.

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^{xv} R. Gordon, et.al, *Identifying effective teachers using performance on the job*, The Brookings Institution, 2006.

^{xvi} L. Cavell, et.al., *Key state education policies on PK-12 education: 2004*. Council of Chief State School Officers, 2005.

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^{xviii} National Center for Alternative Certification, *Overview of alternative routes to teacher certification*, 2006.

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^{xx} National Commission on Teaching and America’s Future, *What matters most: Teaching for America’s future*, 1996.

^{xxi} A. Villar, *Measuring the benefits and costs of mentor-based induction: A value-added assessment of new teacher*

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^{xxiii} S.M. Johnson, et.al., Who stays in teaching and why: A review of the literature on teacher retention, American Association of Retired Persons, 2005.

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^{xxvi} Ibid.

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