Chapter 4
Addressing the Achievement Gap in the United States

Julia V. Clark

The Achievement Gap that exists in American Education is not a gap in ability, but a gap in resources and a gap in expectations. We know that students from all backgrounds can succeed at the highest levels of education, when they are given the support they need to succeed–the support that is regularly given to students from the top income brackets.

Lee Bollinger, President, Columbia University

Our progress as a nation can be no swifter than our progress in education, our requirements for world leadership, our hopes for economic growth, and the demands of citizenship itself in an Era such as this all require the maximum development of every young American's capacity. The human mind is our fundamental resource.

John Fitzgerald Kennedy

Introduction

At this incredible moment in history in an era of unprecedented American hope and expectation, there has never been a time more fitting with an opportunity to include all children in the National Education Agenda. National and international studies indicate that too many children are being left behind in education, especially in mathematics and science, areas critical to success in a technological world. Numerous studies indicate that schools in the United States are failing to adequately prepare all students, especially minority students (Blacks, Hispanics, and Native Americans), to (1) participate fully in a technological society as informed citizens,

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(2) pursue further studies in science and technology, and (3) enter the workforce. America's educational system is not educating the masses. Too many minority students are being left behind.

Blacks, Hispanics, and Native Americans make up 24% of the population but only 7% of the science and engineering workforce. Blacks and Hispanics account for only 4% of the scientists and engineers in the United States. However, this group represents the greatest source of future workers. If present trends continue, 68% of workers entering the labor force between 2005 and 2015 will be minorities.

Minorities need to become an integral part of the technical workforce. A larger number of scientists and engineers must come from the talent pool of minorities, and the United States needs to provide a way to expand its capacity to innovate within a framework of inclusiveness and opportunity for all. The current inadequate preparation of many Americans, particularly minority employees and women, for scientific and technical jobs threatens the nation's ability to compete in the world economy, as well as our security and quality of life. As the generation educated in the 1950s and 1960s prepares to retire, America's colleges and universities are not graduating enough scientific and technical talent to step into research laboratories. This gap represents a shortfall in America's national scientific and technical capabilities. The gap is ignored at our peril. Closing it will require a national commitment to develop more of the talent of all America's citizens, especially the minorities, who comprise a disproportionately small part of the nation's science, technology, engineering, and mathematics (STEM) workforce.

Demographic projections add to the need to increase the number of minorities in STEM fields. The majority of the children who will be born in the United States in the twenty-first century will belong to groups that are underrepresented in careers involving STEM.

Minority children represent the most rapidly growing part of the school-age population. According to the U.S. Census Bureau (2007), the nation will be more racially and ethnically diverse by mid-century. Minorities, now roughly one-third of the U.S. population, are expected to be the majority in 2042, with the nation's projection to be 54% minority in 2050. By 2023, minorities will comprise more than half of all children in the United States (U.S. Department of Commerce 2008).

Another concern in America's education is the student *achievement gap*. Student achievement in mathematics and science is also a national educational concern. Concerns about America's science education performance have come from a series of national commissions and studies over the last decade. Despite the exhortations in the national reports on educational reform issued over the last several years, such as *A Nation at Risk* and *Educating Americans for the 21st Century*, science remains an area for great improvement in America's schools. *A Nation at Risk,* published on April 26, 1983, warned that American schools were being eroded by a "rising tide of mediocrity." *A Nation at Risk,* one of the first comprehensive assessments of the American education system, compared America's educational system to other nations. The results indicated that America's quality of life and competitiveness as a nation depended on reforming the educational system. At the same time, a report to the National Science Board, *Educating Americans for the 21st Century,* emphasized

that keeping pace with the technological world we live in means the nation's mathematics and science education will have to improve. Furthermore, ensuring quality education for all students was a prime concern. Prior to these reports, reform attempts had been initiated, but increased awareness raised by these publications established a new movement to improve mathematics and science education and to target minorities who are at risk in the educational system, especially in mathematics and science.

Defining the Gap

The achievement gap in America refers to the disparity in academic performance, as shown by standardized test scores, between groups of students, mainly minorities: Blacks (African Americans), Hispanics (Latinos), Native Americans (American Indians), and their White (and Asian) peers. The gap is usually defined based on students' performance in elementary and secondary school in the subject areas of mathematics, science, and reading. At each grade level, racial disparities on an array of achievement variables demonstrate a wide gap in performance, especially in mathematics and science, particularly among disadvantaged minorities from urban and rural communities. These disparities start as early as kindergarten, persisting across the secondary grades, and in most cases widen over time.

The achievement performance also differs by family income. At each grade level, in both mathematics and science, students from low-income families have lower average scores and are less likely than students from wealthy families to reach the proficient level. These gaps related to family income are substantial. For example, students from low-income families are at least three times less likely to score at or above the proficient level for their grade in both mathematics and science (National Science Board [NSB] 2006). Low income is measured by whether or not a student is eligible for the free or reduced-priced school lunch program.

Raising academic achievement levels for all students is an important issue for education reform at all levels across the United States. Although improvements have been made, gaps among students of different demographic backgrounds and among schools with different student populations have been a persistent challenge in K–12 education in the United States. These gaps are reflected in this chapter, including teacher qualifications, school environment, and, ultimately, learning outcomes.

Data from the National Assessment of Education Progress (NAEP) indicate that Blacks and Hispanics have shown improvement since 1990, but the 2011 NAEP data show that White and Asian/Pacific Islander students continue to outperform students at every grade level (NAEP 2011). In mathematics and science, most 4th-, 8th-, and 12th-grade students did not demonstrate proficiency in the knowledge and skills taught at their grade level. Racial/ethnic minority students and students from poor families and disadvantaged backgrounds lagged behind their more advantaged peers, with these disparities starting as early as kindergarten, persisting across grades, and, for some kinds of skills, widening over time (NSB 2006). Despite the

improved performance overall, achievement gaps between these various groups persist and have shown no signs of narrowing since 1990. Black, Hispanic, and Native American students in mathematics and science are performing at lower levels than are White and Asian students. In 2011, White students scored higher on average than all other racial/ethnic groups in science. Asian/Pacific Islander and Native American/Alaska Native students scored higher on average than Black and Hispanic students, and Hispanic students scored higher than Black students (U.S. Department of Education National Center for Education Statistics, National Assessment of Educational Progress [NCES] 2011). Boys performed slightly better than girls in both subjects.

Overall, large majorities of 4th-, 8th-, and 12th-grade students did not demonstrate proficiency in the knowledge and skills taught at their grade level. Though a majority of 9th-grade students reached proficiency in low-level algebra skills, few mastered higher-level skills. Results of international mathematics and science literacy tests show that 15-year-olds continue to lag behind their peers in many countries, even though their scores have improved in recent years (NSB 2012).

Efforts to improve student achievement include raising high school graduation requirements, strengthening the rigor of curriculum standards, increasing advanced course-taking, promoting early participation in gatekeeper courses such as Algebra I, and improving teacher quality (NSB 2012).

The NAEP, a congressionally mandated program, referred to as the Nation's Report Card, monitors changes in students' academic performance. It assesses the performance of students in grades 4, 8, and 12. It ranks student performance according to three achievement levels: (1) *basic*—student has partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade; (2) *proficient*—student demonstrates solid academic performance for each grade level assessed; students reaching this level have demonstrated competency over challenging subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter; and (3) *advanced*—student demonstrates superior performance.The levels are set by the National Assessment Governing Board (NAGB) based on recommendations from panels of educators and members of the public of what students should know and should be able to do in the subject assessed.

Research on the Achievement Gap

Much of the research on the minority achievement gap has focused on identifying the factors that drive it. An overview of some factors associated with the achievement gap is presented in the next few pages. This overview is not meant to be exhaustive but is provided to show the complexity of the achievement gap problem and the challenges that must be overcome in order to close it.

Researchers have not reached a consensus about the causes of the academic achievement gap, and they have a lag in minority student performance. Studies cite an array of factors, both cultural and structural, that influence student performance

in school. These factors include poverty, resources, academic coursework, tracking and ability groups, teacher quality, and instructional practice. Schools that serve underrepresented minority and low-income students provide them with differing access to educational resources. Lareau (1987) suggested that students who lack middle-class cultural capital and have limited parental involvement are likely to have lower academic achievement than their better-resourced peers. Other researchers suggest that academic achievement is more closely tied to race and socioeconomic status (Hallinan 1994). For example, being raised in a low-income family often means having fewer educational resources, in addition to poor nutrition and limited health care, which can contribute to lower academic performance. Researchers concerned with the achievement gap between the genders cite biological differences, such as brain structure and development, as a possible reason why one gender outperforms the other in certain subjects. The differing maturation speed of boys versus girls' brains affects how each gender processes information, and it could impact their school performance (Sax 2005). *The Bell Curve* (1994) by Hernstein and Murray proposed that genetic variation in average levels of intelligence (IQ) is at the root of racial disparities in achievement; this created much controversy. Other researchers have argued that there is no significant difference in inherent cognitive ability between different races that could explain the achievement gap and that the environment is the root issue (Dickens 2005; Flynn 1980; Jencks and Phillips 1998).

One explanation for racial and ethnic differences in standardized test performance is that some minority children may not be motivated to do their best on these assessments. Claude M. Steele suggested that minority children and adolescents may also experience stereotype threat—the fear that they will be judged as having traits associated with negative appraisals and/or stereotypes of their racial/ethnic group, which produces test anxiety and hampers their test performance. According to Steele, minority test takers experience anxiety, believing that if they do poorly on a test, they will confirm the stereotypes about the inferior intellectual performance of their minority group. As a result, a self-fulfilling prophecy begins, and the child performs at a level beneath his or her inherent abilities. Steele and Johnson (1998) hypothesize that, in some cases, some minority students, especially African Americans, stop trying in school because they do not want to be accused of "acting white" by their peers (Ogbu 1986). It has also been suggested that some minority students simply stop trying because they do not believe they will ever see the true benefits of their hard work. As Ogbu (1986) points out, minority students may feel little motivation to do well in school because they do not believe it will pay off in the form of a better job or upward social mobility. For Ogbu, students will perform better and will be more engaged in school if they are helped to modify parts of their collective identity that reject school success, through caring individual and institutional practices. According to Ogbu, the cultural–ecological theory of minority schooling considers two sets of factors that shape minority students' school adjustment and academic performance: (1) the way society and its institutions treat and have treated minorities (i.e., the system) and (2) the way minorities interpret and respond to their treatment, which depends on their unique history and minority status in America. He refers to the second set of factors as *community forces*. Based on his research in

2003, Ogbu made the following recommendation, among others, to communities and schools for closing the achievement gap: Teachers need to recognize that their expectations affect students' self-concept as learners and achievers and the internalization of negative or positive beliefs about their intelligence.

Different schools have different effects on similar students. Minority students tend to be concentrated in low-achieving, highly segregated schools. In general, minority students are more likely to come from low-income households, meaning that they are more likely to attend poorly funded schools based on the districting patterns within the school system. Schools in lower-income districts tend to employ less-qualified teachers and tend to have fewer educational resources (Roscigno 2006). Research shows that teacher effectiveness is the most important in-school factor affecting student learning. Good teachers can close or eliminate the gaps in achievement on standardized tests that separate White and minority students (Gordon et al. 2006).

Some researchers (e.g., Haycock 2006) believe that (1) minority children are taught differently—many Hispanic and Black children get a lower-level, less rigorous curriculum; (2) the least-qualified teachers are assigned to teach minority students; and (3) less is expected of minority children, which becomes a self-fulfilling prophecy (McRobbie 1998). "An unfortunate reality that characterizes the problem of many minority students in science is that the burden of understaffed and underequipped schools usually falls on minority communities," said Clark (1996). This phenomenon can be especially harmful to a science curriculum because well-trained teachers and laboratory experiences are essential. Minority students also get less-experienced teachers. Out-of-field teachers teach more classes in high-minority schools. Inequities in school funding can highlight the social context of schooling.

Perhaps the most significant resource deficit for achievement in science is access to science courses (Lynch 2000). There are wide differences in the availability and quality of courses offered, particularly at the high school level. As colleges become more selective, lack of access to science courses puts students in schools with limited resources at a serious disadvantage when competing for postsecondary opportunities.

Many teachers have low expectations of minority students and do not hold them to high rigorous standards or encourage them to take more advanced courses (Jencks and Phillips 1998). Though more research is needed in this area, experts contend that teachers' perceptions, expectations, and behaviors probably help sustain and even expand the achievement gap.

Research conducted by SciMath and the Minnesota Department of Children, Families, and Learning (1998) found that teacher behaviors affect minority student achievement in mathematics and that minority students benefit from teachers who expect students of all racial, ethnic, and cultural backgrounds to achieve. These teachers consider students' cultural backgrounds as assets rather than liabilities and recognize that all racial, ethnic, and cultural groups have contributed to the mathematics knowledge base (Holloway 2004). These teachers increase the cognitive level of interactions with minority students using diverse and flexible assessments to determine students' strengths. They vary the instructional styles in the classroom.

Hand in hand with teacher expectations, researchers are also noting that teacher quality can contribute to the achievement gap. Research indicates that children in schools with high concentrations of minority and poor students are more likely to be taught by unqualified teachers (Clark 1996; Darling-Hammond 2000). These findings are emerging in conjunction with other studies, quantifying the damage caused by ineffective teachers (Jencks and Phillips 1998). Consequently, teacher professional development has become one of the major elements of the school reform efforts.

Some schools tend to place students in tracking groups as a means of tailoring lesson plans for different types of learners. However, as a result of schools placing emphasis on socioeconomic status and cultural capital, minority students are vastly overrepresented in lower educational tracks (VanderHart 2006). Similarly, Black and Hispanic students are often wrongly placed into lower tracks based on teachers' and administrators' expectations for minority students. Studies show that tracking groups within schools are detrimental to minority students (Hyunsook Song 2006). Once students are in these lower tracks, they tend to have less-qualified teachers, a less-challenging curriculum, and few opportunities to advance into higher tracks. Research suggests that students in lower tracks suffer from social and psychological consequences of being labeled as slower learners, which leads children to stop trying in school (Hochschild 2003; Lareau 1987). Many sociologists argue that tracking in schools does not provide lasting benefits to any group of students (Gamoran 1992).

In researching high school mathematics education, Davenport (1993) found that homogeneous ability/achievement grouping impacts high school mathematics education. Within schools using tracking, lower-track students (who are usually the underrepresented minority students) have less access to (1) strong mathematics programs, (2) well-qualified mathematics teachers, and (3) classroom opportunities. Davenport found research support for the position that tracking, especially in high school, widens the achievement gap and "generally fails to increase learning." Research conducted by Oakes (1990) supports these findings.

Research also shows that poor and minority students have disproportionately less access to high-quality, early childhood education, which has been shown to have a strong impact on early learning and development. Magnuson and Waldfogel (2005) found that, although Black children are more likely than White children to attend preschool, they often experience lower-quality care. The same study also found that Hispanic children are much less likely than White children to attend preschool. According to the National Institute for Early Education Research (NIEER), families with modest incomes (less than $60,000) have the least access to preschool education (Barnett and Yarosz 2007). Research suggests that dramatic increases in both enrollment and quality of prekindergarten programs would help alleviate the school-readiness gap and ensure that low-income and minority children begin school on even footing with their peers (Magnuson and Waldfogel 2005).

Education Week Quality Counts (1998) finds that there are no "quick fixes" for the achievement gap in high schools. Major differences in both the opportunity to learn and achievement itself appear in the early grades, so that by the time minority and poor students reach the ninth grade, the deficit is difficult to remedy.

According to Tim Simmons (1999), "race, not poverty drives a wedge between the test scores of Black and White children." Simmons's conclusion is based on the results of a 5-month study conducted by *The News and Observer*. The classroom observations; test data; academic research; and parent, teacher, and student interviews showed a link between racism and the Black–White test score gap (Minority Achievement Report, Trends in Subgroup Performance 2001).

Simmons further stated that "skin color determines what adults expect from thousands of children—and what those children ultimately expect of themselves." Similarly, Greg Malhoit observed that "the statistics portray a tragic picture of minority educational achievement. Despite the end of segregation, the quality of a child's education still depends in large part on skin color." This statement suggests that the Black–White test score gap might be a manifestation of a greater societal ill: a racial divide (Minority Achievement Report, Trends in Subgroup Performance 2001).

The National Task Force on Minority Achievement (College Board 1999) concluded in its Reaching the Top report that "while it is difficult to quantify the overall negative impact of prejudice and discrimination on the educational fortunes of underrepresented minority students, we have strong reason to believe that it is large."

Barton (2003) found links between student achievement and core factors related to students' racial, ethnic, and socioeconomic status (Educational Testing Service [ETS] 2006).

In addition to the cultural, environmental, structural, and instructional arguments for closing the achievement gap, there are strong economic arguments for doing so. Ladson-Billings (2006) argues that a focus on the achievement gap is misleading. Instead, we need to look at the "education debt" that has accumulated over time. This debt comprises historical, economic, sociopolitical, and moral components. Ladson-Billings draws an analogy with the concept of national debt, which she contrasts with that of a national budget deficit, to argue the significance of the education debt. A 2009 report by the consulting firm McKinsey & Company asserts that the persistence of the achievement gap in the United States has the economic effect of a permanent national recession. The report claims that, if the gap between Black and Latino performance and White student performance had been narrowed, the gross domestic product (GDP) in 2008 would have been $310–525 billion (2–4%) higher. If the gap between low-income students and their peers had been narrowed, the GDP in the same year would have been $400–670 billion higher (3–5%). McKinsey & Company (2009) has provided strong evidence that narrowing the gap would have a positive economic and social impact. Jeneks and Phillips (1998) have argued that narrowing the Black–White test score gap "would do more to move the United States toward racial equality than any politically plausible alternative."

Factors Contributing to the Achievement Gap

The first step toward closing the achievement gap and attracting more minority students to STEM fields is to understand the dynamics that suppress their achievement. The achievement gap is a matter of race and class. Researchers have tried

to pinpoint why race and class are such strong predictors of students' educational attainment. In the 1990s, the controversial book, *The Bell Curve,* claimed that gaps in student achievement were the result of variation in students' genetic makeup and natural ability—an assertion that has since been widely discredited. Many experts have since asserted that achievement gaps are the result of more subtle environmental factors and "opportunity gaps" in the resources available to poor versus wealthy children. Being raised in a low-income family, for example, often means having fewer educational resources at home, in addition to poor health care and nutrition. At the same time, studies have also found that children in poverty whose parents provide engaging learning environments at home do not start school with the same academic readiness gaps seen among poor children generally (U.S. Department of Education 2000; Viadero 2000; Sparks 2011).

Researchers have provided several factors contributing to the achievement gap and preventing Blacks and other minority students from achieving success in education, including mathematics and science. They can be summarized in the following grouping:

- Teachers lack skills to deliver instruction to low-performing students.
- Schools that have a history of low performance lack rigor in mathematics and science programs. The curriculum is often watered down, and instruction is not designed to challenge students to perform at high levels.
- Inadequate resources to deliver challenging instruction in STEM programs.
- Tracking students into classrooms where both teachers and students perform at low levels.
- Racial and linguistic minority students and low-income students historically have not been provided equitable access to resources, instruction, and opportunities to achieve at high levels.
- Placement of teachers with minimal teaching skills and experiences with high needs students.

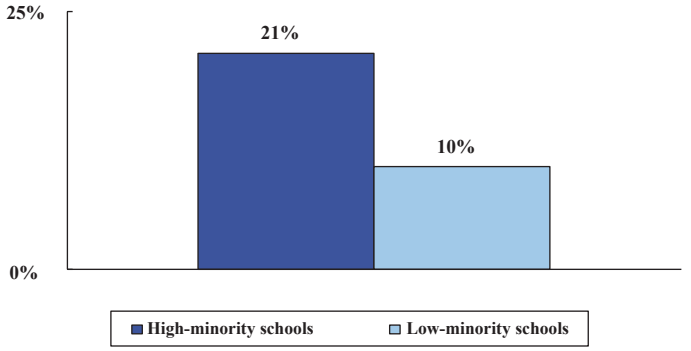
The author (Clark 2013) believes that the key factors contributing to the achievement gap can be summed up in two words: equity and access. Overall, minority students have less access to: (1) well-qualified mathematics and science teachers, (2) strong mathematics and science curriculum, (3) resources, (4) classroom opportunities, and (5) information.

Minority Students Have Less Access to Well-Qualified Mathematics and Science Teachers

Teacher quality can contribute to the achievement gap. Good teaching matters more than anything else, but Blacks and other minority students get less than their fair share of qualified teachers. Minority students get more inexperienced teachers—teachers with 3 or fewer years of experience. As shown on the table below, inex-

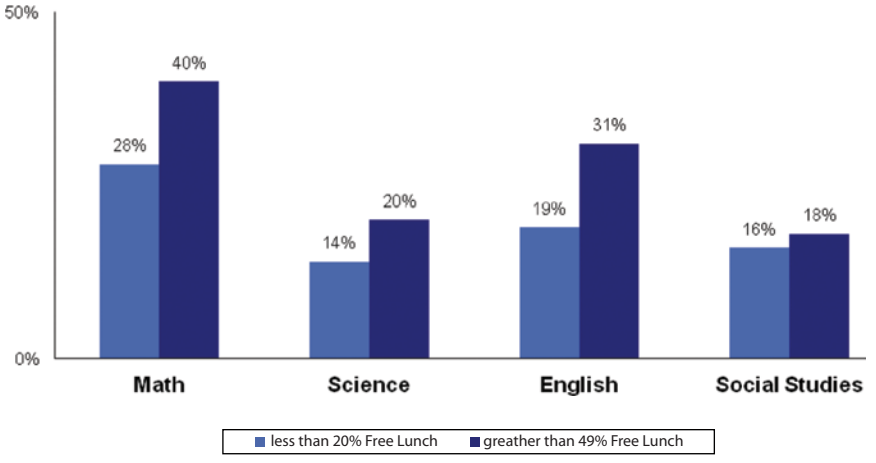
perienced teachers are twice as likely to be in schools with a high level of minority enrollment than in schools with a low level.

Minority students get more inexperienced* teachers



***Teacher with 3 or fewer years of experience. "High" and "low" refer to top and bottom quantities.**
Source: National Center for Education Statistics, "An Indicators Report," December 2000.

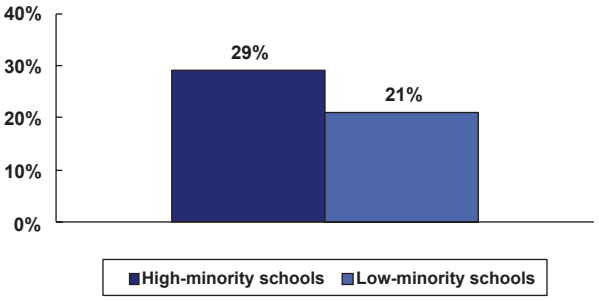
More classes in high-poverty schools are taught by the least-qualified teachers*



***Teachers who lack a major or minor in the field.**
Source: National Commission on Teaching & America's Future, What Matters Most: Teaching for America's Future (p.16) 1996.

The least-qualified teachers are often assigned to teach minority students. More classes in high-minority schools than in low-minority schools are taught by out-of-field teachers—teachers lacking a college major or minor in the field. High-minority schools contain 50% more minority students. Low-minority schools contain 15% or fewer minority students.

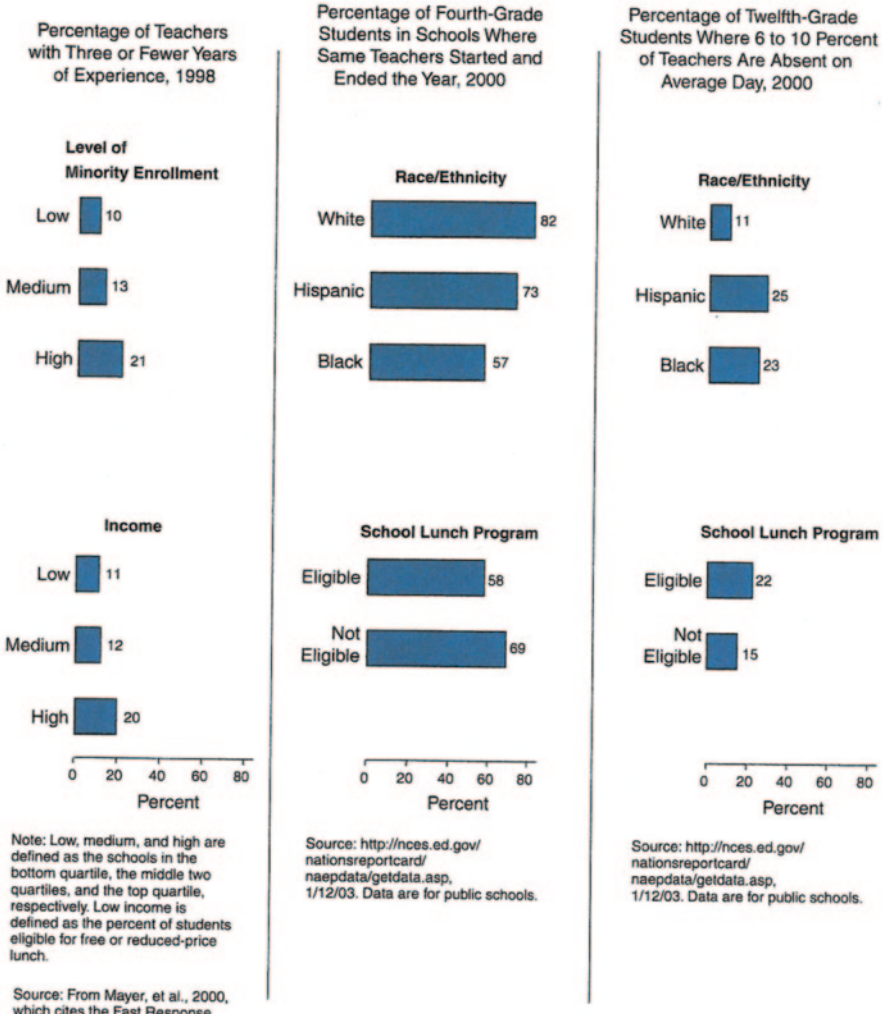
More classes in high-minority schools are taught by out-of-field teachers*



***Teachers lacking a college major or minor in the field.**
Source: Education Trust (2003).

Further, teachers and principals in low-income, high-minority, inner-city schools all report problems with teacher interest, motivation, preparation, and competence in mathematics and science instruction. These problems are more evident at the secondary level, where "nearly all types of secondary schools tend to place their least qualified teachers with low-ability classes and their most qualified teachers with high ability classes."

Teacher Experience and Attendance



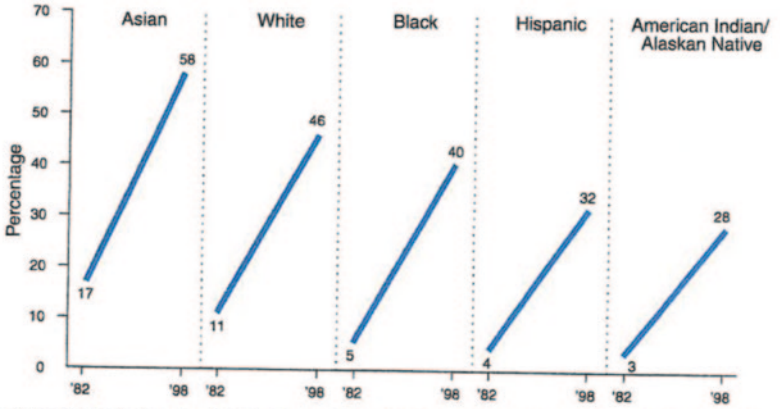
Minority Students Have Less Access to a Rigorous High-Level Curriculum

Research shows that students' academic achievement is closely related to the rigor of the curriculum. Poor and minority students have less access to high-level curriculum.

Rigor of Curriculum

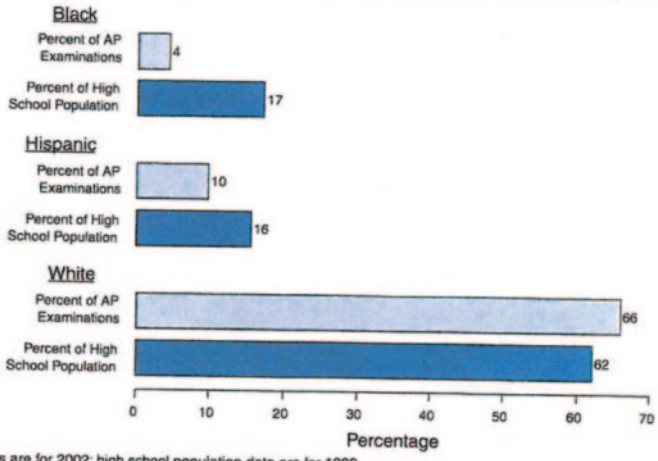
Percentage of High School Graduates with Substantial Credits in Academic Courses, 1982 and 1998

Percentage with four years of English, three years each of social studies and mathematics, and two years of a foreign language



Source: National Center for Education Statistics, *Digest of Education Statistics 2001*, Table 143. Original data from National Center for Education Statistics, *High School Transcript Study*.

Distribution of Advanced Placement Examinations Compared with the Distribution of the High School Population, by Race/Ethnicity, 1999/2002*



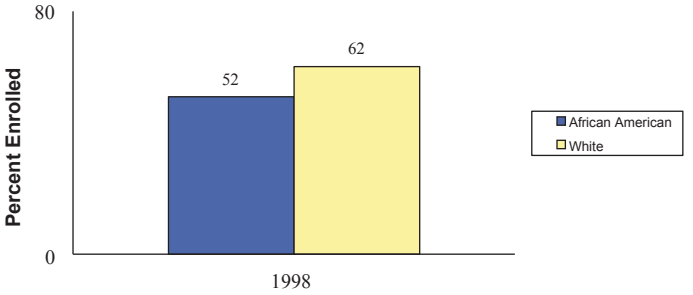
*AP examinations are for 2002; high school population data are for 1999.
Sources: AP data are from the College Board; high school population data are from National Center for Education Statistics, *Digest of Education Statistics 2001*, Table 42.

Minority students consistently achieve and participate less in mathematics and science and have less access to mathematics and science and high-level curriculum. They experience less extensive and less demanding courses and programs. They are less likely to have completed advanced mathematics and science courses.

Differences exist in mathematics and science being taken across racial groups. For example, fewer African-American students are enrolled in Algebra II. Whereas 62% of White and 70% of Asian students had taken Algebra II in 1998, only 52% of African Americans, 48% of Hispanics, and 47% of American Indians had taken this course.

The percentages of African-American, Hispanic, and American-Indian graduates taking chemistry and physics are well below those of White and Asian graduates. In 1998, 63% of White and 72% of Asian high school graduates had taken chemistry, and 31% of White and 46% of Asian students had taken physics. In 1998, 53% of African Americans, 46% Hispanics, and 47% American Indians had taken chemistry; only 21% of African Americans, 19% of Hispanics, and 16% of American Indians had taken physics (NSB 2002).

Minority high school graduates are also less likely to have completed advanced mathematics and science courses, and they are less likely to be enrolled in a full college-prep track.



Source: CCSSO, State Indicators of Science and Mathematics Education, 2001.

Minority Students Have Less Access to Resources

Research shows that school districts where low-income, high-minority students are educated consistently receive less state and local money to educate them than do the districts serving the smallest number of minority students. They received approximately $614 less per student per year in 2003 (Education Trust 2006).

Students in low-income, high-minority schools appear to have less access to computers and computer staff, science laboratories, and related resources. They also lack access to science classes and rigorous science curriculum.

Inequities of technology access exist in America's schools. School access, however, does not always mean classroom access, and a digital divide between rich and poor schools still exists. Schools with high-minority enrollment have less access to the Internet than do schools with low-minority enrollment. Access to technology is more of a given for White students than for minority students. Data from the U.S. Department of Education, National Center for Education Statistics (NCES 2000) revealed that Internet access in classrooms varies according to school characteristics. For example, in 1999, 39% of instructional rooms had Internet access in schools with a high percentage of low-income students or high concentrations of poverty compared with 62–74% in schools with low concentrations of poverty.

Minority Students Have Less Access to Classroom Opportunities

Teachers of low-income and minority students place less emphasis on essential curriculum goals such as developing inquiry and problem-solving skills. In low-ability tracks, almost all goals are less emphasized, expectations are lower, and instruction is less engaging. There are inequities in school funding. Students from non-White ethnic groups, with the exception of Asian Americans, appear more likely to attend a disadvantaged school, in terms of affluence and resources. The disadvantaged schools are more likely to have low teacher morale, deteriorating school facilities, fewer materials, lower-quality or nonexistent laboratory opportunities, lower student motivation, and fewer certified teachers—especially for science. Nationwide, only about 65% of eighth-grade teachers report adequate facilities for laboratory science (NSB 1996). Performance on the 1996 NAEP in science was higher for students from well-equipped classrooms.

Minority Students Have Less Access to Information

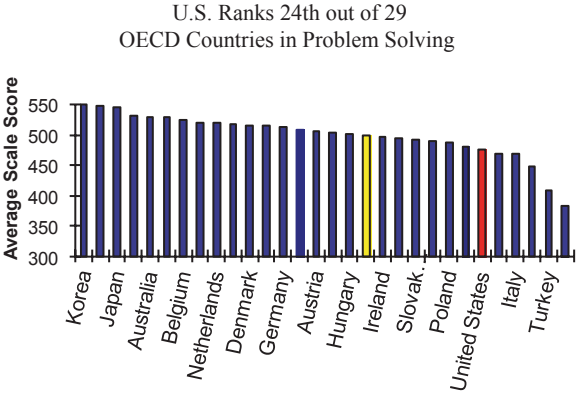
Low-income, rural, and minority parents have less access to information regarding educational opportunities for their children.

In summary, some of the major factors that contribute to the achievement gap in mathematics and science include inequity in access to qualified teachers, facilities, resources, challenging science and mathematics curricula for minority students, and too few students taking advantage of advanced coursework. School characteristics (such as courses offered and teacher education and experience), student characteristics (such as family income), and mathematics and science course-taking all correlated with academic achievement (U.S. ED/NCES 2000c). In addition, national, state, and school district policies regarding teacher qualifications and curricula vary, resulting in differences in access to high-quality teachers and higher-level mathematics and science courses.

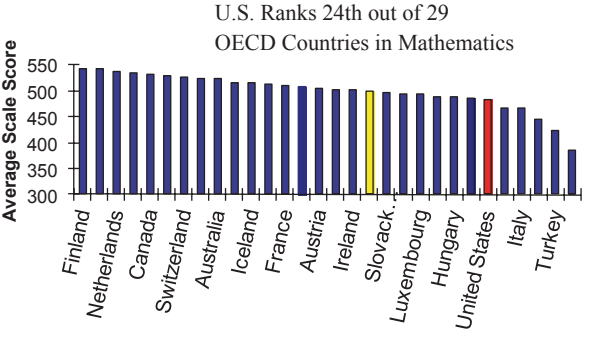
The State of Mathematics and Science in the United States

International Comparisons of Student Science and Mathematics Performance

There is a growing concern that the United States is not preparing a sufficient number of students in mathematics and science. The U.S. falls behind other countries in mathematics and science. Although the most recent NAEP results show improvement in U.S. students' knowledge of mathematics and science, the large majority of students fail to reach adequate levels of proficiency. For example, among the 40 countries participating in the 2003 Program for International Student Assessment (PISA), the U.S. ranked 24th in science literacy and 28th in mathematics literacy. Compared with students in other countries, U.S. students are not achieving at high levels, and U.S. students fare worse in international comparisons at higher-grade levels.



Source: Organisation for Economic Co-operation and Development (OECD), PISA 2003 Results, data available at http://www.oecd.org/



Source: Organisation for Economic Co-operation and Development (OECD), PISA 2003 Results, data available at http://www.oecd.org/

Two mathematics and science assessments place U.S. student achievement in mathematics and science in an international context: the Trends in International Mathematics and Sciences Study (TIMSS; called the Third International Mathematics and Science Study in 1995) and the Program for International Student Assessment (PISA). PISA assesses the performance of 15-year-olds in mathematics and science literacy every three years. Most countries participating in PISA are members of the Organisation for Economic Co-operation and Development (OECD), although the number of participating non-OECD nations and regions is increasing. Most OECD countries are economically advanced nations (NSB 2012).

PISA is a literacy assessment, not a curriculum-based assessment. It measures how well students apply their knowledge and understanding to real-world situations. The term *literacy* indicates its focus on the application of knowledge learned in and outside of school.

The results from the two assessment programs paint a critical picture. In 1995, on the TIMSS, U.S. students performed slightly better than the international average in mathematics and science in grade 4, but by grade 8 their relative international standing had declined, and it continued to erode through grade 12. Of the 25 other countries participating in the fourth-grade component of the assessment, 12 had lower average mathematics scores and 19 countries had lower scores in science than the U.S. (NSB 2004). The eighth-grade students in the U.S. scored below the international average in mathematics but above the international average in science (NCES 1997b; NSB 2004).

The fourth- and eighth-grade results from the 1995 TIMSS study suggest that U.S. students perform less well on international comparisons as they advance through school. Four years later, a repeat study focused on the (TIMSS-R) performance of eighth-grade students in 38 countries. In 2000, the PISA assessed 15-year-olds from 35 countries in reading, mathematics, and science. TIMSS and TIMSS-R measured mastery of curriculum-based scientific and mathematical knowledge and skills. PISA assessed students' scientific and mathematical literacy, with the aim of understanding how well students can apply scientific and mathematical concepts. U.S. 12th-grade students performed below the 21-country international average on the TIMSS test of general knowledge in mathematics and science (NCES 1998; NSF 2012).

Despite recent improvement, U.S. PISA scores in mathematics remain consistently below the OECD average and also below those of many non-OECD countries. In the most recent PISA test in 2009, the U.S. average score of 487 fell below the OECD average of 496 and was lower than 17 of the 33 other OECD nations, including Republic of Korea (546), Finland (541), Switzerland (534), Japan (529), Canada (527), and the Netherlands (526). The U.S. score was also lower than the scores in several non-OECD regions/countries/economics, such as Shanghai, China (60); Singapore (562); and Hong Kong (555). In 2009, U.S. students demonstrated higher mathematical literacy than did students in only 5 out of 34 OECD countries (Greece, Israel, Turkey, Chile, and Mexico; NSF 2012).

U.S. students performed relatively better in the PISA science assessment. The average science literacy score of U.S. 15-year-olds improved by 3 points from 2006

to 2009. Whereas U.S. students scored lower than the OECD average in 2006 (489 versus 498), this gap was not evident in 2009 (502 versus 501). The U.S. gains in science since 2006 were driven mainly by improvements at the bottom of the performance distribution; performance at the top remained unchanged (OECD 2010b).

Despite improvement, the 2009 U.S. score (502) was below that of 12 OECD nations (512–554). U.S. students scored lower than students in the five top-performing OECD nations (Finland, Japan, Republic of Korea, New Zealand, and Canada) by 27–52 points. U.S. students also lagged behind their peers in (non-OECD) Shanghai, China; Hong Kong; and Singapore (by 40–73 points). The U.S. 90th percentile score in scientific literacy was 629, below the corresponding scores in 7 of 33 other OECD nations (642–667) (OECD 2010b; *The Chronicle of Higher Education,* Dec. 4, 2007).

According to a report by *The Washington Post* (December 10, 2008), U.S. students are doing better on TIMSS than they were in the mid-1990s.

TIMSS results released in December 9, 2008 show how fourth- and eighth-grade students in the U.S. measure up to peers around the world. The U.S. students made notable strides in mathematics. Since 1995, the average score among fourth-grade students has jumped 11 points, to 529. However, students in Hong Kong, Singapore, Taiwan, Japan, Russia, and England were among those with a higher average. Hong Kong topped the list with an average score of 607.

Eighth-grade students also had a higher average score than in 1996 and bested their counterparts in 37 countries. However, they lagged behind peers in Taiwan, South Korea, Singapore, Hong Kong, and Japan, among other peers.

In summary, the results from the two assessment programs paint a complex picture. U.S. students scored above the international average in the TIMSS assessment and below the international average in the PISA assessment. The two programs are designed to serve different purposes, and each provides unique information about U.S. student performance relative to other countries in mathematics and science (Scott 2004). TIMSS provides data on mathematics and science achievement of students in primary- and middle-school grades (grades 4 and 8 in the U.S.). PISA reports the performance of students in secondary schools by sampling 15-year-olds. TIMSS measures student mastery of curriculum-based knowledge and skills. PISA places emphasis on student's ability to apply scientific and mathematical concepts and thinking skills to problems they might encounter, particularly in situations outside the classroom.

In both 2006 and 2009, U.S. 15-year-olds scored below those of many other developed countries in the PISA, a literacy assessment designed to test mathematics and science. Nonetheless, U.S. scores improved from 2006 to 2009. The average mathematics literacy score of U.S. 15-year-olds declined by 9 points from 2003 to 2006, and rose by about 13 points in 2009, placing the United States below 17 of 33 other members of the OECD. The average science literacy score of U.S. 15-year-olds was not measurably different from the 2009 OECD average, though it improved by 3 points from 2006 to 2009. The U.S. score was lower than the score of 12 out of 33 other OECD nations participating in the assessment.

National data also indicate that the achievement gap among subgroup of students has not been closed. Not only do American students lag behind their international peers, but also, when student achievement is disaggregated by race, the scores of minority students, who are underrepresented in mathematics and science, are below those of their European and Asian-American peers. TIMSS measures student performance in science topics/content and cognitive skills of knowing, applying, and reasoning.

"While it is good news that fourth grade students have made significant gains in mathematics, it is troubling that our students are still behind their international peers in both mathematics and science—fields that are key to our country's economic vitality and competitiveness," said Representative George Miller (D-California), Chairman of the U.S. House Education and Labor Committee, and "It is increasingly clear that building a world-class education system that provides students with a strong foundation in mathematics and science must be part of any meaningful long-term economic recovery strategy" (Washington Post 2008).

The scores on the two international assessment tests led to renewed calls to bolster mathematics and science in the nation's schools by increasing the ranks of well-prepared teachers and providing other support.

The Policy Framework

Over the last few years, the problems in the nation's schools have rightly risen to the top of the national policy agenda. This year is no exception. The nation seems to understand that its schools are not adequately preparing its students, particularly poor and minority students, for college and careers in the twenty-first century. There is also increased awareness of the long-term social and economic implications of an inadequate education for individuals, the communities in which they live, and the nation as a whole. There is a growing consensus that there is a stronger federal role needed in addressing these issues. Given the severity of the crises, the nation cannot afford to let another generation of students pass through the system unprepared for college and careers.

The nation must ensure that K–12 schools—and their students—are no longer left behind in the education system. Policies must drive systemic reforms to help low-performing students. Numerous studies indicate that schools in the United States are failing to adequately prepare all students for a world that depends more and more on rapidly changing technology. Many students leave American schools without a basic understanding of science, mathematics, and technology. The students most affected are from underrepresented minority and low-income communities. The demand for scientists and engineers is not being met, and schools are not preparing future citizens with an adequate background of knowledge necessary to make decisions about their lives.

The nation's efforts to address the achievement gap have a long history. Expectations to address the achievement gap increased with the *Brown v. Board of Education* desegregation decision in 1954 and with the passage of the Elementary

and Secondary Act (ESEA) in 1965, which focused on the inequality of school resources. ESEA authorized grants for elementary- and secondary-school programs for children of low-income families; school library resources, textbooks, and other instructional materials; supplemental education centers and services; strengthening of state education agencies; education research; and professional development for teachers.

The Civil Rights Act of 1964 speared optimism for progress in society as a whole. In 2004, the 50th anniversary of *Brown vs. Board of Education* was observed. On May 17, 2009, its 55th anniversary was observed. It reminded us of how far and how little our education system has actually come. It is astonishing that, more than 50 years after *Brown vs. Board of Education,* a large achievement gap persists. In a statement marking the 57th anniversary (2011), Representative George Miller (D-CA), the ranking Democrat on the House Education and the Workforce Committee, pointed to both progress and obstacles on the road toward equity: "Our federal education laws are rooted in the effort to uphold this promise, but sadly, education inequalities still exist on many levels in this country." Miller said, "They exist when children in the poorest schools are denied access to great teachers and they exist when school districts allow dropout factories to fail our students."

All children are entitled to a solid education in the United States. There is a good reason for this: For generations, education has been the most reliable path to a better quality of life, including access to good jobs and careers. Ensuring that every child gets a solid education will go a long way toward fulfilling America's promise of equal opportunity for all (Education Trust 2001).

The Black community has long recognized the central importance of education. That is why Black Americans have fought so hard for educational opportunities throughout this country's history. Although Black Americans won the right to equal access in public schools more than 50 years ago, the struggle for educational excellence and equity did not end with the victory in *Brown vs. Board of Education.* There is still much work to be done to ensure that Blacks and other minority children get the best education. Schools serving minorities often lack the money, qualified teachers, textbooks, and other instructional materials needed to serve their students. Even when minority students attend "better" schools, they often are not given the best teachers, not assigned to the most challenging courses, and not educated to their full potential (Education Trust 2001).

Educational Policies and Reform Initiatives

Numerous studies indicate that schools in the United States are failing to adequately prepare all students for a world that increasingly depends on rapidly changing technology. Many students leave American schools without a basic understanding of STEM education. Most of such students are from minority and low-income communities. The demand for scientists and engineers is not being met, nor are schools preparing future citizens with an adequate background of knowledge necessary to make decisions about their lives.

In an effort to improve the quality of mathematics and science in our nation's schools and to make mathematics and science accessible to all students, major national reform initiatives have been designed. These initiatives have gained wide distribution and have been or are being implemented by a wide range of U.S. schools, universities, industries, and science organizations. These comprehensive initiatives are the No Child Left Behind Act (NCLB), America COMPETES Act, and Race to the Top.

Increasing overall student achievement, especially lifting the performance of low achievers, is a central goal of education reform. This goal is reflected in the federal NCLB Act of 2001, which mandates that all students in each state reach the proficient level of achievement by 2014. This goal is also highlighted in the more recent federal Race to the Top program, which calls for states to design systematic and innovative educational reform strategies to improve student achievement and close performance gaps. The federal government also targets funds directly to low-performing schools through the School Improvement Grants program, for example, to support changes needed in the lowest-achieving schools across the nation.

Among the many factors that influence student learning, teacher quality is critical. To ensure that all classrooms are led by high-quality teachers, NCLB mandates that schools and districts hire only highly qualified teachers, defining "highly qualified" as having attained state certification and a bachelor's degree and having demonstrated subject area competence. Teaching quality has remained in the national spotlight. The Race to the Top program, a component of the American Recovery and Reinvestment Act of 2009, called for applications from states to compete for more than $4 billion for education innovation and reform, including recruitment, professional development, compensation, and retention of effective teachers. Salaries, working conditions, and opportunities for professional development contribute to keeping teachers in the profession and keeping the best teachers in the classroom (Berry et al. 2008; Brill and McCartney 2008; Hanushek and Rivkin 2007; Ingersoll and May 2010).

No Child Left Behind Act (NCLB)

The United States set a national goal of ensuring that each student receives an equitable, high-quality education, and that no child is left behind in this quest. President Bush signed the No Child Left Behind Act (NCLB) on January 8, 2002. This Act focuses on standards and aligns tests and school accountability to ensure that all students in all groups eventually perform at the grade level in all tests, and that schools show continual improvement toward this goal or face sanctions. As written, NCLB required states to immediately set standards in mathematics and reading as well as science and language arts, by 2005. The law requires that every school be held individually accountable for the progress of all students. It expects schools to close all achievement gaps in 12 years. It is a huge expectation given the size of the gap that divides many Whites and middle-class students from those who are poor or minority.

NCLB reauthorizes the Elementary and Secondary Act of 1964. It represents the president's education reform plan and contains changes to the ESEA that was enacted in 1965. This reform gives districts flexibility in how they spend their federal education dollars, in return for setting standards for student achievement and holding students and educators accountable for results. NCLB changes the federal government's role in K–12 education by focusing on school success as measured by student achievement. The Act also contains the president's four basic education reform principles: (1) stronger accountability for results, (2) increased flexibility and local control, (3) expanded options for parents, and (4) emphasis on teaching methods that have been shown to work.

NCLB is federal legislation that enacts the theories of standards-based education reform, formerly known as outcome-based education, which is based on the belief that setting high expectations and establishing measurable goals can improve individual outcomes in education. Prompted by the publication of *A Nation at Risk* in the 1980s, many states initiated a broad set of education policy reforms, including increased course credit requirements for graduation, higher standards for teacher preparation, teacher tests for certification, state curriculum guidelines and frameworks, and new statewide student assessments (CCSSO 2003). The NCLB Act of 2001 reaffirmed the key role of states by requiring them to report on school and district performance using state assessments aligned with state standards in mathematics, science, and language arts. NCLB also required states to ensure that all classrooms have highly qualified teachers in core academic subjects. The Act required states to develop assessments in basic skills to be given to all students in certain grades, if those states are to receive federal funding for schools. NCLB does not assert a national achievement standard; standards are set by each individual state.

NCLB is an ambitious law. The law sets deadlines for states to expand the scope and frequency of student testing, revamp their accountability systems, and guarantee that every teacher is qualified in their subject area. NCLB required states to make demonstrable the annual progress in raising the percentage of students' proficiency in reading and mathematics and in narrowing the test-score gap between advantaged and disadvantaged students. At the same time, the law increased funding in several areas, including K–3 reading programs and before- and after-school programs, and provided states with greater flexibility to use federal funds as they see fit.

The effectiveness and desirability of NCLB's measures generated much discussion and remain debatable.

America COMPETES Act

The America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (America COMPETES Act) was signed into law on August 9, 2007. The America COMPETES Act was a bipartisan legislative response to recommendations contained in the 2005 National Academies "Raising

Above the Gathering Storm" report and the Council on Competitiveness "Innovate America" report. A wide range of U.S. industries, universities, and science organizations supported it. COMPETES seeks to ensure that U.S. students, teachers, businesses, and workers will continue leading the world in science, innovation, research, and technology.

The law presents a balanced set of policies to improve the country's short- and long-term competitiveness. COMPETES invests in long-term science and research, as well as short-term technology development and innovation. Legislation is directed at increasing research investment, improving economic competitiveness, developing an innovation infrastructure, and strengthening and expanding science and mathematics programs at all points on the educational pipeline. It ensures not only that our nation will produce the world's leading scientists and engineers, but also that all students will have a strong grounding in mathematics and science and are prepared for technical jobs in every sector of the economy. The Act focuses on three primary areas of importance to maintaining and improving U.S. innovation in the twenty-first century: (1) increasing research investment; (2) strengthening educational opportunities in STEM, from elementary through graduate school; and (3) developing an innovation infrastructure. The Act provided research investments in several federal agencies to improve mathematics and science education. The agencies included the National Science Foundation (NSF), Department of Energy's Office of Science, National Institute of Standards and Technology (NIST), National Aeronautics and Space Administration (NASA), and National Oceanic and Atmospheric Administration (NOAA).

The America COMPETES Act was approved by the U.S. Congress as a measure to strengthen the U.S. position within the world's scientific and engineering communities. Although the USA has traditionally been a world leader in these two areas, other countries (e.g., China, India, and Japan) are quickly closing the gap in higher education, scientific knowledge, and technical abilities. The bill was also intended to encourage people to study and teach mathematics and science, along with supporting research into emerging technologies and increasing funds for federal science-based organizations. The America COMPETES Act was a significant step toward a national innovation agenda.

Race to the Top

In 2009, the President Obama administration instituted the Race to the Top (RTTT) program. This program provides financial incentives to states to produce measurable student gains. The primary goals of the program are improving student achievement, closing achievement gaps, and improving high school graduation rates. This initiative is similar to the NCLB Act in that it has many of the same goals, though it places greater emphasis on closing the achievement gap between high- and low-performing schools. The major difference between the two educational reform programs is that RTTT is a competitive grant program that provides incentives for

schools to change, whereas NCLB mandated changes in state and local education systems (Lohman 2011).

RTTT is a competitive grant program funded by the U.S. Department of Education as part of the American Recovery and Reinvestment Act of 2009. This program is designed to encourage and reward states creating the conditions for education innovation and reform, achieving improvement in student outcomes, and implementing reform plans in four core areas: (1) adopting standards and assessments that prepare students to succeed in college and the workplace; (2) building data systems that measure student growth and success and inform teachers and principals how to improve instruction; (3) recruiting, developing, rewarding, and retaining effective teachers and principals; and (4) turning around the lowest-performing schools (NSB 2012).The American Recovery and Reinvestment Act of 2009 established a broad four-point framework to improve the K–12 education system. The framework—implemented through the creation of new competitive grant programs and the realignment of existing federal funds—focuses on developing rigorous standards and assessments, improving the effectiveness of teachers and principals, using data to improve performance, and turning around low-performing schools (Executive Office of the President 2010).

Success Stories

The concern for "raising the bar and closing the gap" in educational outcomes is widespread throughout the United States and around the world. Some schools and districts have confronted the inequities in the education system and are providing evidence that improvements are being made in student performance. These schools and districts have provided ways to improve the performance of underserved low-income and minority students and have observed how their performance has changed. They have raised their test scores and graduation rates by providing resources and making community-wide and long-term investments in poor children; creating better early-childhood programs; and using clear, ambitious goals for all students and curricula aligned to those goals.

Gains in reading, mathematics (higher than the national average), and other subjects have been made in the District of Columbia, Virginia, Maryland, Louisiana, South Carolina, Mississippi, Texas, and other states. Some of the success stories are described below.

Virginia

A new U.S. Department of Education (ED) report recognizes Virginia for narrowing achievement gaps between Black and White students in reading and mathematics. The report, *Achievement Gaps: How Black and White Students in Public Schools*

Perform in Mathematics and Reading on the National Assessment of Education Progress (NAEP), compares student achievement in 2007 with the performance in previous years. In comparing the performance of students nationwide with state-level achievement in the national fourth- and eighth-grade reading tests, the ED National Center for Educational Statistics reports the following:

- Virginia is one of only five states with achievement gaps in reading smaller than the nation's in both grades.
- Virginia is one of three states where the achievement gap in grade-4 reading narrowed between 2005 and 2007 because of increased Black achievement.
- Virginia's achievement gap in grade-4 reading is 7 points smaller than the nationwide gap, and in grade 8, the gap is six points smaller.
- Virginia is one of 13 states where fourth-grade reading achievement is higher for both Black and White students than it was in 1992, the first year of NAEP reading tests in grade 4.

The report also credits Virginia for narrowing achievement gaps in mathematics:

- Virginia is one of only four states where fourth-grade mathematics scores increased for both Black and White students between 2005 and 2007.
- Virginia is one of 15 states to narrow the achievement gap in fourth-grade mathematics as a result of Black students outpacing the gains of White students since 1992, when grade-4 NAEP mathematics testing began.
- Virginia is one of 26 states where mathematics scores for both Black and White eighth-grade students increased since grade-8 NAEP mathematics testing began in 1990.

Patricia I. Wright, Superintendent of Public Instruction, said "Closing these gaps will require the continued commitment of educators, parents and community leaders to high standards and accountability," and "The progress cited in today's report provides encouragement that we can eliminate historic disparities even as we seek to raise the achievement of all students" (Virginia Department of Education [VDOE] 2009).

The Virginia Board of Education recently honored two school divisions and 92 schools for raising the academic achievement of economically disadvantaged students. The awards are based on student achievement on state assessments during the 2009–2010 and 2010–2011 school years. Highland County and West Point schools earned the designation of "Distinguished Title 1 School Division" by exceeding all federal ESEA achievement objectives in reading and mathematics for two consecutive years (VDOE 2012).

Maryland

In September 2011, the Maryland State Education Association (MSEA) and public school advocates held a statewide forum on closing the achievement gaps for Maryland students, with educators, students, parents, and community partners. They

shared successes and identified strategies for closing the gaps. An outcome of this meeting, local associations, school districts, and communities formed countywide Closing the Achievement Gap committees (Maryland State Association 2009).

Louisiana

Louisiana has made notable progress in their effort to close the achievement gap between races and socioeconomic groups. Based on NAEP data, Louisiana is one of only two states to narrow the achievement gap between Black and White students in both fourth-grade reading and eighth-grade mathematics from 2003 to 2011. Additionally, since the state implemented its accountability system in 1999, the performance gap between Black and White students on state assessments has narrowed by 11.6% in English language arts (ELA) and 11.2% in mathematics. At the same time, from 1999 to 2011, the gap between economically disadvantaged students and their peers also narrowed by 4.4% in ELA and 5.5% in mathematics (Louisiana Department of Education 2011).

These and other states have shown that poor students and minority students can perform well above norms and that the achievement gap can be narrowed if the appropriate instruction, curriculum, and resources are provided. Minority and low-income students in these states have made strides in narrowing achievement gaps and attaining the proficiency level that exceeds the averages in their states.

Each year The Education Trust, a Washington-based research and advocacy organization, identifies and honors high-performing, high-poverty, and high-minority schools (http://www.edtrust.org/dc/resources/success-stories). All of the "Dispelling the Myth" schools, as they are called, have made strides in narrowing achievement gaps, attaining proficiency levels that significantly exceed the averages in their states, or improving student performance at an especially rapid pace. These schools do not offer simple answers or easy solutions, but several common strategies emerge from their practices. They provide a rich curriculum coupled with strong, focused instruction. They have high expectations for all students. They use data to track student progress and individual student needs. They also employ purposeful professional development to improve teachers' skills (The Education Trust 2003). One of these schools includes the Longfellow School, Mount Vernon, New York. This school, with 98% African-American and 83% low-income students, outperformed three-quarters of other New York State elementary schools in mathematics and language arts for 2 years in a row. In 2001, it performed as well or better than 97% of New York schools in mathematics and 88% of New York schools in language arts. Other schools making gains in closing the achievement gap are Norview High School in Norfolk, Virginia, and DC Key Academy in the District of Columbia, where the first-year student gains were double the national average. A school district that is raising achievement for all students while narrowing gaps is Aldine, Texas (The Education Trust 2003). Some states are making gains in closing the gaps. African-American, eighth-grade students are achieving better than the na-

tional average in mathematics in Louisiana, Virginia, South Carolina, Mississippi, Texas, and the District of Columbia (The Education Trust 2003).

Concluding Statement

In this chapter, the *achievement gap* refers to the persistent disparity in achievement in mathematics and science between minority (Black, Hispanic, and Native American) and low-income students and White students as measured by standardized test scores obtained from the NAEP, the Nation's Report Card. At each precollege grade level, in both mathematics and science, minority students and students from low-income families have lower scores and are less likely to reach the proficient level than are White students and students from wealthy families. As a result, these students represent only a small proportion of scientists and engineers in the United States. Collectively, Blacks, Hispanics, and Native Americans constitute 24% of the total US population and 7% of the total STEM workforce.

Research shows that minorities, particularly Blacks, Hispanics, and Native Americans, are underrepresented and underserved in several areas in STEM. They are underrepresented in the scientific workforce. They are underserved in the education provided, educational resources, and school funding. The most compelling factors are inequity in access to qualified teachers, facilities, resources, and challenging mathematics and science curriculum for minority students. These deficiencies have contributed to an achievement gap. Despite policies calling for "equal opportunities to learn," minority students often do not have a chance to study as rigorous a curriculum as do more privileged students, and they are less likely to be taught by teachers with high levels of experience and expectations.

Education is the key to developing the intellectual capacity of our children—the next generation of innovators, consumers, and citizens. If the United States is to maintain its global preeminence, students must be taught the fundamentals necessary to prepare them. To increase the participation of minority students in mathematics and science and to ensure that all students receive an appropriate, high-quality mathematics and science education, measures should be taken to ensure that minority and underserved students have improved opportunities and greater encouragement to participate fully in mathematics and science education.

Educating all of its students is of critical importance to America's future. Closing the achievement gap will require a national commitment. The promise made by America and articulated by Franklin D. Roosevelt over a century ago must be reclaimed: "*We seek to build an America where no one is left out.*"

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