Introduction

Proceedings from the Wing Institute's Fifth Annual Summit on Evidence-Based Education

Education at the Crossroads: The State of Teacher Preparation

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In 1983, the U.S. Department of Education published a landmark report, *A Nation at Risk*, which identified a crisis in education performance so severe that it constituted a threat to the nation. Student achievement on standardized tests was well below proficiency standards, too few students were graduating from high school, there was a dramatic gap between the performance of White students and that of African-American and Hispanic students, and the performance of U.S. students compared to those of other industrialized nations was falling (Gardner et al., 1983). Enormous resources, energy, and focus were marshaled to take this challenge head on. As educational gains failed to materialize, this cycle of "call to action" and "education reform" has been replicated at regular intervals. Goals 2000, begun in 1994, was one of many programs launched with much the same fanfare, message, and intent. When that failed to produce the desired results, No Child Left Behind (NCLB) became the education reform law of the land in 2001. Now, once again, as the realization sinks in that we are failing to make progress in educating our children, new reforms are being contemplated.

ATTEMPTS AT SCHOOL REFORM THROUGH STRUCTURAL INTERVENTIONS

The past efforts to reshape education generated an enormous amount of action and change in the form of structural interventions: large-scale system changes

that affect the organizational design of education systems without directly addressing the actual teaching that takes place in the classroom. The assumption has been that each of these structural interventions would improve teacher and student outcomes. Several of the most recent structural interventions include increased education funding, class size reduction, school choice, and, most recently, charter schools. As the following data show, (1) the effort and resources expended to carry out these interventions have been significant, (2) the structural interventions have, by and large, been implemented on a large scale, and (3) they have had little or no impact on student outcomes at the macrolevel.

Increased Education Funding

At the national level, education spending has increased dramatically over the past 40 years (Figure 1). Annual K–12 per pupil funding has increased by 140% from the 1969–70 school year to the 2007–08 school year (from $4,637 per pupil to $11,134), when adjusted for inflation and benchmarked at 2007–08 dollars. Funding increased 22% over the 10-year period ending in 2007–08.

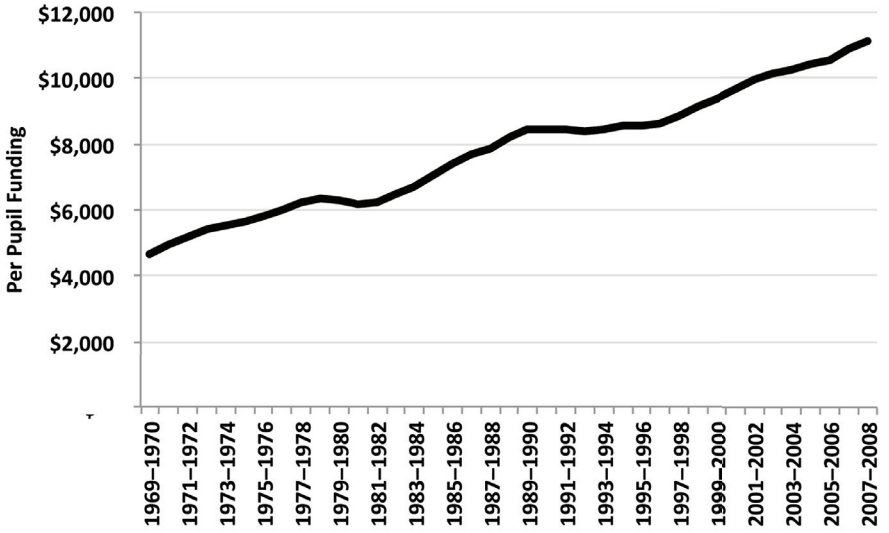

Figure 1. Annual K–12 per pupil funding in U.S. 1970–2008 (adjusted for inflation). Data are drawn from Snyder and Dillow (2011, p. 274).

Internationally, the United States spends more per student than any other nation in the world except Luxembourg. The metric used by the Organisation for Economic Co-operation and Development (OECD) is the total dollars spent over the K–12 life of a child. In 2009, the United States spent an astounding $105,752 (Organisation for Economic Cooperation and Development [OECD], 2010c) The top five nations with the highest reading scores averaged only $66,792 in spending over the K–12 life of a child. The top five nations with the highest mathematics scores averaged only $78,995 (Organisation for Economic Cooperation and Development [OECD], 2010a).

As a structural intervention, increased funding for education fits the pattern identified above. The intervention has been extremely costly, it has been implemented by successfully, and, as will be demonstrated later, there has not been a corresponding impact on student outcomes.

Class Size Reduction

Few structural interventions have garnered more public support than class size reduction, and the resources committed to this intervention over recent years have been significant. A 2007 survey showed that 77% of Americans favored spending educational dollars on decreasing class size rather than increasing teacher salaries (Howell, Peterson, and West, 2007). As of 2010, 36 states have laws restricting the number of students in a general education classroom, in some or all grades (Zinth, 2010). In 1996, California launched an ambitious initiative to reduce K–3 class sizes to 20 students per class. It spent over $20 billion from 1996–97 through 2009–10 on reduced class sizes, averaging $1.75 billion per year for last the 5 years (Luckie, 2009). In 2003, Florida adopted a class size reduction constitutional amendment. It is projected to have spent $21.6 billion from 2003–04 through 2011–12, averaging $2.94 billion per year for the last 5 years (Florida Department of Education, n.d.). As a result of these and many other initiatives, pupil-teacher ratios in public schools have fallen by about 30% since 1970 (Figure 2).

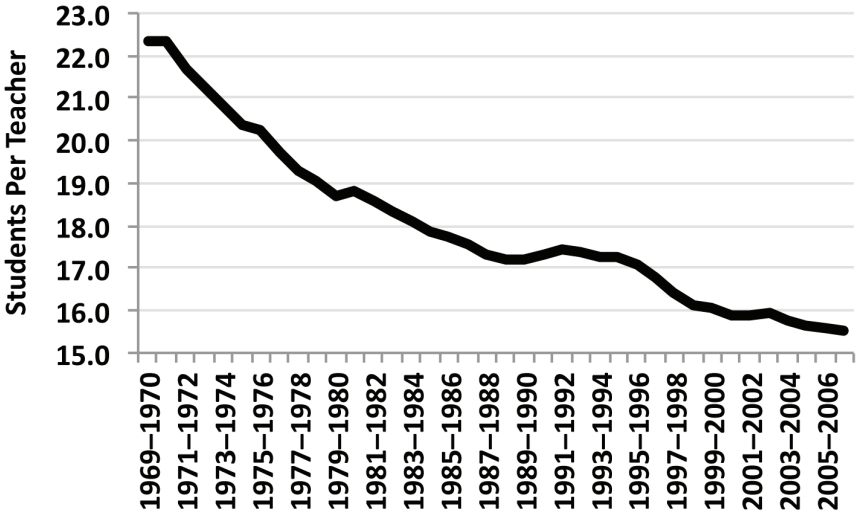

Figure 2. Pupil-teacher ratios in public schools. Data are drawn from Snyder and Dillow (2010, p. 100).

Class size reduction represents another structural intervention that has been implemented at a significant scale and cost without corresponding changes in student outcomes.

School Choice

Another structural intervention has been to increase the amount of choice that parents have in selecting their children's school placement. The theory is that increased competition (driven by choice) will improve school performance. These choices typically include charter schools, private schools, public magnet schools, and other public school programs that provide options. As of 2010, 33 states had passed legislation mandating school districts to implement intra-district or inter-district school choice programs, which allow parents to send their children to traditional public schools outside of the neighborhoods in which they reside (Nichols & Özek, 2010). The growth in charter schools is discussed later. The percentage of students enrolled in schools offering choice increased from 20% to 27% during the 15-year period between 1993 and 2007 (Figure 3).

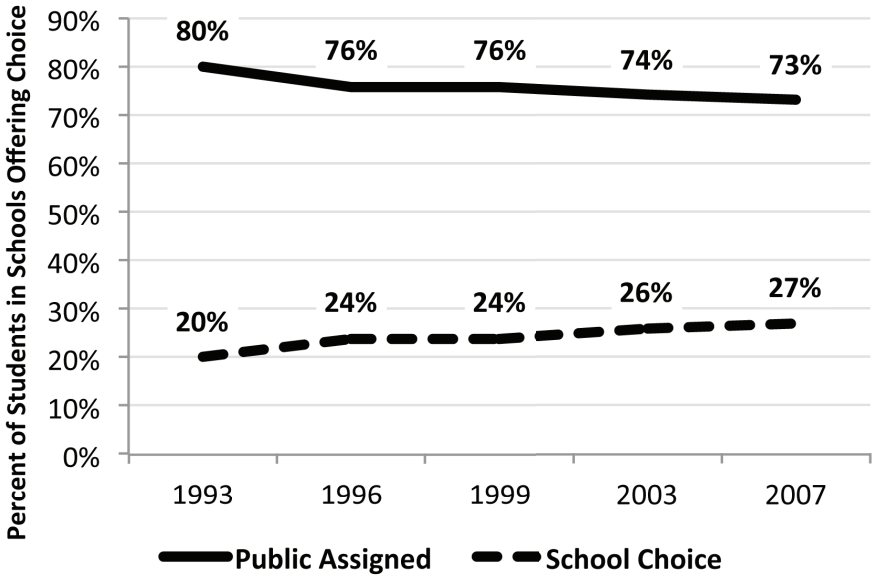

Figure 3. Percent of students enrolled in assigned public schools and schools offering choice. Data are drawn from Grady and Bielick (2010, p. 7).

While public assigned schools still make up the majority of student placements, the school choice structural intervention has continued to increase.

Charter Schools

The most recent and popular structural intervention is the charter school. Usually publicly funded and governed by organizations or groups under contract with the state, charter schools have greater autonomy than public schools and are often exempted from selected state or local rules and regulations. As of November 2010, charter schools operated in 40 states and the District of Columbia (National Center for Education Statistics [NCES], 2011a).

From 1999–2000 to 2008–09, the number of students enrolled in charter schools more than tripled from 340,000 to more than 1.4 million (Figure 4).

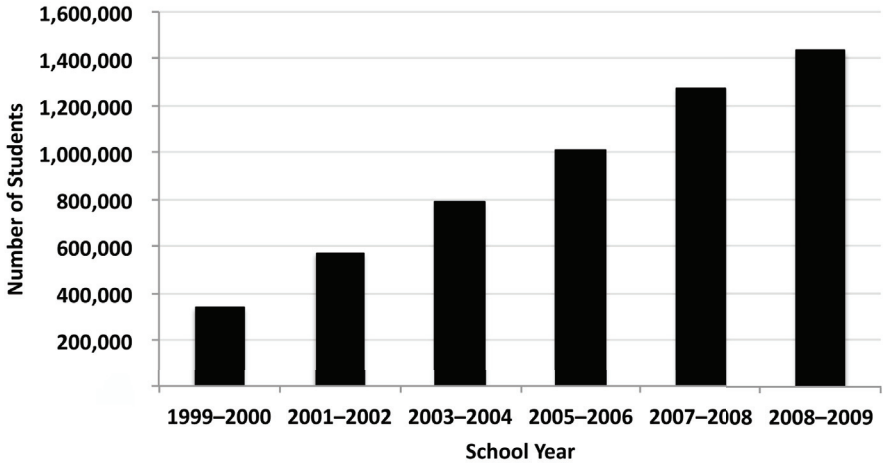

Figure 4. Number of students enrolled in public charter schools (1999–2000 to 2008–09). Adapted from *The Condition of Education 2011,* (p. 25), by S. Aud, W. Hussar, G. Kena, K. Bianco, L. Frohlich, J. Kemp, and K. Tahan, 2011, Washington, DC: U.S. Department of Education. In the public domain.

During this period, the percentage of all public schools classified as charter schools increased from 2% to 5%. In 2008–09, there were 4,700 public charter schools in the United States (NCES, 2011a).

THE IMPACT OF STRUCTURAL INTERVENTIONS ON STUDENT PERFORMANCE

While these structural interventions—greater funding, smaller classes, more choice, and more charter schools—have been successful in terms of changing the public education landscapethere has been virtually no corresponding improvement in student performance at the national level. This conclusion comes from three well-established sources of student performance data: the National Assessment of Educational Progress (NAEP), the Program for International Student Assessment (PISA), and the U.S. 4-year adjusted cohort graduation rate:

NAEP has often been called the "gold standard" for standardized academic testing because of its constant rigorous scrutiny (Gorman, 2010). It was established in 1964, with the first tests administered in 1969. It provides a

continuing assessment of what America's students know and can do in math, reading, science, writing, the arts, civics, economics, geography, and U.S. history. NAEP is administered by the National Center for Education Statistics (NCES), a division of the Institute of Education Sciences in the U.S. Department of Education. Panels of technical experts within NCES and other organizations continually scrutinize tests for reliability and validity, keeping them similar from year to year and documenting changes. It is one of the only common metrics for all states, providing a picture of student academic progress over time.

PISA is a carefully constructed and well-documented test instrument for measuring student academic performance across nations (Organisation for Economic Cooperation and Development [OECD], 2006). Coordinated by the Organisation for Economic Co-operation and Development (OECD), this international study is conducted every 3 years. It measures the performance of 15-year-old students in 64 countries (34 member nations and 30 participating nations) in reading, mathematics, and science. Tests have been given since 2000. In addition to reporting on test scores, PISA collects data on a large number of education system characteristics and identifies statistical correlations between results and selected variables.

The 4-year adjusted cohort graduation rate is the number of students who graduate in 4 years with a regular high school diploma divided by the number of students who entered high school 4 years earlier. It was adopted in 2008, when the U.S. Department of Education enacted regulations establishing a uniform and more accurate measure for calculating the rate at which students graduated from high school. Prior to this mandate, many states failed to account for students who left school prior to the 12th grade, often dramatically skewing the data (Hall & Gutierrez, 1998). The 4-year adjusted cohort graduation rate captures all students, including those who drop out in earlier grades. Above all, it is a metric that is now uniform across all 50 states and can be used over time.

There is much debate in our education system about what constitutes a quality education and how best to measure many of the non-academic outcomes such as creativity, social intelligence, and problem solving. There is also much cynicism about such macromeasures as standardized tests. However, while standardized tests may not measure every education outcome, they do assess one of the most important outcomes: what students have learned in selected content areas such as reading and math. And while some of the standardized tests used in different states and localities may merit cynicism, the NAEP and PISA tests are consistently analyzed to meet the highest standards of reliability, validity, and social relevance. Data from these tests provide a clear and unambiguous picture of how well the U.S. education system is educating students on selected measures. The cohort graduation rate data provides an additional critical indicator of overall performance of the system.

Student Performance Data (NAEP)

The richest set of student achievement data comes from the NAEP, which makes available test data in mathematics and reading going back to 1970 (Long-Term Trend Assessment) and up to 12 different subject areas going back to 1992 (main NAEP Assessment). The Long-Term Trend Assessment data provides test scores at age 9, 13, and 17. The main NAEP Assessment tests by grades 4, 8, and 12.

NAEP provides data on subject matter achievement in two ways: scale scores and achievement levels. Scale scores provide a numeric summary of what students know and can do in a particular subject and are presented for groups of students. NAEP subject area scales for reading and math range from 0 to 500. Achievement levels are used to report results in terms of what students should know and are able to do. The Long-Term Assessment data only report scale scores, but show a remarkable lack of student achievement progress over the last 40 years in both subjects (Figures 5 and 6). This occurred despite numerous and significant school reform initiatives (A Nation at Risk, Goals 2000, NCLB) and the aforementioned structural interventions.

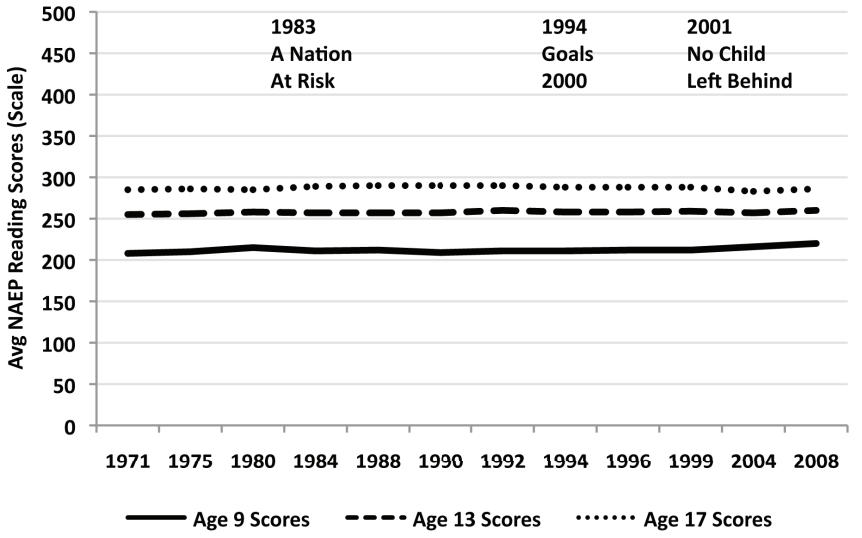

Figure 5. National Assessment of Education Progress (NAEP) Long-Term Trend Assessment reading scores. Data are drawn from *National Center for Education Statistics Data Explorer for Long-Term Trend* [Data file].

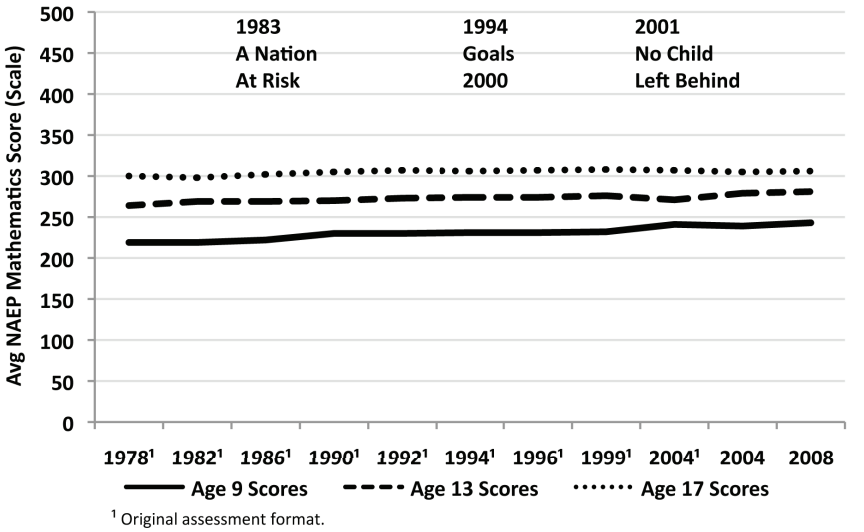

Figure 6. National Assessment of Education Progress (NAEP) Long-Term Trend Assessment mathematics scores. Data are drawn from *National Center for Education Statistics Data Explorer for Long-Term Trend* [Data file].

The data become even more alarming when analyzed in the context of achievement levels. The main NAEP Assessment standards identify three achievement levels, or benchmarks, for student performance at each grade: "advanced" represents superior performance, "proficient" signifies solid academic performance, and "basic" denotes partial mastery of prerequisite knowledge and skills fundamental for proficient work. "Proficiency" becomes a critical benchmark because it is the level at which students have met the standards for a subject area. It is also the benchmark by which the No Child Left Behind law holds school districts accountable. While the law allows for states to use their own tests and proficiency cut scores (a flaw in the system), one of NCLB's fundamental goals is that *all* children are to be proficient in reading and math by 2014. Proficiency standards are critical in evaluating education effectiveness.

NAEP data can also be analyzed to identify the percentage of students at a given grade level who are at or above proficiency. Again, "proficiency" means that students at this level have demonstrated competency over challenging subject matter for their grade level. Below proficiency means students have only partial mastery. Figure 7 shows the percentage of fourth-grade children who can read at or above proficiency level.

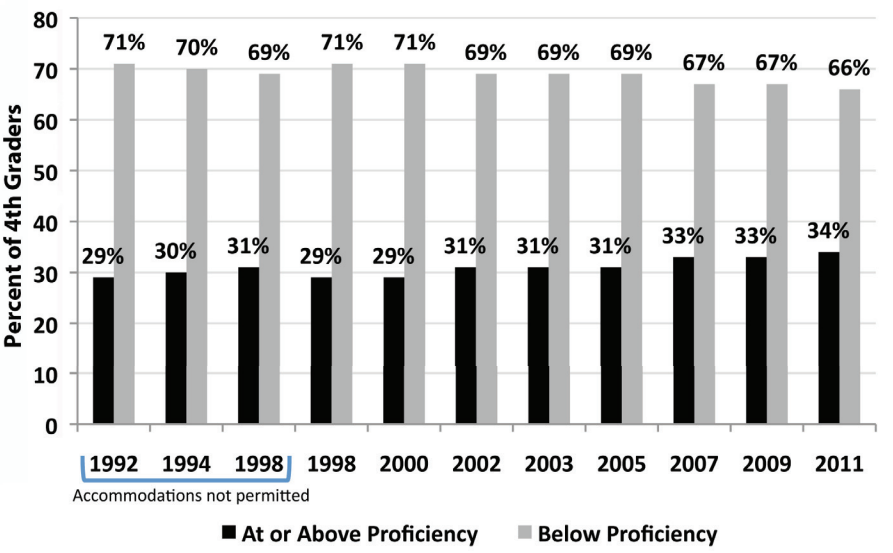

Figure 7. Percent of 4th graders reading at or above proficiency. Adapted from *The Nation's Report Card: Reading 2011,* (p. 10), by the National Center for Education Statistics, 2011, Washington, DC: U.S. Department of Education. In the public domain.

In 2011, only one third of fourth-grade students read at or above proficiency level, which represents only a 5% point improvement since 1992. Reading proficiency data varied significantly across states, with New Mexico and Mississippi having the lowest percentage of proficient readers at 20% and 22%, respectively. The state with the greatest percentage of proficient readers was Massachusetts, with 51% (National Center for Education Statistics [NCES], 2011c).

The data did not improve significantly when it came to the percentage of 12th-grade students who read at or above proficiency (Figure 8).

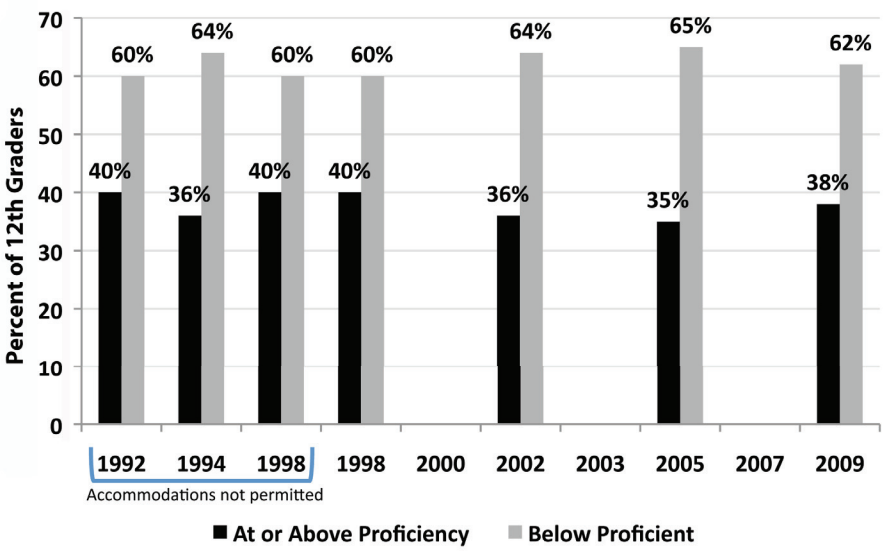

Figure 8. Percent of 12th graders reading at or above proficiency. Adapted from *The Nation's Report Card: Grade 12 Reading and Mathematics 2009 National and Pilot State Results,* (p. 9), by the National Center for Education Statistics, 2010, Washington, DC: U.S. Department of Education. In the public domain.

Only 38% of 12th-grade students were reading at or above proficiency in 2009, which is actually a decrease in performance from 40% in 1992. While 12th grade achievement data have not historically been collected at the state level, 11 states volunteered to participate in a pilot program (National Center for Education Statistics [NCES], 2010). Once again, individual states had widely differing performances. West Virginia (29%), Arkansas (32%), and Florida (32%) had the lowest percentages of proficient readers among 12th graders. New Hampshire (44%) and Massachusetts (46%) had the highest (NCES, 2010).

Achievement levels in mathematics painted a very similar picture. While there was a significant improvement in test scores between 2000 and 2007, there has been little subsequent change, leveling out at 39% to 40% proficiency (Figure 9).

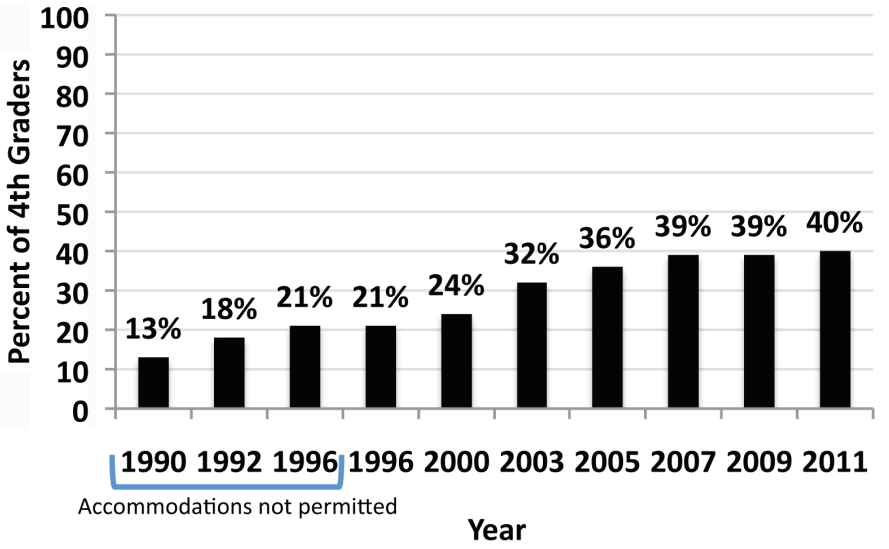

Figure 9. Percent of 4th graders at or above proficiency in mathematics. Adapted from *The Nation's Report Card: Mathematics 2011,* (p. 11), by the National Center for Education Statistics, 2011, Washington, DC: U.S. Department of Education. In the public domain.

Mathematics achievement data for 12th-grade students is only available for 2005 and 2009, as a change in the mathematics framework for the assessment necessitated a new trend line for that subject at grade 12. A total of 23% of 12th-graders performed at or above the proficient level in mathematics in 2005, 26 % in 2009 (NCES, 2010). As with reading achievement data, the only individual state data came from the 11 state pilot programs in 2009. West Virginia (13%) and Arkansas (15%) had the lowest percentage of 12th-grade students at or above proficiency in mathematics. New Hampshire (32%) and Massachusetts (36%) had the highest (NCES, 2010).

NAEP data also show a significant gap in the performance of children of color. Figure 10 illustrates the stark contrast between 12th-grade White students and students of color in reading proficiency. In 2009, 46% of White students were at or above proficiency, while only 22% of Hispanic students and 17% of Black students were at or above proficiency.

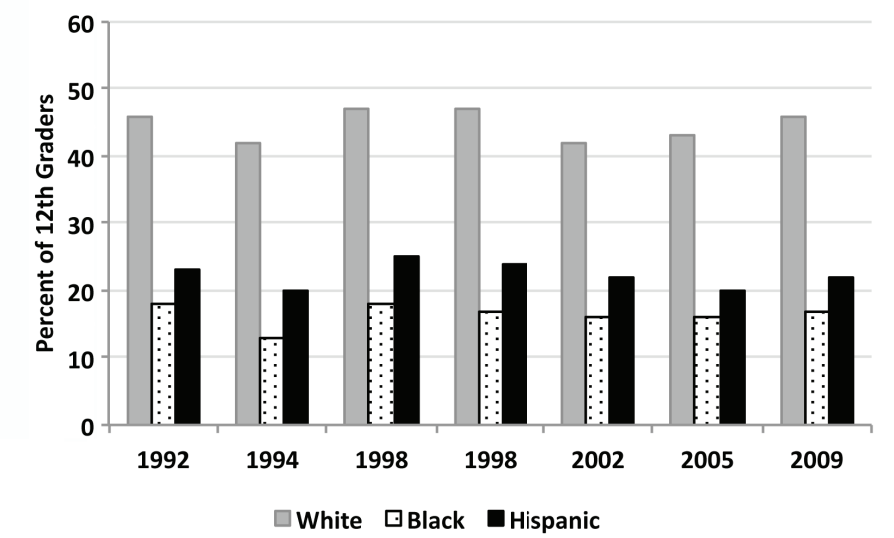

Figure 10. Percent of 12th graders by race at or above proficiency in reading. Data are drawn from the National Assessment of Educational Progress Reading Assessments of 1992, 1994, 1998, 2002, 2005, and 2009 (National Center for Education Statistics, 2012b)

The data also show that the reading proficiency gap continued without improvement. In 1992 the proficiency gap between White and Black students was 28%; in 2009 it was 29%. In 1992 the gap between White and Hispanic students was 23%; in 2009 it was 24%.

NAEP achievement data in mathematics show the same level of discrepancy in proficiency between races. In 2009 only 33% of White students were at or above proficiency in mathematics, while Black and Hispanic students had staggeringly low proficiency levels of 6% and 8%, respectively (Figure 11).

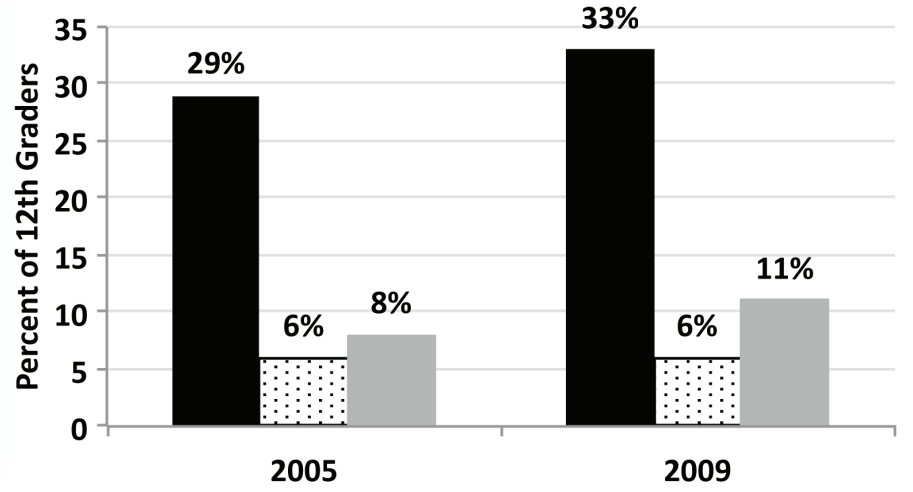

Figure 11. Percent of 12th graders by race at or above proficiency in mathematics. Data are drawn from the National Assessment of Educational Progress Mathematics Assessments of 2005 and 2009 (National Center for Education Statistics, 2012a).

As with reading, there was no improvement in this gap since the previous test in 2005. In fact, it got worse, with the gap between White and Black students increasing from 23% points in 2005 to 27% in 2009, and that between White and Hispanic students increasing from 21% points to 22% points.

Student Performance Data (PISA)

The other student performance outcome test data come from PISA results, which show the United States trailing 13 nations in reading, 16 in science, and 24 in mathematics (Table 1). The United States test scores actually dropped by 5 points between 2000 and 2009 PISA tests (Organisation for Economic Cooperation and Development [OECD], 2010b)

Table 1
2009 PISA reading, science, and mathematics scores.

Rank	Reading	Score	Science	Score	Mathematics	Score
1	South Korea	539	Finland	554	South Korea	546
2	Finland	536	Japan	539	Finlnd	541
3	Canada	524	South Korea	538	Switzerland	534
4	New Zealand	521	New Zealand	532	Japan	529
5	Japan	520	Canada	529	Canada	527
6	Australia	515	Estonia	528	Netherlands	526
7	Netherlands	508	Australia	527	New Zealnd	519
8	Belgium	506	Netherlands	522	Belgium	515
9	Norway	503	Germany	520	Australia	514
10	Estonia	501	Switzerland	517	Germany	513
11	Switzerland	501	United Kingdom	514	Estonia	512
12	Poland	500	Slolvenia	512	Iceland	507
13	Iceland	500	Poland	508	Denmark	503
14	**United States**	**500**	Ireland	508	Slovenia	501
15			Belgium	507	Norway	498
16			Hungary	503	France	497
17			**United States**	**502**	Slovak Republic	497
18					Austria	496
19					Poland	495
20					Sweden	494
21					Czech Republic	493
22					United Kingdom	492
23					Hungary	490
24					Luxembourg	489
25					**United States**	**487**

Adapted from *PISA 2009 Results: What Students Know and Can Do – Student Performance in Reading, Mathematics and Science (Volume I)* (p. 15), by the Organisation for Economic Cooperation and Development, 2010, Paris: OECD. Copyright 2010 by OECD.

Student Performance Data (Graduation Rates)

The 4-year adjusted cohort graduation rate data paint a grim picture. In the 2007–08 school year, approximately 25% of all students nationwide (one in four) who entered high school 4 years earlier as freshmen failed to complete high school graduation requirements. This translated to 1.3 million students failing to earn diplomas. In addition to documenting extremely poor graduation rates, the data show very slight improvement over the previous 14 years (Figure 12)

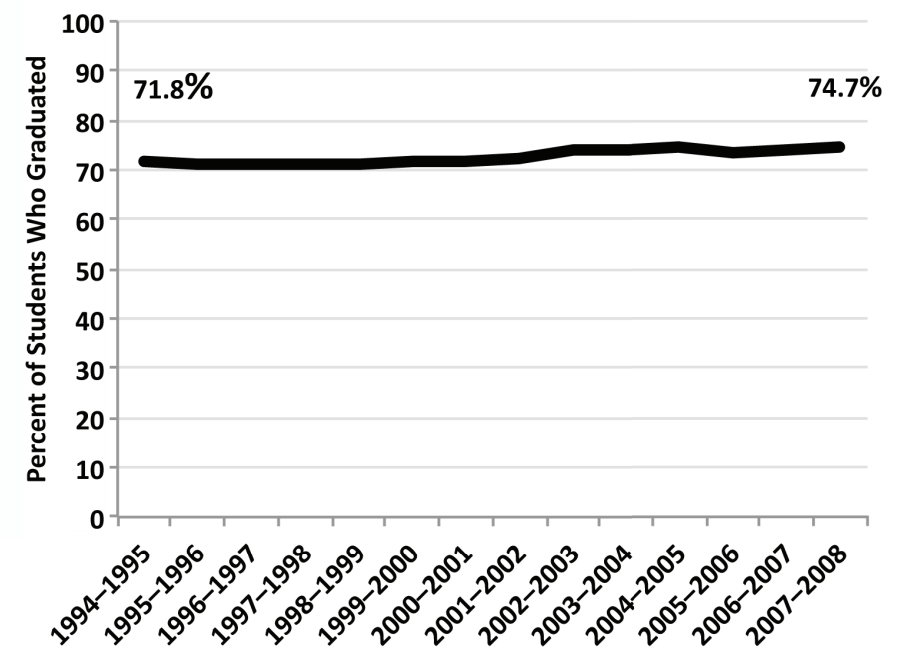

Figure 12. Average high school freshman graduation rate. Data are drawn from Snyder and Dillow (2011, p. 177).

As with test scores, graduation rates varied dramatically from state to state. They ranged from the graduation percentages in the low 50s (Nevada 51.3%, District of Columbia 56%) to the high 80s (Vermont 89.3%, Wisconsin 89.6%) (Snyder & Dillow, 2011).

As with test scores, student performance based on graduation rates shows significant inequality when analyzed by race. Asian/Pacific students and

White students had the highest percentage of graduate rates (91% and 81%, respectively). Other ethnic groups had much lower percentage of graduation rates: American Indian/Alaska Native/Asian Pacific Islander, 64%; Hispanic, 64%; and Black,62%. (Figure 13).

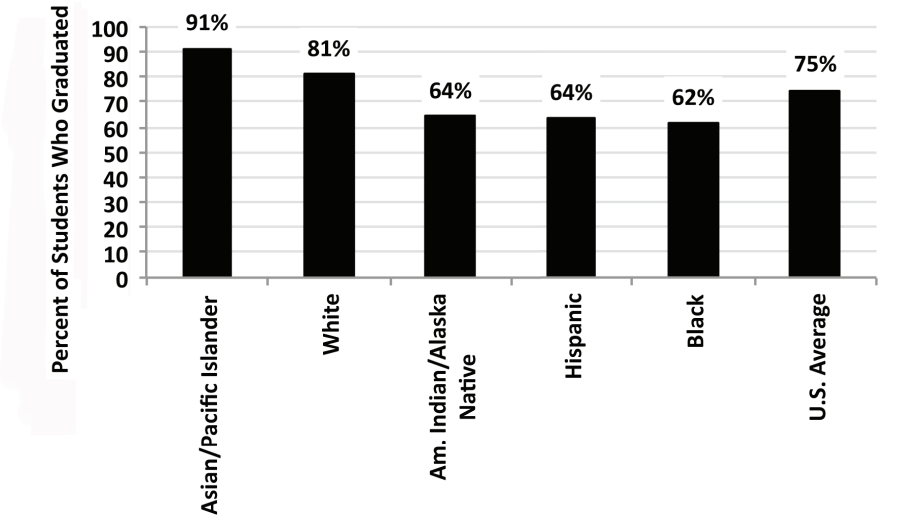

Figure 13. High school graduation rate by ethnicity (2007–08). Data are drawn from Stillwell (2010, p. 7).

Student Performance Data (Summary)

The poor performance of 12th graders nationwide in achieving reading and math proficiency is a clear indicator of the deficiencies of the U.S. education system. However, the percentage of 18-year-olds who are proficient in reading drops even more dramatically when graduation rate data are factored in. In other words, the 2009 NAEP proficiency reading rate of 38% for 12th-grade students (Figure 8) leaves out the 25% of students who failed to graduate and most likely fell below proficiency in reading. Factoring in those students produces the statistics shown in Table 2.

Table 2
Reading proficiency of all 18-year-olds

	% of 12-Grade Students At or Above NAEP Reading Proficiency	Graduation Rate	% of all 18-Year-Olds At or Above NAEP Reading Proficiency
All	38	75	28
White	46	81	37
Hispanic	22	64	14
Black	17	62	11

The data in column 1 are drawn from the National Assessment of Educational Progress Reading Assessments of 1992, 1994, 1998, 2002, 2005, and 2009 (National Center for Education Statistics, 2012b). The data from column 2 are drawn from Stillwell (2010, p. 7).

This analysis suggests that as few as 28% of all 18-year-olds in 2009 were reading at or above proficiency levels. When the data are broken down further by ethnicity, the results are staggering. Only 14% of Hispanic children, and 11% of Black children were reading at proficiency by age 18! While this is a rough calculation and doesn't count any 18-year-old dropouts who may have been proficient in reading or any 18-year-olds who were tested and didn't graduate, the essence of the outcome is clear. The United States is failing to educate the vast majority of its 18-year-olds in reading. The proficiency scores were even worse for math; just 29% of 12th-grade students were at or above proficiency. With graduation rates factored in, only 22% of 18-year-olds were proficient in math.

EDUCATION AT THE CROSSROADS: THE STATE OF TEACHER PREPARATION

It is clear that education is at yet another crossroads. Despite the investment of an enormous amount of time, money, and energy, we face the exact same problems identified almost 30 years ago in *A Nation at Risk*. Student achievement on standardized tests is well below proficiency standards, too few students are graduating from high school, there is a dramatic gap between the performance

of White students and that of African-American and Hispanic students, and student performance lags far behind that of other industrialized nations. The data suggest we have made no progress whatsoever.

This stunning lack of improvement in student performance in the face of such an enormous effort leaves us with the question: what have we missed? The answer takes us back to the most essential component of education, teaching. While focusing on structural interventions, we failed to examine and improve what actually takes place in the classroom between teachers and students. Structural interventions by themselves do not necessarily impact the quality of teaching. Increased funding, smaller class sizes, school choice, and charter schools have no impact if teachers are not given the skills to be effective. This was the focus of the Wing Institute's Fifth Annual Summit on Evidence-Based Education, *Education at the Crossroads: The State of Teacher Preparation.*

The Wing Institute's annual evidence-based education summits were created to help answer the question of what is missing in education reform. They bring together education stakeholders from a wide range of professions, disciplines, organizations (academic, service, education, research, and advocacy), and consumers in a 2-day working session built around a specific topic. The goal is to share the very latest data and research on the topic, facilitate discussion and problem solving among a diverse group of participants, and establish action steps for dissemination of the resulting information into real-world settings. Past summit topics have included:

- **Building an Evidence-Based Education Roadmap**
- **Response to Intervention (RtI): An Evidence-Based Education Review**
- **Sustainability: Implementing Programs That Survive 100 Years**
- **Data-Based Decision Making: The Achilles' Heel of Evidence-Based Education**

The following chapters are the proceedings from the Wing Institute's 2010 summit, *Education at the Crossroads: The State of Teacher Preparation.* The summit focused on the critical role of teacher preparation in any reform effort, including the importance of linking student outcomes to teacher performance, and linking teacher quality to teacher preparation, induction, and support. A review of the state of the art on teacher preparation was provided by three speakers whose professional accomplishments have significantly advanced our knowledge: Dr. James Kauffman (Professor Emeritus of Education, University of Virginia), Dr. Dan Reschly (Professor of Education and Psychology, Vanderbilt University), and Dr. Larry Maheady (Professor, Department of Curriculum and Instruction, SUNY Fredonia).

In an attempt to answer the question of what is missing in education reform, the Wing Institute has been conducting an extensive and ongoing search of existing databases, research studies, policy analyses, and other sources of scientific and performance data for clues. Historically, the biggest obstacle to answering this question has been a lack of data on how we are doing (student and school performance outcome data) and what works in education (efficacy and effectiveness research on education interventions). When performance outcome data were present, they seldom measured relevant outcomes consistently and empirically over time. Where research has existed, it has often been qualitative (subjective), not quantitative (objective). As a result, most reform efforts have been flying blind, with little empirical feedback to evaluate their impact and effectiveness.

This situation has been changing recently, as an abundance of useful performance outcome and research data are becoming available. The bad news is that these data question the value of many of our education reform efforts. The good news is that they are starting to paint a picture of where we are and what went wrong. The best news is that they provide guidance for where we need to go to make effective school reform a reality. That guidance points toward the importance of teachers, and to new and more effective strategies for teacher preparation.

In the first chapter, ***Effective Teachers Make a Difference,*** Jack States of the Wing Institute reviews the most recent research and data on teacher preparation, including the impact of teachers on student achievement, the critical skills that make teachers effective, the evidence-based strategies for producing effective teachers through teacher preparation programs, and strategies for transitioning teachers from preservice to classroom.

In the second chapter, ***Science and the Education of Teachers*****,** James Kauffman discusses the importance of making teacher preparation as scientific as possible and urges not just adopting but embracing a scientific and mathematical approach to improving education. He emphasizes that professions based on scientific evidence and field tests develop manuals and checklists to guide their practices, and argues that education must do the same.

In the third chapter, ***Comprehensive Teacher Induction: What We Know, Don't Know, and Must Learn Soon!***, Larry Maheady and Michael Jabot review how teacher induction programs have failed to support new teachers, improve their teaching skills, or positively impact student learning. They discuss what we know and don't know about teacher induction, and describe the promising efforts of one regional state college to improve teacher induction.

Taken together, these papers begin to build a roadmap for actually linking school reform initiatives to student performance outcomes.

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