The Future of Children

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America's High Schools

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America's High Schools

Introducing the Issue

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Approximately 16 million students attend more than 40,000 high schools in the United States. The vast majority of these students (more than 90 percent) attend public schools.[1] And yet by most accounts, the typical American high school is failing its students in terms both of excellence and of equity. Although the math and reading achievement scores of both fourth- and eighth-grade American youngsters have improved over the past seventeen years according to the nation's "report card," the National Assessment of Educational Progress (NAEP), the math and reading scores of twelfth graders have been stagnant or even falling over roughly the same period. As another way to think about it, the overall U.S. achievement goal is for all students to score at or above the proficient level—the level at which they demonstrate solid academic performance exhibiting competency over challenging subject matter.[2] And yet in 2005 only 35 percent of the nation's high school students met or exceeded this level in reading and less than 25 percent did so in math. The results from 2005 further suggest that although students attending suburban schools ("urban fringe" in NAEP parlance)

score significantly higher than those in urban and rural districts in mathematics, the scores of students in U.S. central cities, suburbs, and rural areas are, statistically speaking, not distinguishable in reading. Lackluster performance is thus widespread, but poor urban (and to some extent rural) high schools represent especially troubling pockets of students placed at risk of school failure.

Questions abound about how accurately the NAEP reflects the true skills of seventeen-year-olds, primarily because the stakes of the assessment are low and students may not be highly motivated to do their best. But few observers quibble about the news from the labor market, which is no different. Twenty-five years ago a high school dropout earned 12 percent less, and a high school graduate (with no further schooling) earned 10 percent less, than an individual with some college education (but without a bachelor's degree), reflecting the relative value that employers put on the skills of workers with different levels of education. Today, however, high school dropouts are earning 46 percent less, and high school graduates 15 percent less, than adults with some college education.[3] These growing earnings disparities mean that a high

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school diploma, while increasingly necessary as a ticket to the middle class, is no longer sufficient as a terminal education credential.

What went wrong? Clearly there are many reasons why students are graduating with insufficient skills for today's society. First and foremost, today's economy is quite different from that of twenty-five years ago. Since the advent of the technological revolution—which some describe as being as profound as the industrial revolution—employers have been demanding ever more skilled workers.[4] Similarly, globalization is forcing less-skilled U.S. workers to compete increasingly with less-skilled workers all around the world. Thus, just to distinguish themselves from the billions of other workers worldwide with less than a college education, young people today must have some postsecondary schooling.

High schools, however, must shoulder some of the blame for failing to prepare young people adequately for today's workforce. Understandably, the task is difficult. A century ago, when the American high school was assuming its current structure, compulsory schooling laws generally required young people to attend school only until age fifteen (although it was common to grant waivers to much younger children), and only about 10 percent of U.S. youths attended high school.[5] Today, however, all states require attendance until at least age sixteen (or completion of tenth grade), and some extend the requirement to age eighteen.[6] And, for the past forty years, desegregation and immigration have required high schools to serve an increasingly diverse set of students. Indeed, whereas during the early 1960s high school students were roughly 88 percent white and 12 percent non-white, today they are approximately 60 percent white and 40 percent non-white, including 17 percent of Hispanic origin.[7]

At the same time, it can be difficult for schools to find the resources to meet the educational needs of their students. As one example, all schools struggle to find adequately prepared teachers, and nowhere is this problem more acute than at the high school level.[8] Finding teachers for more technical subjects such as math and science is particularly difficult, especially in the schools that need them the most—those educating poor children in urban areas. And so, faced with a changing economy, an ever more diverse student body, escalating staffing difficulties, and, over the past several decades, with increasing calls for more accountability for their efforts, many high school administrators and policy makers are stumped as to what to do next.

This is a particularly auspicious time to take stock of the tasks now facing U.S. high schools and to consider what researchers and policy makers now know about reform—what works and what does not.

Fortunately high school reform has finally arrived near the top of the education policy agenda.[9] States are beginning to take seriously the need to reform their high schools. Indeed, in 2004–05 the Chair's Initiative of the National Governors' Association (NGA) was "Redesigning the American High School." The NGA's fifth national summit on education, held in 2004, was the first devoted to high schools. Since 2000, the Bill

& Melinda Gates Foundation has invested $2 billion into efforts to reform high schools, largely into "smaller" schools that aim to promote personalized relationships and more rigorous and relevant coursework.[10] The federal government has invested millions of dollars in enhancing and scaling up the use of comprehensive school reform models for high schools and in supporting the creation of small learning communities in low-performing high schools. The National Conference of State Legislatures, along with several states including California, North Carolina, and Virginia, have tasked their legislators and staff, together with their departments of education, family services, and justice, to focus on their dropout and truancy problems.

This is thus a particularly auspicious time to take stock of the tasks now facing U.S. high schools and to consider what researchers and policy makers now know about reform—what works and what does not. To this end, we have assembled a group of experts and asked them to focus on the overarching challenges that all high schools face but that are especially problematic for low-performing schools whose limited capacity to meet these challenges often places large numbers of their students at high risk of failure. Many of these tasks fall under the following six headings: helping students make the transition to high school in the ninth grade, keeping students from dropping out, reforming the structure of high schools, upgrading the rigor and relevance of the curriculum, promoting high-quality and engaging instructional strategies, and preparing students for postsecondary education and the world of work.

In addressing these issues, we asked the contributors to this volume to synthesize and critically review the highest-quality evidence available for their topic. Finding such high-quality evidence proved to be the most daunting aspect of their endeavors. By far, the authors found the evidence base to be strongest for describing the nature of the problems facing high schools and for identifying individual and institutional correlates of these problems. Rigorous evidence on effective strategies for transforming low-performing schools into high-performing schools, while emerging, remains very limited.

The central methodological challenge in addressing questions about the effects of high school improvement strategies lies in differentiating between "outcomes" and "impacts." Simply put, outcomes are measures of the level of performance, experiences, attitudes, or other behaviors of the individuals or groups that are the subjects of a given study. These outcomes are the result of many factors such as the individual's motivation, ability, interest, family support, health, prior academic experiences, the quality of the current school, and, in the case of a study of a reform strategy, the reform itself. Impacts, in contrast, represent the causal effect of any one of these factors, including the reform, on the outcomes of interest. Thus, for example, the impact of an intervention on student educational success measures only the additional contribution of the intervention as distinct from all other factors. To assess impacts rigorously (that is to control for all of the other factors), it is critical to determine a benchmark that will answer questions about "outcome levels compared with what." Recent research in education and in other social science domains shows again and again that the method for identifying a truly valid benchmark is probably the most important factor affecting the validity of the answers to impact questions. Getting the benchmark wrong often means getting the wrong answer to the right question.

Using outcomes to judge program effectiveness without an adequate method to identify a valid benchmark promotes two related risks in efforts to identify and support initiatives that make a difference. First, if interventions are assessed only on the basis of outcomes, researchers and policy makers are likely to recognize and reward interventions and reforms on the basis of whom they serve rather than on the basis of what they do differently to educate young people. Second, in relying on outcomes rather than impacts, researchers and policy makers are likely to recognize and reward seemingly high-performing programs because they operate under promising conditions rather than because they use promising practices that add value to what is already available. Much of the research cited in the articles in this volume was not able to disentangle these factors, but we note that more rigorous evidence is available now than ten years ago and the research community has increasingly turned to designs that allow for strong causal inferences between intervention strategies and improvements in outcomes of interest.

Before reviewing the articles in this issue, we emphasize that space constraints made it impossible to cover many important topics. One such topic is the role of resources, their impact on student success, and what resource changes might be necessary when attempting to implement reform. Another topic that is not discussed in depth in this volume—teachers and other staffing needs—was the focus of a recent volume of *The Future of Children*.[11] It should also be noted that most of the contributors to this volume focus on evidence regarding challenges for the least-prepared students rather than for those at grade level or better. This emphasis is attributable mostly to the charge to review the most rigorous evidence: many of the most

rigorous studies have been conducted in low-performing schools or have focused on low-performing students. In addition, although we explicitly asked contributors to discuss evidence regarding rural high schools when possible, such evidence turned out to be almost nonexistent. Finally the volume does not address violence in high schools, a real and pressing problem, particularly in some areas. The impossibility of addressing all relevant topics here leads us to hope that this volume will be part of a much longer, and continuing, discussion about the issues confronting U.S. high schools.

We and the authors recognize that many of the problems facing U.S. high schools have their roots in the often poor preparation of students in elementary and middle schools—preparation whose inadequacy becomes most visible in high school when academic and social demands increase dramatically. Thus policy makers face the following conundrum: should they invest more money to provide failing high school students with a chance to "catch up" and get back on track to a healthy transition to adulthood? Or should they invest that same money to improve services for younger children and prevent these problems for the next generation? Although many advocates—most recently the Nobel Laureate economist James Heckman—argue strongly and eloquently that the marginal dollar should be spent on (very) young children, it is hard to give up on a generation—or more—of students.[12] Doing so may be particularly risky because rigorous evidence is not yet available about how best to improve elementary and middle schools (or even preschools) in ways that prevent problems in high school. Secondary school is also one of the last institutions through which society can try to influence positively the lives of nearly all children.

What Have We Learned?

Although each article in the volume opens with a full summary, in this section we briefly highlight some of the findings we think are the most important.

Overview

In his overview, Robert Balfanz, of Johns Hopkins University, traces the evolution of the American high school as well as its transformation over the past twenty-five years. He begins by painting a statistical portrait. He notes that most secondary school students attend public schools that span grades nine through twelve and that they are roughly evenly spread across urban, suburban, and rural areas. At the same time, U.S. secondary schools are quite racially segregated as 40 percent of white students attend high schools that are 90 percent or more non-minority and nearly 30 percent of minority students attend high schools that are 90 percent or more minority. This racial segregation is closely mirrored in segregation by social class as well.

Balfanz then traces the history of a fundamental question that is at the heart of nearly all of the articles in this volume: what is the purpose of a high school education? Although the mission has shifted over the years, today high schools generally have two identified goals: developing economically self-sufficient adults and cultivating an educated citizenry. Traditionally, in pursuing the former goal, high schools have prepared students for immediate entrance into the labor market (through vocational education) and for enrollment at a postsecondary institution. The increasing demand for skilled workers in today's economy, however, is leading many educators to place greater emphasis on what students are learning and their preparation for college. As evidence Balfanz notes that less than 3 percent of high school students

attend vocational or technical high schools and that the number of vocational credits earned by students has steadily declined over the past twenty years. Instead, high schools have made efforts to increase the number of students taking more rigorous—usually college-preparatory—courses and to impose stricter graduation requirements to increase accountability. It is not at all clear, however, that these reforms have brought with them a concomitant improvement in academic achievement. As a result, Balfanz argues that policy makers and educators must find a way to improve the quality of high school course work, paying close attention to how it aligns with the requirements of college coursework and the workplace. High schools must also find ways to address the educational needs of students who arrive not yet ready for high school coursework, as well as to engage students for whom material is uninteresting and irrelevant.

How Do U.S. Students Compare with Their International Counterparts?

Many observers eagerly await the results of international assessments of students in the United States and other countries as a means of understanding the health of the U.S. educational system. Although such comparisons are intuitively quite appealing, Daniel Koretz, of Harvard University, explains that differences in educational systems and in the test instruments used to make the international assessments make it necessary to use such evidence cautiously. Most important, he argues persuasively that—to date—such data cannot be used to compare high school students across countries.

Koretz notes important differences between the two main international assessments: the Trends in International Mathematics and Science Study (TIMSS) and the Program for

International Student Assessment (PISA). The TIMSS tests fourth and eighth graders and attempts to follow the school curriculum closely, whereas the PISA tests fifteen-year-olds and measures their ability to apply their knowledge to "real-world" problems. Koretz also cautions that because the participating countries vary from one assessment to the next (both in terms of the data source and the year), the results also vary. One should thus consider the results from both sources and avoid comparing U.S. students with an "international average" (which will vary depending on the participating countries). Critically, neither assessment includes students at the end of secondary school. The TIMSS attempted to do so in 1995, but differences across the countries in terms of the structure of secondary schooling proved so daunting that the effort has not been repeated. As a result, one of Koretz's main lessons to those eager to assess U.S. high schools using international data is that the data to back up such an analysis do not currently exist.

Transitioning to High School
The difficulty of high school for many students in the United States begins the day they first set foot through its doors in ninth grade. Ruth Curran Neild, of Johns Hopkins University, reports that nearly all incoming high school students experience some anxiety, though for some the transition is positive as it represents a time when they attain greater independence and can associate with a new set of peers. Such students adjust quickly and make steady progress toward high school graduation. For others, however, the transition is more perilous. These students receive failing grades in some or all of their classes, which means that before they finish their freshman year, they have fallen "off track" from graduating in four years. And these same "off track" freshmen ultimately account

for a disproportionate share of high school dropouts. Indeed, nationally one-third of recent high school dropouts were never promoted beyond the ninth grade.

Neild considers four potential hypotheses to explain why the transition to high school is so difficult for so many students. The first, a developmental argument, is that this transition coincides with other life changes, such as declining parental supervision and support and increasing peer influence, both of which may lead to a drop in academic performance. The second hypothesis is that for 80 percent of students attending a public high school in the United States, ninth grade also represents a disrupting change to a new school (and often new peers). The third hypothesis is that students are inadequately prepared for a high school curriculum. And the final explanation is that the way the traditional high school is organized—with students attending multiple classes in a day and teachers identifying more with their subject-matter department than with a set of students—means that struggling students fall through the cracks because no one takes a personal interest in their academic difficulties. After reviewing the evidence, Neild concludes that inadequate preparation for high school and the organization of high schools are the main culprits for the difficult transition.

Finishing High School
One of the most obvious metrics by which to assess the health of America's educational system as a whole—and high schools in particular—is the rate at which students graduate from secondary school. And yet, state-by-state differences in the definition of a high school graduate, along with other data issues, complicate efforts to estimate a single national high school graduation rate. Estimates from the Current Population Survey suggest

that approximately 88 percent of adults aged eighteen to twenty-four hold a high school credential. By contrast, the estimate of the share of ninth graders that has graduated four years later, using administrative data from the Common Core of Data (CCD), is only about 75 percent. John Tyler, of Brown University, and Magnus Lofstrom, of the Public Policy Institute of California, examine the different estimates and various explanations as to why they differ. They find that whether or not people who complete a General Educational Development (GED) credential are counted as high school graduates goes a long way in reconciling the estimates. The primary reason not to count GED holders as high school graduates is that they have lower employment and earnings, and less subsequent educational attainment, than do those who earn a regular high school diploma. To the extent that these outcomes differ by type of credential, the authors argue that calculations of education attainment statistics should not consider the GED as equivalent to a regular high school diploma.

Overall, Tyler and Lofstrom conclude that a reasonable estimate of the national high school graduation rate (not including GED receipt) lies between 75 and 78 percent, although the rate is lower among black and Hispanic students. They also find that the high school graduation rate has not changed much in the past forty years. As such, U.S. high schools appear to be doing about as well as they were during the late 1960s in terms of graduating students, although the changing economy and the increased demand for skilled workers have dramatically increased both the personal and the social costs of not earning a high school diploma. The primary costs to individuals include lower earnings and poorer health, but society also pays a price in terms of lower tax revenue, higher

spending on public assistance, and higher crime rates. The authors review research on programs to prevent students from dropping out and to increase the likelihood of graduation and conclude that the most successful are close mentoring and monitoring of students, case management of individual students, family outreach, and curricular reforms with a career orientation.

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High School Structural Reform Models
Concerns about the relatively high dropout rates and other indicators that America's high schools are not living up to their potential have caused more and more decision makers to look closely at structural reform models. Such models include comprehensive school reform programs, dual enrollment and early college high school, small learning communities, specialty (such as "career") academies, charter schools, and education management organizations. Steve Fleischman and Jessica Heppen, both of the American Institutes for Research, consider the theory of action behind each of these reform models and assess how well each achieves five separate goals: creating a personalized and orderly learning environment; assisting students who enter high school with poor academic skills;

improving instructional content and practice; preparing students for the world beyond high school; and stimulating change in over-stressed high schools.

A careful review of the evidence leads the authors to see glimmers of hope for structural reform models, although the research base of studies with rigorous designs is unacceptably thin. Fleischman and Heppen emphasize the need for both researchers and educators to pay close attention to how such models are implemented—not least to the context in which they are implemented. They also stress the need for significant and sustained commitment to the reform by school and district staff and leaders.

Curricular controversies over the years have centered on three main questions. What should students learn? Should all students learn the same material? Who should decide what students learn?

Getting Tough

A key element in efforts to turn around struggling U.S. high schools is the curriculum, the focus of the article by Valerie Lee, of the University of Michigan, and Douglas Ready, of Columbia University. Curricular controversies over the years have centered on three main questions. What should students learn? Should all students learn the same material? Who should decide what students learn? The answers to these questions, in turn, can be found in the answer to another question: what is the fundamental purpose of secondary education? Using these questions as a focal point, the authors survey the history of the high school curriculum. They emphasize three recent phases of curriculum research and reform.

During the first half of the twentieth century, U.S. secondary schools organized the curriculum into fairly rigid vocational, general, and academic tracks. During the 1960s, however, they began to allow students to choose their courses according to their future plans, interests, and abilities. In 1983, in a sharp critique of the U.S. educational system, *A Nation at Risk* charged that such latitude enabled students to avoid academically rigorous courses, and it urged a return to basics for all students. In response, according to Lee and Ready, policy makers engaged in a series of standards-based reforms. Phase I of recent curriculum reform was characterized by efforts to increase the number of core subject courses that were required for graduation. Students nevertheless continued to choose different kinds of courses to fulfill the graduation requirements—and the differences were highly correlated with students' socioeconomic background. Lee and Ready summarize research from Phase II that attempted to show the effect of increasing the number of academically demanding courses high schools offered and eliminating remedial and other less-demanding alternatives. Based on (largely correlational) studies suggesting that students who take academic (college-preparatory) courses have better educational outcomes than others as well as on the increasing skill demands of the new economy, the nascent Phase III reforms require all students to follow a college-preparatory curriculum.

The authors conclude their article by examining some cautionary evidence regarding Phase III. In 1997, the Chicago Public

Schools adopted a "College-Prep for All" curriculum that required students to complete a college-prep sequence in addition to taking particular courses in core subjects. The initial evidence on the impact of this reform on student outcomes has been disappointing. Policy makers would therefore do well to support more careful and rigorous research on efforts to require a college-preparatory curriculum for all before embracing it as the solution to poor academic performance among U.S. high school students.

High School Instruction

Tom Corcoran and Megan Silander, both of Columbia University, highlight the need to worry not only about *what* teachers teach, but also about *how* they teach. Improving the educational attainment of U.S. students, they say, requires increasing the effectiveness of instruction, which the authors define broadly as "the interactions among teachers, students, and content directed toward supporting students' achievement of learning goals." Corcoran and Silander explore evidence on how high school organizational structure affects instruction as well as the effectiveness of different instructional strategies.

The current U.S. practice of organizing high school instruction by subject or discipline means that most teachers teach between one hundred and two hundred different students each week and interact with each student only during a particular school period. Further, outside of the classroom, teachers are typically organized into subject-matter departments, leaving them relatively isolated, unable to work together across subjects, and having little sustained contact with their students. Some evidence suggests that this compartmentalized structure is detrimental to good instruction and that reform models that reorganize high schools into smaller learning communities,

form teacher teams, or promote interdisciplinary approaches may have the best chance of improving teaching and learning.

The authors also examine links between student achievement and different instructional strategies, such as interdisciplinary teaching, teaming or cooperative learning, project-based learning, adaptive instruction, inquiry, and dialogic teaching. Noting that many of these strategies overlap, they conclude that, broadly speaking, *how* a teacher teaches matters. Although the evidence is limited, they argue that effective approaches include well-designed grouping strategies and a classroom environment that encourages students to voice their ideas and questions and that presents them with challenging tasks.

Going forward, the authors argue that policy makers must pay as much attention to the instructional approaches adopted by teachers and schools as they traditionally do to the tasks of preparing, selecting, and retaining those teachers. They urge policy makers to consult the growing evidence on effective instructional practice that would likely raise not only student achievement but also teacher morale (which, in turn, may reduce teacher turnover). In addition, teachers and administrators will need to use more "adaptive" instructional approaches that respond continually to student progress and needs. In today's standards-based policy environment, the authors argue, improving instruction is critical to achieving the dual goals of increasing academic rigor while also raising the achievement standards for all students.

Getting Ready for College

Content knowledge, basic skills, and core academic skills are not the only essential components of being "college ready." Melissa Roderick, Jenny Nagaoka, and Vanessa Coca,

all of the University of Chicago, argue that non-cognitive skills and norms of performance and "college knowledge" also belong on that list. The essential non-cognitive skills include behaviors such as self-awareness, self-monitoring, and self-control, all of which in turn translate into good study skills and work habits that are critical to meeting the academic and social demands of college. Students must also have the college knowledge necessary to be able to effectively search for and apply to college as well as to understand the norms and culture of college.

Roderick, Nagaoka, and Coca consider several standards for college readiness, ranging from being able to secure enrollment at a minimally selective four-year institution to being able to enroll at a selective institution to being able to complete some or all of a four-year degree. Depending on which definition one chooses, one can then assess indicators of college readiness using different metrics. One indicator, for example, would be meeting the minimum coursework requirement for college admission. Another would be a specific level of performance on achievement exams (such as high school exit exams or college entrance exams) or a specific high school grade point average (GPA). The authors find that whatever the metric used to assess college readiness, wide racial and ethnic disparities exist. They also note that even among students who aspire to attend college, many do not know how to take the necessary steps to do so.

Noting the disappointing evidence regarding efforts to raise standards through curricular reform, Roderick, Nagaoka, and Coca argue for a different tack: creating data systems to track all students' progress through school, including college. Holding high schools accountable for the outcomes of their

graduates, they say, will generate the incentive needed for improvement. In addition to accountability, they support efforts to develop data systems to provide schools and districts with clear indicators for college readiness, clear standards for these indicators, and clear guidance about what students need to do to improve.

Expanding High School Options
In the final article in the volume, David Stern, of the University of California–Berkeley, focuses on two widely accepted goals of public education: producing an educated citizenry and helping students become economically self-sufficient. He concludes that the evidence suggests that high schools are failing at the first task. Students who complete high school but do not attend college are less likely to vote or volunteer, and results from the NAEP suggest that high school seniors have a poor understanding of democratic institutions, on average. The evidence is more promising, although far from conclusive, when it comes to the effectiveness of career-technical education (CTE, formerly known as "vocational education") for generating economic independence. Overall, Stern concludes that high schools, as now structured, fall short of fulfilling their ideals. He argues therefore for continuing the trend of combining academic rigor with work-related relevance. He also advocates incorporating performance measures into funding formulas, encouraging more adults to serve as mentors to young people, and expanding educational options that take place outside of geographically fixed schools as promising reforms worth trying to address the underperformance of today's high school model.

Where to Go from Here
The renewed focus on the challenges facing low-performing high schools presents policy

makers, practitioners, and researchers with two unique opportunities. First, recognizing the importance of innovative and systematic interventions to help high schools better prepare their students for college and work, districts, states, the federal government, and the private sector seem ready to increase investments in such interventions. Building on a platform of small schools and account-ability, the contributors to this volume suggest that these investments must tackle the instructional core of high school as well as supplemental academic and social support services, guidance and postsecondary transi-tion counseling, and teacher quality.

Second, contributors stress the need for the nation to develop a common understanding of what the minimum requirements should be for high school graduation. Although it is not necessary for every state to adopt exactly the same standards, it is essential to recog-nize the vast differences in existing standards. For example, while the Regent's diploma is required for high school graduation in New York City, an acceptable performance on the GED can lead to a high school diploma in New Jersey. Is a high school diploma from New Jersey, therefore, equivalent to one from New York City? Developing nationally recognized minimum requirements that focus on the skills students need to succeed in today's workforce would make it possible to answer this question confidently. Such a system of minimum requirements could also enable students who meet those require-ments early in their high school careers to move on and develop higher-level skills that qualify them for more rigorous and relevant opportunities in postsecondary education and the workforce.

More broadly, the nation needs to conduct a dialogue on the goals of high school in the twenty-first century. Clearly, preparation for the workforce must continue to be foremost among these goals. The real question is whether a high school education should be considered sufficient for today's young adults, or whether high school should be viewed as the new "middle school," with K–14 or even Pre-K–16, rather than K–12, as the standard. While not dispositive, the evidence suggests that preparation for college and preparation for (immediate) work and career need not be mutually exclusive: some of the most exciting and innovative strategies for improving aca-demic achievement—such as middle college high school and career academies—creatively blend academic rigor with "real-world" relevance. This combination of rigor and relevance is the goal of the Carl D. Perkins Career and Technical Education Improve-ment Act of 2006 (also known as Perkins IV) and is consistent with what many community colleges already attempt to do.

That said, it is essential to recognize that the skill demands of the workforce continue to evolve and that high schools (and post-secondary institutions) must remain nimble in their efforts to prepare students to meet those demands. Globalization, for example, is moving ever more U.S. jobs abroad. Although during the 1980s and early 1990s most of the jobs moved offshore did not require a college education, increasingly today they do. Economist Alan Blinder cautions that U.S. policy makers should try to anticipate which jobs will likely be moved offshore in the future and focus on preparing American young people for jobs that are best done here at home.[13] Such jobs, he argues persuasively, are those that require personal delivery (such as driving a taxi or performing brain surgery) or that are seriously compromised when delivered electronically. The point is that skill and education will not likely continue to be

the distinguishing characteristics of jobs that are difficult to move offshore. This change, largely brought about by advances in technology, undoubtedly has implications for high school curriculum reform over the coming years.

In implementing these, and any other changes, it is essential to ask how to get the incentives right. If postsecondary education and work are key goals for high schools, it will be necessary to develop measurement and data systems to keep track of how well high schools are achieving these goals. Funding formulas can help here. As David Stern argues in his article, school districts now receive funding based on the number of students in attendance at a particular time during the academic year rather than on the performance of such students. Schools and districts thus have a greater incentive to simply "warehouse" students than to ensure that they are gaining valuable skills and knowledge. Of course, many dedicated administrators and teachers in all school districts in the country have devoted their careers to doing the best they can for students. Nonetheless, studies suggest that incentives matter. Reforming funding formulas to account for dropouts, "on-time" progression toward graduation, and the performance level of students would not only likely generate an increase in student achievement but also send the very strong message that we, as a society, value these outcomes.

Finally, although states and districts are to be applauded for embarking on renewed efforts to increase investments in high schools, those efforts will come to naught unless they are accompanied by a commensurate investment in building rigorous evidence about which reforms worked—and for whom and under what circumstances—and which did not work. Over the past century, U.S. education policy making has gone through periods of intense focus on high-profile problems, during which the nation has made large investments in creative approaches to addressing these problems. Too often, however, the investments on promising reforms were not complemented by investments in knowledge-building. As a result, promising initiatives were designed on well-intentioned (and even theory-driven) intuition and then dismissed on an equally well-intentioned (but unsystematic) catalog of anecdotes about successes, failures, and how hard it is to change things for the better. Education policy makers and researchers should seize the opportunity now to leave a legacy of rigorous research so that the nation will not find itself in a similar situation with the next generation of high school students.

Endnotes

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7. Data from the 1961 and 2006 October *Current Population Survey* (www.census.gov/population/socdemo/school/p20-117/tab05.pdf and www.census.gov/population/www/socdemo/school/cps2006.html [October 26, 2008]).

8. For a nice summary of these issues and the related evidence, see Richard Murnane and Jennifer Steele, "What Is the Problem? The Challenge of Providing Effective Teachers for All Children," *Future of Children* 17, no. 1 (2007).

9. For example, the U.S. Department of Education Strategic Plan did not explicitly identify high school reform as an objective until the 2002–07 plan (SP02 07) (www.ed.gov/pubs/StratPln/index.html [SP 98-02] www.ed.gov/about/reports/strat/plan2002-07/index.html [SP02-07][October 26, 2008]).

10. "All Students Ready for College, Career, and Life: Reflections on the Foundation's Education Investments 2000–2008," report by the Bill & Melinda Gates Foundation, September 2008.

11. See the *Future of Children* volume *Excellence in the Classroom* (spring 2007) for a collection of articles on issues regarding teachers.

12. See, for example, James J. Heckman, "Schools, Skills, and Synapses," *Economic Inquiry* 46, no. 3 (2008): 289–324.

13. See, for example, Alan S. Blinder, "Offshoring: The Next Industrial Revolution?" *Foreign Affairs* 85, no. 2 (2006): 113–28, or Alan S. Blinder, "How Many U.S. Jobs Might Be Offshorable?" Working Paper 142 (Princeton University Center for Economic Policy Studies, March 2007).

Can the American High School Become an Avenue of Advancement for All?

Robert Balfanz

Summary

As the twenty-first century opens, says Robert Balfanz, the United States is developing a deep social consensus that American high schools should ensure that all adolescents graduate from high school prepared for postsecondary schooling and training. Balfanz asks how well high schools are succeeding in this mission and whether they can ultimately fulfill it.

Balfanz first surveys the structure and demographics of today's high schools. Forty percent of white students attend high schools that are 90 percent or more white, while roughly one-third of Latino and African American students attend high schools that are 90 percent or more minority. Minority students are also much more likely than white students to attend high schools that confront the challenges of concentrated poverty. In predominantly white, affluent suburban school districts, nearly every student arrives ready for high school work and then graduates. In all-minority inner city schools in high-poverty neighborhoods, most entering students lack a good middle school education and only half to two-thirds graduate.

With only a third to a half of high school graduates today prepared to succeed in college, how likely is it that American high schools will succeed in their mission of preparing all students for additional schooling or training? Balfanz argues that reforms over the past twenty-five years offer some hope. The standards and accountability movement has made the American high school a more focused and academic place. College preparatory course-taking has increased substantially, as has standardized testing. Mandatory exit exams have been imposed. And during the past decade, in particular, reformers have made a concerted effort to improve the low-performing high schools that serve low-income and minority students. Investments by the federal government and by foundations have led to the development of several types of reforms that have been proven effective, thus raising hopes that the nation's lowest-performing high schools can better serve their students. Still, the American high school has a considerable way to go to be able to prepare all students for further schooling or training. To advance all its students, it must find a way to bring to scale the methods and mechanisms, conditions, and know-how that have enabled a few low-performing high schools to achieve this transformation.

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A much maligned but durable institution, the American high school has played a key role in shaping the nation since its inception in the mid-nineteenth century. It has provided a means of upward mobility, served as an engine of economic growth, and played a vital role as a community-building and socializing institution. At the same time, it has perpetuated inequalities and often fallen short of its ideals.[1] At the dawn of the twenty-first century, the American high school is once again being called on to help promote the nation's success—this time, by ensuring that all adolescents graduate from high school prepared for postsecondary schooling and training. This new challenge is in many ways the end point of a 150-year evolution.

Begun as a college-preparatory institution for a small fraction of society in the nineteenth century, the American high school added a workforce-preparation mission in the early twentieth century.[2] As it became a mass institution through mid-century, it took on a socialization role, as a way station where adolescents moved from childhood to adulthood. The curriculum was modified, and a general course of study filled with life-adjustment courses joined the academic and vocational components.[3] Through the 1960s and 1970s, extensions to compulsory school-ing laws and changes in the labor market helped make attending high school the norm for all adolescents. To retain students' interest and participation, the American high school tried to offer something for everyone to the point that it came to be described, aptly, as a shopping mall.[4] Beginning in the 1980s and accelerating to the present day, the mission shifted once again. In response to the nation's transition from an industrial to an information economy, academic preparation

once again became a priority. No longer an end point in the public education system, the American high school is now being asked to prepare all its students for the postsecondary schooling and training required for full economic and social participation in U.S. society. In short, it is being challenged to make good on its potential and become an avenue of advancement for all.

In this article I examine the state of the American high school at the start of the twenty-first century and ask how well it is succeeding in this new role and what its prospects are for ultimately fulfilling this mission. I first examine the structure and demographics of the American high school, then look in more depth at its current goals and outcomes. Next I explore the prospects that the American high school will be able to reformulate itself and successfully prepare all students for additional schooling or training. I evaluate its ability to change by looking in depth at its evolution over the past twenty-five years and considering the forces that might both advance and constrain its success.

The American High School Today

Understanding where the American high school is headed requires taking a close look at what it is today. In this section I examine how it is organized, where it is located, and who attends it.

A Common Structure

Across the nation the great majority of high school students share a common experience. They attend a public, regular high school that begins in the ninth grade and concludes in the twelfth grade. In 2006, 90 percent of high school students attended a public school. Less than 3 percent attended an alternative school, and less than 2 percent a vocational high school. Only a small fraction of high

school students attended a charter school (3 percent) or a magnet school (8 percent). Today close to eight out of ten students go to a high school that begins in the ninth grade. Twelve percent go to combined middle and high schools that begin in the sixth, seventh, or eighth grade and conclude in the twelfth grade, and fewer than 4 percent attend senior highs that begin in the tenth grade.[5]

Distinct Environments
Variations in school location and size begin to differentiate students' high school experiences. Roughly 30 percent of public high

school students attend schools in large or mid-size central cities. An almost equal share attends schools in rural areas or small towns. The remaining 40 percent of students attend suburban high schools. About 15 percent of public high school students attend small schools with 500 or fewer students. A greater share (25 percent) attends very large high schools with 2,000 or more students.[6]

Various school locations and sizes combine to produce a number of distinct high school environments. About 35 percent of rural students attend small schools with 500 or

Table 1. Percentage of All Students and Students of Various Race and Ethnicity Attending High Schools with Selected Characteristics, 2005–06

Percent

School characteristic	All students	American Indian/ Alaskan Native students	Asian/Pacific Islander students	Hispanic students	Black students	White students
Minority concentration						
0–25% minority	44.8	26.5	20.6	9.9	9.8	66.4
26–50% minority	21.3	25.8	25.3	17.4	20.2	22.1
51–75% minority	14.1	16.6	22.6	22.3	22.8	8.7
76–100% minority	19.8	31.1	31.5	50.4	47.2	2.7
0–10% minority	25.1	8.5	6.1	2.6	2.4	39.6
90–100% minority	12.6	23.2	14.2	32.8	34.3	0.7
Percentage of students eligible for free or reduced-price lunch						
0–10%	16.7	7.5	24.8	8.3	6.2	21.4
10–39%	46.4	35.5	43.1	29.2	30.5	56.1
40% or more	36.8	57.0	32.1	62.5	63.2	22.5
School size						
50 to 200 students	3.8	15.6	1.4	3.7	3.5	3.8
201 to 500 students	11.7	23.3	4.7	8.3	10.8	13.1
501 to 1,000 students	20.8	24.6	10.5	12.1	19.5	24.3
1,001 to 1,999 students	37.6	24.8	36.7	30.2	41.9	38.9
2,000 or more students	26.1	11.7	46.7	45.7	24.3	19.8
Number of students per teacher						
15 or fewer	32.6	41.8	21.5	25.2	34.7	34.8
16 to 20	43.8	39.1	36.9	35.1	47.5	45.9
21 or more	23.6	19.1	41.6	39.7	17.9	19.4

Source: Common Core of Data, "Public Elementary/Secondary School Universe Survey, 2005–06," v.1a, (Washington: The National Center for Education Statistics, 2006).

fewer students, but an equal share attends larger schools with 1,000 or more students. Only about a tenth of central-city students attend small schools, with nearly four times that share attending very large schools with 2,000 or more students. In suburban areas three out of four students attend schools with 1,000 or more students. Schools with between 500 and 1,000 students—a size that research suggests effectively balances the need for personalization and the need for the learning opportunities that lead to the greatest achievement gains—are most commonly located in suburban or rural areas.[7]

Still Separate and Unequal?

Where high schools differ most is in the composition of their student bodies and the resources available to organize and provide instruction and activities. As seen in table 1, more than fifty years after *Brown v. Board of Education* only about a fifth of high school students across all racial and ethnic groups attend a high school whose student composition (26–50 percent minority) reflects the national distribution of majority and minority groups enrolled in public high schools. Students more commonly attend high schools that are nearly all white or all minority. Forty percent of white students attend high schools that are 90 percent or more white, and close to 30 percent of African American and Latino students attend high schools that are 90 percent or more minority. Nearly three-quarters of Latino and African American students attend high schools where most students are minority.

Minority concentration and poverty are also tightly linked in the nation's high schools. Free and reduced-price lunch data are notoriously inaccurate at the high school level. Students are reluctant to turn in the necessary forms, and schools put forth varied

efforts to collect them. With the appropriate cautions, however, the data can indicate lower bounds. With those caveats in mind the available data point to significant differences in the extent to which majority and minority students attend high schools with many low-income students. At a minimum, six out of ten Latino and African American high school students attend schools where at least 40 percent of the student population is eligible for free or reduced-price lunch. As seen in table 1, Latino and African American students appear to be three times more likely than white students and two times more likely than Asian American students to attend high schools that must confront the challenges of concentrated poverty.

One reason for the intersection of poverty and racial segregation in the nation's high schools is the abandonment of the public school system, particularly at the secondary level, by middle- and upper-income families in some central cities and Southern counties. In these locales private high schools are disproportionately white, and public high schools are disproportionately African American and Latino. For example, in both Chicago and Atlanta 50 percent or more of white students attend private high schools.[8] The rejection of public high schools by middle- and upper-income families amplifies the effect of residential segregation in creating separate and unequal schools because even in locales where affluent, middle-class, and low-income families share the same school district, some of the more affluent and middle-class families are opting out of the public secondary schools.

An in-depth analysis of how resources vary from one high school to another is beyond the scope of this article—and data on the resources available to individual schools are

not detailed enough for such an analysis in any case. But existing data show that high schools differ substantially in the resources at their disposal.

The most basic resource, the ratio of students to teachers, influences not only class size, but also the personnel available for contact with students, homework support, after-school activities, and the basic ratio of adults in the school to students in need. Across all high schools in the United States wide disparities exist in student-teacher ratios. Only about half of the nation's high schools have fifteen or fewer students per teacher, the ratio some research has suggested is necessary to support state-of-the-art high school reforms.[9] At the other end of the spectrum about 5 percent of high schools have twenty-six or more students per teacher. Thus some high schools have twice as many teachers as others for the same number of students. Considerable differences exist even within and across high-poverty school districts. Some high-poverty high schools in New Jersey—because of rulings by the state supreme court in the *Abbott v. Burke* school funding case since the 1980s—have student-teacher ratios of eleven to one. But some high-poverty schools in Los Angeles—because of voters' approval in 1973 of Proposition 13, a ballot initiative capping property tax rates—have student-teacher ratios of thirty or more to one.[10] Cross-references of student-teacher ratios, poverty levels, and minority concentrations demonstrate that Latino students in particular attend high-poverty high schools with student-teacher ratios considerably higher than those experienced by either African American students in high-poverty schools or white students in affluent high schools.[11]

High school districts also differ dramatically in how much they invest in their students.

At the extreme, it is possible, particularly in northern cities and their surrounding suburbs, to find two high schools within ten miles of each other with one spending $15,000 per pupil and the other $5,000.[12] Lawsuits that have been filed in a number of states clearly document the adverse impact of such inequities on the quality of the school facilities, the availability of instructional supplies, and the during-school and after-school learning opportunities provided to high school students in the lower-funded schools.[13]

A look at the community resources available in the school districts serving the fifty wealthiest and fifty poorest urban and suburban communities highlights the extremes. In the districts that serve the wealthiest communities, located exclusively in the suburbs, the median income is $120,000, and 16 percent of the students are minority. By contrast, in the fifty poorest communities, located in either mid-size central cities or their urban fringe, the median income is $19,000, and 90 percent of the students are minority. As seen in table 2, the students in the wealthiest communities attend smaller high schools with a lower student-teacher ratio. The students in the poorest communities, on average, attend larger schools with a far greater number of needy students and with fewer adults to provide support. It is perhaps not surprising, then, how different student outcomes are in each. Nearly all the students in the wealthiest communities are promoted in a timely fashion and graduate, compared with less than two-thirds of the students in the poorest communities.

In sum, the high school experiences of many U.S. students continue to be separate and unequal. Most Latino and African American students attend high schools with disproportionately high concentrations of low-income

Table 2. Selected Characteristics of High Schools in the Fifty Wealthiest and Poorest Urban and Suburban School Districts, 2005–06

Percent

School characteristic	Fifty wealthiest districts	Fifty poorest districts
Share of minority students	16.1	89.8
Share of schools with a student-teacher ratio of 16 or more	33.4	49.6
Share of schools with 1,500 or more students	36.4	58.6
Graduation rate	96.0	64.0

Source: Same as table 1.

and minority students. Four out of ten white students attend high schools with few minority students. Only in some low-wealth rural districts primarily in the South do white students attend high schools with large numbers of low-income students.

Gaps in Entering Students' Achievement Levels

A final characteristic that differentiates high schools is the achievement levels of their incoming freshmen. The academic skills and outlooks that students bring to a high school shape both the nature and the outcomes of the school. U.S. high schools educate students with vastly different levels of preparation. In some of the affluent communities in the list of the fifty wealthiest, 95 percent or more of students enter high school having scored proficient on their state's eighth-grade examinations used for federal accountability under the 2001 No Child Left Behind (NCLB) Act. In high-poverty, non-selective inner city high schools, fewer than one in five students enters high school having reached proficiency levels in eighth grade. In fact, most incoming ninth graders in these schools have fifth- or sixth-grade mathematics and reading skills, resulting in part from a two-tiered system of high schools in some large central cities.[14] Students with grade-level skills (or better) gain admission to selective

high schools or selective programs within high schools. A recent flyer from one such school district could not have been plainer. It stated that only students with high test scores, good grades, good attendance, and good behavior in the middle grades would be admitted to the selective high schools and programs. By definition, the neighborhood, or non-selective, high schools are left to educate only students with low test scores, low grades, poor attendance, or poor behavior. Thus, in large urban systems some high schools are educating only students with high needs. More than 80 percent of their ninth graders repeat the grade or are over-age, or are in special education, or have below-seventh-grade math and reading skills. Selective high schools or programs have only a small fraction of students with these characteristics.[15]

National Assessment of Educational Progress (NAEP) scores indicate that high-poverty eighth graders have skill profiles closer to the average fourth grader than the average eighth grader.[16] Moreover, low-scoring eighth graders are not equally distributed across the nation, but are concentrated among minority populations in the central cities of the Northeast and Midwest and throughout the Southeast and Southwest.[17]

Thus, within a common structure, high school students in the United States experience vastly different learning environments. The high schools that students attend range from predominantly white, large suburban schools in affluent communities, where nearly every student arrives ready for high school work and graduates, to all-minority inner city schools that serve high-poverty neighborhoods, where most students enter high school lacking a good middle grades education and only one-half to two-thirds of the students ultimately graduate. The spectrum also includes selective city schools that serve predominately minority students and send large numbers to college, as well as nearly all-white small rural schools in low-wealth counties where most students enter high school with inadequate skills and few attend college. In between are all manner of variations in school size, student composition, and entering skill levels.

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Purpose and Outcomes of Today's High Schools

Given a common structure, but distinct environments and a still separate and unequal experience for many students, what is the purpose of high school in the twenty-first century? The weight of evidence suggests a growing consensus among both the students

who attend the schools and the school districts and states that organize them that regardless of the characteristics of a school or its students, the primary purpose of high school today is to prepare students for college. The secondary functions of workforce preparation, socialization, and community-building remain, but ask a student, parent, school district administrator, or state school official the purpose of high school, and by far the most common response is that the mission of high school is to prepare students for postsecondary schooling.

The High School Survey of Student Engagement reports that in 2004, when 90,000 students nationwide (though with a bias toward the Midwest) were asked why they go to school, 73 percent responded, "I want to get a degree and go to college." This response outpaced "because of my peers/friends" (68 percent), "because I want to acquire skills for the workplace" (47 percent), and "because of what I learn in classes" (39 percent). Moreover, 82 percent of respondents said they plan to enroll in some form of postsecondary schooling after high school, and 10 percent were uncertain.[18] Likewise, a nationally representative study sponsored by the U.S. Department of Education found that only 5 percent of the nation's high school seniors in 2004 reported that they expected to end their formal education with a high school diploma. Fully 87 percent reported that they expected to attend college, with more than one-third anticipating graduate or professional school.[19] In the main, students act on these intentions, with three-fourths of high school graduates enrolling in college within two years.

Perhaps nothing better signifies the growing ascendance of college preparation as the core mission of high schools than the widespread availability in high schools of college-level

coursework. Roughly seven out of ten high schools offer dual-credit courses with local colleges or Advanced Placement courses, or both. Opportunities for such courses, however, differ sharply by school size. About half of small, primarily rural high schools offer students the opportunity to take college-level courses, compared with nearly all larger, primarily suburban and city high schools.[20]

But is the American high school successfully preparing its students to succeed in postsecondary schooling or career training? The question, though simple, defies a straightforward answer.

Graduation Rates and Measured Achievement

The most fundamental high school outcome is graduation. Because each state measures its graduation rate in a manner of its own choosing, however, it is not possible to directly compare official graduation rates across states or between school districts or to calculate a national graduation rate. As John Tyler and Magnus Lofstrom point out in their article in this volume, multiple graduation rate estimates are available, each with its own strengths and weaknesses.[21] Citing the recent analysis of James Heckman, Tyler and Lofstrom conclude that the national graduation rate is around 77 percent. Overall, then, for close to a quarter of their students, U.S. high schools are not achieving the most basic outcome. This national average, moreover, conceals great variations. In a third or more of U.S. high schools nearly everyone graduates; in 15 percent of schools graduation is not the norm, and graduation rates can be 50 percent or lower. Latino and African American students are three to four times more likely than white students to attend schools with a low graduation rate, and their graduation rates lag behind those of white students

by 15 to 30 points depending on the estimate and the state.[22]

It is also difficult to get a clear picture of the achievement levels of high school students in the United States. National Assessment of Educational Progress (NAEP) results for seventeen-year-olds provide some evidence, though questions about student effort and motivation challenge the validity of the results. On the one hand, NAEP results are based on a sample of all seventeen-year-olds, not just those who are college bound. On the other hand, the test is of no consequence personally for teenagers, who may or may not be motivated by the nation's desire to measure their progress, and thus it is unclear how seriously students attempt to do well on it. Overall, NAEP results indicate that close to half of all seventeen-year-olds demonstrate moderately complex procedures and reasoning skills in mathematics and can understand complicated information in reading. The results also indicate that less than 10 percent demonstrate the highest levels of achievement.[23] In the Education Longitudinal Study of 2002, only 35 percent of seniors achieved the second-highest level of mathematics performance and demonstrated "understanding of intermediate-level mathematical concepts and/or having the ability to formulate multistep word problems."[24] International comparisons of secondary achievement generally show U.S. students performing in the middle to the bottom of the pack. However, as Daniel Koretz points out in his article in this volume, these international comparisons are complicated by differential student populations and motivations.[25]

Results on the Advanced Placement exams provide a different window on high school student achievement. They indicate that significant numbers of high school students are

already capable of college-level work. Among the class of 2007, approximately 15 percent of students scored a three or higher on an Advanced Placement exam—the level generally required to be awarded college credit.[26]

College-Preparatory Coursework

Another way to examine the outcomes of high school is to ask what share of graduates took the academic courses that would prepare them for college or postsecondary training. Here, too, depending on how one presents the data, different pictures can emerge. According to the Education Longitudinal Study (ELS), the graduating class of 2003–04, on average, earned the following credits: 4.3 English, 3.9 social studies, 3.6 mathematics, 3.3 science, 2.0 fine arts, and 2.0 in a foreign language. Thus the typical high school graduate now completes the college-preparatory or New Basics curriculum identified as a key national goal in *A Nation at Risk,* the 1983 report by the National Commission on Excellence in Education. Moreover, according to the ELS, fully 30 percent of seniors in 2003–04 earned a credit in an Advanced Placement (AP) or International Baccalaureate (IB) course.[27]

Recently, however, the college-preparatory curriculum has been redefined by some to include not just total credits but specific courses, including one credit of mathematics higher than Algebra II, one science credit higher than general biology, and two credits in a single foreign language. Applying these more stringent criteria, only 26 percent of the graduating class of 2004 met the standard. These results mirror those reported by students who took American Council of Testing (ACT) exams for college admission. Of that group, 56 percent stated that they took the traditional college-preparatory curriculum, but only 28 percent reported

taking the specific and more advanced course sequence the ACT identifies with the greatest odds of passing college courses.

Recently, investigators, including Melissa Roderick, Jenny Nagaoka, and Vanessa Coca in their article in this volume, have argued that what is essential is not taking a specific set of college-preparatory courses, but engaging in coursework that develops the knowledge, skills, and habits of mind required for success in postsecondary schooling.[28] Interviews and surveys of college students aimed at identifying why some high school graduates succeed in college and others do not regularly point out that what college students believe matters is being able to keep up with the pace, volume, and intensity of college work. This in turn requires strong reading, writing, study, and self-management skills.[29]

Evidence on how well high schools are preparing students in these domains is slim, and what exists is not encouraging. NAEP reading scores for seventeen-year-olds have been essentially flat since 1971, despite the rise in academic course-taking. Differences in the instructional time that high school and college students spend in class are not huge, but great differences surface in high school and college students' self-reporting on the reading and writing and the volume and pace of course assignments they complete outside of class. More than half of the students completing the High School Survey of Student Engagement reported spending less than three hours a week preparing for all their courses. On similar surveys, first-year students at four-year and community colleges reported spending more than double that time. Only 8 percent of the high school students, compared with more than half of first-year students at four-year colleges, reported spending more than ten hours a week

preparing for their classes. And the minimal out-of-class effort reported by the high school students appears to be all that is required. Four-fifths of them stated that they often or very often came to class prepared, and two-thirds of those who reported spending three hours or less a week preparing for class stated that they received mostly A's and B's.

Just 2 percent of the high school students reported reading as much material outside of class as college students do, and only 8 percent of high school seniors reported doing as much writing—in both the number of papers and their length. Despite these obvious gaps between high school work and college expectations, two-thirds of the high school students responding reported that their high school education was preparing them for college. One caveat in interpreting these findings is that although students from across the nation took part in the survey, by far the largest concentration of students was in the Midwest, which has the highest number of states without statewide graduation requirements or exit exams.[30]

In sum, based on available evidence it is possible to make a case that somewhere between a third and a half of high school graduates leave high school prepared with a reasonable chance to succeed in college. The higher figure roughly corresponds to 75 percent of high school graduates enrolling in college within two years, with about 28 percent needing to take one or more remedial courses in college. The lower figure roughly tracks the share of high school students who ultimately graduate from college.[31] Within these national averages, however, wide disparities persist. The college graduation rate of low-income students has been flat for decades, at less than 10 percent,[32] and recent research in a number of large high-poverty cities shows

that college graduation remains a rare feat for their high school students.[33]

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Workforce Preparation
Despite claims that the goal of high school should be to make sure all students are college- and career-ready, in practice the evidence seems to suggest that workforce preparation has become decidedly a secondary goal—both in the minds and actions of students and in the policies and offerings of school districts and high schools. Vocational schooling has been renamed career and technical education (CTE), but by whatever name, it is not a dominant feature of today's high school. Less than 3 percent of students attend vocational or technical high schools, and the number of vocational credits students earn has been in steady decline, falling from an average of 4.4 credits in 1982 to 3.5 credits in 2004.[34] According to the ELS, only 15 percent of the 2003–04 graduating class took an "occupational curriculum concentration" defined as "at least three credits in one specific labor market preparation area such as agriculture, business, marketing, health care, etc." The ELS also found that high school seniors with an occupational curriculum concentration had decidedly lower

mathematics skills than students with either academic or general curriculum concentrations.[35]

A number of high-profile organizations including Achieve (founded by business organizations and the nation's governors) and the ACT have advanced the position that fundamentally the same set of knowledge, skills, and capacities is needed to succeed in college and the workforce.[36] In their view, college readiness leads to workforce preparation. Scholars such as Jeannie Oakes and Norton Grubb, among others, have hotly contested this view, stating that to blur the distinction leads to a narrow academic focus in high school and the loss of valuable knowledge, skills, and outlooks rooted in effective career preparation.[37] College-going rates and labor market outcomes for students who receive a General Educational Development (GED), as noted by Tyler and Lofstrom in their article in this volume, provide some implicit support for the position that the narrowest of academic preparation is neither the best preparation for college nor rewarded in the labor market. The GED is designed to capture the knowledge and skills equivalent to those recognized by a high school diploma and is benchmarked so that 40 percent of high school seniors fail it. As such, the GED would seem to be a reasonably rigorous exam of academic knowledge. Yet students who successfully complete the GED do not do as well as high school graduates either in college or in the labor market. This finding suggests that success in both college and the labor market depends on more than just the acquisition in high school of academic knowledge and skills. Proponents of a blend of academic and CTE experiences in high school are also supported by the few available studies that indicate that students who combine academic and CTE preparation

do well in postsecondary schooling and are rewarded in the labor market.[38] This group, however, represents only a tiny fraction of high school students. Just 3 percent of the class of 2003–04 combined an occupational curriculum concentration with an academic concentration.[39]

Future Prospects for the American High School

The uneven academic and workplace outcomes of today's high school students make it possible to conclude that the American high school is falling short in realizing its new mission of preparing every student for postsecondary schooling or career training. Looking ahead to whether the American high school can become an engine of advancement for all, however, requires understanding not only its current state, but also its recent evolution, as well as some forces that may constrain further progress and some that may advance it.

Evolution over the Past Twenty-Five Years

The picture of the American high school painted by high school reformers during the early 1980s is barely recognizable today. Classics such as Ernest Boyer's *High School*, Theodore Sizer's *Horace's Compromise,* and Arthur Powell, Eleanor Farrar, and David Cohen's *Shopping Mall High School* collectively depicted an institution whose predominant goal was to keep students occupied through an ever-diversifying assortment of courses and pathways designed to accommodate their presumed interests and needs. High schools of that era required more credits in physical education than in mathematics. Many required typing. Scholastic Aptitude Test (SAT) scores were declining, and students could graduate with just a single mathematics credit earned by taking consumer mathematics.[40] These reports from the

Table 3. Percentage of Students Taking
Selected Upper-Level High School Courses,
1982 and 2004

Percent

| | School year | |
Course	1982	2004
Geometry	47	76
Algebra II	40	67
Chemistry	32	64
Pre-Calculus	6	28
Physics	15	33

Source: M. Planty, S. Provasnik, and B. Daniel, *High School Coursetaking: Findings from the Condition of Education 2007* (Washington: Department of Education, National Center for Education Statistics, 2007).

field, combined with growing recognition of the role high schools would need to play in forming human capital for the information age, led the authors of *A Nation at Risk* to call for strengthening the academic component of high schools through both the New Basics course-taking standards (essentially a college-preparatory curriculum) and increased standardized testing. In the intervening twenty-five years, the standards and accountability movement has thoroughly transformed the American high school.

Raising Standards

One result of the accountability movement has been a substantial increase in academic course-taking. Three-fourths of states have significantly raised the number of credits needed for graduation (in the six states where graduation credits are determined locally, it is not possible to make state-level judgments), and twenty-three states have fully adopted the academic core of the New Basics (four credits in English, three in mathematics, three in science, three in social studies). A recent federal study shows that the average number of credits earned by a high school graduate increased from 21.7 in 1982 to 25.8

in 2004.[41] The greatest upsurge in credits has been in mathematics—from 2.7 to 3.6—and science—from 2.2 to 3.2. History and social studies, arts, and foreign language credits have also risen significantly, as vocational and elective credits have declined. Perhaps the most dramatic increases were in the share of students taking upper-level college-preparatory courses such as geometry, Algebra II, chemistry, pre-calculus, and physics (see table 3). By 2004, moreover, male and female graduates were not earning materially different numbers of total credits or math and science credits.[42] The shopping mall high school had been replaced by a smaller number of "big boxes," primarily academic subject stores.

States have also raised standards by widely adopting increased standardized testing. Twenty-two states now require students to pass exit exams (or in some cases to demonstrate comparable proficiencies) to receive a diploma. With three more states planning to mandate exit exams by 2012, approximately two-thirds of high school students will have an exit exam requirement. Because exit exams are concentrated in Southern and Western states, which have higher minority populations, 76 percent of minority students face exit exams compared with 58 percent of white students.[43] In addition to exit exams, high school students face a wide range of local, state, and federal standardized testing. The federal No Child Left Behind Act, for example, mandates that every high school student be tested in mathematics and reading in at least one high school grade.

Many local school districts have also significantly increased grade-to-grade promotion requirements in an effort both to end social promotion and to ensure that students earn the necessary credits to graduate.[44] Districts

have also adopted zero tolerance disciplinary policies, which have led to an increase in suspensions, expulsions, and student involvement with the juvenile justice system.[45]

The Consequences of Accountability Reforms

Taken together, it is clear that all these accountability reforms—a significant increase in graduation requirements, the growth of exit exams, the tightening of grade-to-grade promotion requirements, and the advent of zero tolerance discipline policies—have made it harder to earn a high school diploma today than it was thirty years ago. What is less clear is whether the reforms have led to better student outcomes. One major consequence of making it harder to earn a high school diploma, for example, appears to be a large increase in high school grade retention, particularly between the ninth and tenth grades, as Ruth Curran Neild describes in detail in her article in this volume. Tougher graduation requirements seem, at a minimum, to be forcing more students to take longer to earn their high school diploma. But some fairly convincing evidence suggests that students who repeat high school grades do not, for the most part, ultimately obtain their diplomas. Case studies from large urban districts have repeatedly demonstrated that students who are not promoted on time to the tenth grade are less likely to graduate than those who are promoted on time.[46] Other research has also shown that the more rigorous recent exit exams have lowered graduation rates, particularly in states with a large high-poverty and minority population.[47] Finally, no evidence indicates that increased grade retention is leading to higher academic achievement. Some observers had hoped that providing students with extra time in high school would boost their achievement scores or that the threat of grade retention would

motivate them to work harder, or both. But as high schools became less efficient in graduating students on time, NAEP scores did not increase significantly.[48]

School and Classroom Changes

The past twenty-five years have also seen significant changes in student-teacher and teacher-teacher interactions. In many high schools, the movement of special education students into the least restrictive environment, the increase in the number of students learning English as the result of immigration, and the formal dismantling of a rigid tracking system have led to much more diverse and heterogeneous classrooms. In urban and increasingly in older suburban communities, as well as low-wealth rural districts, the growing concentration of poverty has further changed the composition of classrooms—bringing in more students who face a host of environmental and individual challenges associated with living in high-poverty neighborhoods and, often, single-parent households.[49]

At the same time, the standards and accountability movement has brought high-stakes testing, district-wide curricula, pacing guides, and instructional coaches all pushing for more homogenized instruction.[50] Especially in grades and subjects that face high-stakes testing, test preparation has become a commonplace and often time-consuming activity.[51] In high schools with numerous low-performing students, reform has become a habitual activity, often accompanied by a high turnover in administrators.[52]

Many high schools have also adopted scheduling or organizational changes that have altered the number of classes and students that teachers teach, lengthened their class periods, and in some cases, changed the

nature of their daily interactions with fellow teachers from a primary focus on a single subject area to a more interdisciplinary focus. Such changes have often been accompanied by efforts to personalize large high schools by breaking them up into smaller learning communities or creating ninth-grade academies.[53] In some cases, career academies in which students take a linked series of career and technical electives have created opportunities for academic and vocational teachers to work together and for teachers to blend workforce applications into their core classes.[54]

Efforts to Improve Low-Performing Schools

Over the past decade, reformers have made a concerted effort to improve the low-performing high schools that educate primarily the nation's low-income and minority students. Investments by the federal government in comprehensive whole-school reform models, as well as philanthropic efforts to promote evidence-based high school reform, have led to the development of several strategies for transforming low-performing high schools. The new reform models, explored in detail by Steve Fleischman and Jessica Heppen in their article in this volume, have significantly improved student attendance, course passing, and grade promotion and graduation rates in challenging environments.[55] A multibillion dollar investment by the Bill & Melinda Gates Foundation has led to the formation of hundreds of new small schools, district-wide efforts to reform large comprehensive high schools, and a large network of research, policy, and advocacy groups dedicated to improving the high school education of primarily poor and minority students.[56] The combination of federal and philanthropic investments has led to reforms that have

been proven effective, thus challenging the view that improving the nation's lowest-performing high schools is impossible.[57] Recent efforts in New York City, for example, have demonstrated that even the nation's largest and most complex city, which educates more than one million students, can successfully raise its graduation rate.[58] Overall, available evidence suggests that the nation's low-performing high schools can be improved, though reform is difficult and often uneven. The need to implement a reform model in precise accord with evidence-based practice offers multiple and constant challenges, as does ensuring that effective reforms are sustainable.[59]

The American high school may thus be able to continue on a reform trajectory that would enable it to reach far more of the students whom it now leaves unprepared to succeed in college or postsecondary training.

Finally, awareness is growing of the need to experiment with different forms of high schooling, as elucidated by David Stern in his article in this volume. Emerging reforms include efforts by charter management organizations to create networks of new high schools; the early college movement, which aims to smooth the transition from high school to college; and attempts to create multiple pathways to high school graduation based on careful analysis of the needs of students who fall off the graduation path.[60]

Many of these emerging reforms have generated preliminary evidence of positive effects, but must await further research before final judgments can be made about their effects and scalability.

What about the Future?

On one hand there is reason to be pessimistic that the nation's high schools as currently conceptualized and organized can prepare all students for postsecondary schooling or career training. A case can be made that even after a quarter-century of reform, high schools prepare only half of their graduates, at best, to succeed as adults, while leaving the remainder of graduates less than fully prepared and failing totally the one-fifth to a quarter of all U.S. high school students who drop out.

Moreover, because the nation's dropouts are heavily concentrated among its low-income and minority students, who, in turn, are geographically concentrated in a subset of large and medium-sized cities, low-wealth rural districts, and, increasingly, the suburbs of the South and Southwest, the result is worse than simply diminished life chances for individuals. In some of these locales, up to half of all high school students drop out and up to half of these dropouts are simply idle, neither joining the labor force nor seeking further education. Entire communities are thus being shut off from full participation in American society.[61]

On the other hand, it is possible to make a case that the trend in high school reform is going in the right direction. The American high school is not only more focused and more academic than it was twenty-five years ago; it is a very different place. In addition, Americans seem to have reached a deep social consensus that the role of the high school in the twenty-first century is to provide universal preparation for postsecondary schooling or career training. A growing body of research on high school reform, the emergence of a number of reforms that have been proven effective in transforming or replacing low-performing high schools, and current efforts by the Department of Education to require and support rigorous evaluation of new reform models may within another generation create the conditions necessary to attain this goal. The American high school may thus be able to continue on a reform trajectory that would enable it to reach far more of the students whom it now leaves unprepared to succeed in college or postsecondary training.

But to reach that goal, high schools must move beyond increasing the number of academic courses students take and assessing their accomplishments with greater rigor. Reformers must find ways to enhance the quality, coherence, and value of the coursework high school students complete, to align that coursework with the cognitive tasks required by college work and the workplace, and to increase the effort students put into their work. Reformers must also create a system of academic and social supports for students who enter high school with inadequate academic skills and declining levels of school engagement.[62]

Several challenges must be overcome if the more hopeful vision is to prevail. First, the American high school is in reality a multiplicity of micro-systems, as can be seen by cross-referencing the number and size of high schools within a school district. Close to 40 percent of U.S. high schools, for example, are the only secondary school in their school district, but these schools range in size from 50 students to more than 2,000. At the other end of the spectrum, about 12 percent of high

schools are located in large urban and county districts that have twenty or more high schools each. Each of these systems of high schools (as well as all those in between the extremes) offers its own set of challenges to the work of improving the quality of student coursework. Districts with a single high school must meet the needs of all the students in a community; the smaller schools, especially, may find it hard to provide multiple pathways to adult success. Large systems with twenty or more high schools may have difficulty achieving consistently high outcomes in so many locations, especially systems that are tiered, with students at or above grade level attending selective schools or programs, students below grade level going to neighborhood high schools, and students who struggle in neighborhood high schools being sent to alternative schools.

Second, although the social consensus on the goals of the American high school is strengthening, agreement on the best ways to achieve the goals is elusive. The federal government, states, local school districts and schools may thus proceed in many different directions. Larger schools will also be challenged to mobilize the one hundred to two hundred adults who staff them to work collectively toward a common goal over time. Recent analyses of teachers' reactions to direction given by states and districts in response to No Child Left Behind have shown that almost all differences are between teachers within schools, not across schools or districts.[63] Improvements in instruction depend much more on teacher cooperation and effort than on more rigorous course requirements or additional testing.

The third challenge is resources. Local control of education means, by and large, local funding of education. Although some states have moved to equalize funding or at least provide a sufficient base of funding for all school districts, many have not. Nor has the federal government to date shown a willingness to step in to provide all high schools with the resources they need to meet the challenges they face. Rather, Washington has invested heavily in early, elementary, and postsecondary education.[64] Finally, advances in the learning sciences, which might provide the basis for more successful instruction, may not be easy to implement using the current core technology of mass schooling—a single teacher working with twenty to thirty adolescents.

Conclusion

In sum, although the American high school has experienced a remarkable transformation over the past twenty-five years, it still has a considerable way to go to achieve its current mission—to prepare all students for further schooling or training. To serve as a means of advancement for all of its students and the nation, the American high school will need to find a way to bring to scale the methods and mechanisms, conditions, and know-how that have enabled a few high schools to achieve this transformation in the past decade. The in-depth examinations in the following articles will provide a deeper sense of both the possibilities and limits of the American high school in achieving this goal.

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How Do American Students Measure Up?
Making Sense of International Comparisons

Daniel Koretz

Summary

In response to frequent news media reports about how poorly American students fare compared with their peers abroad, Daniel Koretz takes a close look at what these comparisons say, and do not say, about the achievement of U.S. high school students. He stresses that the comparisons do not provide what many observers of education would like: unambiguous information about the effectiveness of American high schools compared with those in other nations.

Koretz begins by describing the two principal international student comparisons—the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA). Both assessments, he stresses, reflect the performance of students several years before they complete high school. PISA, which targets fifteen-year-old students, measures students' abilities to apply what they have learned in school to real-world problems. By contrast, TIMSS tests fourth and eighth graders. Unlike PISA, TIMSS follows the school curriculum closely.

Because the findings of the two tests are sometimes inconsistent, Koretz stresses the importance of considering data from both sources. He cautions against comparing U.S. students with an "international average," which varies widely from survey to survey depending on which countries participate, and recommends instead comparing them with students in other nations that are similar to the United States or that are particularly high-achieving.

Many observers, says Koretz, speculate that the lackluster average performance of American students in international comparisons arises because many, especially minority and low-income U.S. students, attend low-performing schools. But both TIMSS and PISA, he says, show that the performance of American students on the exams is not much more variable than that of students in countries that are socially more homogeneous or that have more equitable educational systems.

Koretz emphasizes that the international comparisons provide valuable information and are a useful source of hypotheses about American secondary schooling to be tested by researchers. Studies designed to explain differences between U.S. students and those in very similar countries, he says, might provide especially useful suggestions for changes in policy and practice.

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One reason for the widespread dissatisfaction with American secondary schools is the view that U.S. students perform poorly compared with their peers in other nations. For years, the drumbeat of bad news from international student comparisons has been unrelenting. In 1983, *A Nation at Risk,* the report that did much to spur ongoing efforts to reform American education, stressed the weak performance of U.S. students compared with students abroad, and negative international comparisons have been a staple of public debate about American education ever since.[1] International comparisons of student achievement are now carried out frequently, and newspapers never fail to highlight their disappointing results. A comment a few years ago in *Education Week,* the leading trade paper in K–12 education, is typical: "In their most recent lackluster showing on the world stage, students in the United States scored below average in mathematics literacy and problem-solving in an international comparison of the academic skills of teenagers in developed nations."[2]

The data, however, are more limited and more complex than is often realized, and the story they properly tell is not quite so straightforward. The results that receive the most attention—the simple ranking of countries in terms of their average mathematics achievement—are less clear-cut than most observers think. Moreover, the data include useful information beyond the horse race that gets little or no attention, some of which flies in the face of common expectations. Data about student performance at the end of high school are scarce and especially hard to collect and interpret. International comparisons of student achievement are valuable, but they cannot provide a clear evaluation of the performance of American high schools.

In this article I explore what these international comparisons do accomplish. I begin by describing the available data from the two principal international student surveys. After raising several cautions and offering advice about how to interpret the data, I describe some key findings of the international assessments. Finally, I discuss their implications.

What Are the Data?

Just whom is the press talking about when it reports gloomy news about the comparative achievement of American students? The great bulk of the news reflects two ongoing international surveys: the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA).[3] The two are cited interchangeably in the press, but they are quite different, and their results are sometimes different as well—occasionally strikingly so.

International comparisons of student achievement are valuable, but they cannot provide a clear evaluation of the performance of American high schools.

PISA's target population is a single group: fifteen-year-old students attending educational institutions, including part-time students. Thus, in most instances, PISA tests students near but not yet at the final grade of secondary schooling. Individuals not being schooled or being schooled at home, in the workplace, or out of the country are intentionally excluded.[4] The survey, which is repeated

every several years, assesses mathematics, science, and reading. The PISA assessment is intended to measure students' abilities to apply what they have learned in school to real-world problems. For that reason, the framework from which the PISA tests are constructed does not closely mirror school curricula. The PISA tests are organized by broad themes, such as "change and growth," rather than curricular areas, such as geometry, and some of the test items are intended to look rather different from what one might find in a typical curriculum-based test.

TIMSS differs from PISA in all of these respects. TIMSS samples students by grade, not by age. In its first iteration, TIMSS surveyed three groups: fourth-grade students, eighth-grade students, and students at the end of secondary school.[5] Defining comparable groups at the end of high school is a daunting task because of the great variation across countries in the structure of secondary schooling. The sample for this part of TIMSS in 1995 was described as follows:

> The intention of the assessment of final-year students was to measure what might be considered the "yield" of the elementary and secondary education systems of a country with regard to mathematics and science. The international desired population, then, was all students in the final year of secondary school. Students repeating the final year were not part of the desired population. For each secondary education track in a country, the final grade of the track was identified as being part of the target population, allowing substantial coverage of students in their final year of schooling. For example, grade 10 could be the final year of a vocational program, and grade 12 the final year of an academic program. Both of these grade/track combinations are considered to be part of the population [but grade 10 in the academic track is not].[6]

As in the PISA surveys, out-of-school youth were not sampled. This complex sampling makes comparisons among countries extremely hard to interpret. Perhaps for that reason, this end-of-school component has not been repeated in subsequent TIMSS surveys.

TIMSS differs from PISA also in the characteristics of its assessment. TIMSS is intended to follow school curricula reasonably closely. For this reason, the content of the test, the mix of items across content areas, and even the characteristics of the items themselves differ appreciably from those of PISA. For example, in recent tests, TIMSS devoted 25 percent of its items to algebra, while PISA allocated 11 percent. As I shall show, these differences do matter, and they pose a challenge for people using the results.

Interpreting International Comparisons: Some Essential Cautions

Some years ago, the U.S. Department of Education offered the following summary of the performance of American students on the first (1995) TIMSS survey: "On the eighth-grade TIMSS assessment, U.S. students scored somewhat above the international average in science and somewhat below average in mathematics."[7] As the quotation from *Education Week* with which I began this article suggests, similar statements comparing U.S. students with an international average have been common.

Comparisons with an "international average," however, are nearly meaningless. An average is useful if it represents a clear comparison group. For example, telling a parent that her fourth-grade child scores below the average of all fourth graders in the state is useful information. However, in the case of international comparisons, the "international

mean" reflects the collection of countries that happened to participate in a given assessment in a given year. That happenstance group is not always a sensible comparison, and it changes over time, moving the average up or down considerably. For example, in 1999, a year after the statement above was published, the TIMSS mathematics assessment was administered again. In the main presentation of the results, the United States was shown as scoring above the "international average" of countries that participated in that year. A few pages later, however, the report showed the United States scoring well below the average of a different group of countries, those that that had participated in both 1995 and 1999.[8] This problem is easily avoided. American performance should not be compared with a slippery "international average," but with the performance of other countries that provide an informative contrast. For example, it is useful to compare the United States with the nations that consistently perform best, such as Japan and Singapore, as well as with nations that are in many respects more similar, such as Australia and Canada. These comparisons are generally stable over time, although they are not always consistent from one survey to another, for example from TIMSS to PISA.

A second complication in interpreting international comparisons involves differences among assessments. International assessments measure very broad domains of achievement, such as the cumulative mastery of mathematics over the first eight years of schooling. All tests of broad domains use a relatively small number of test items to estimate mastery of the entire domain, most of which remains untested. In this respect, tests function much like political polls, which use the views of a few people to predict the voting behavior of a much larger group of people, most of whom are not surveyed. The fact that tests are only small samples of performance has many important implications, one of which is that different tests sample somewhat differently from the domain and therefore may yield different views of performance. These variations may not indicate that something has gone wrong with one of the tests, although they may.[9]

Some little-noticed results from TIMSS illustrate the importance of decisions about sampling content. The eighth-grade mathematics assessment comprises five content areas, such as algebra and data representation. Some nations perform appreciably better in some of these areas than in others. For example, the United States and Australia performed more poorly in geometry than in the other four areas, while Singapore performed markedly better in fractions and numbers than in the others.[10] As a result, the rankings of countries that are reported by the press can be modified, although not dramatically, simply by changing the relative emphasis given to the five content areas in that particular test.[11] Larger differences among tests, such as some of those between TIMSS and PISA, can be expected to have even larger effects.

And indeed, in some cases, the results of PISA and TIMSS differ substantially. For example, in recent TIMSS and PISA assessments of mathematics, Scotland, New Zealand, and Norway ranked considerably better on the PISA assessment than on TIMSS; the Netherlands, Hong Kong, South Korea, and the United States had quite similar ranks on both tests; and Russia and Hungary ranked much higher on the TIMSS assessment than on PISA.[12] In the 2003 TIMSS assessment of eighth-grade mathematics, Norway scored far below the United States. In the PISA assessment of the same year, Norway outscored the

United States, not by much, but by enough that the difference was statistically significant (that is, unlikely to have arisen simply by chance because of sampling students).

It is not hard to find "explanations" of these differences, but in fact, the explanations remain speculative. Because of the design of the two assessments, it is not possible to explain differences between their results with confidence. These disparities may reflect intentional differences in content, differences in sampling of students, or unintentional factors that have not yet been identified. Nonetheless, they pose a problem for users of the results. For example, how does the mathematics performance of American students compare with that of students in Norway? That question has no single answer, though some other important patterns in the findings are consistent.

The inconsistencies are no reason to put international comparisons aside. They are simply reason to be careful in interpreting the results. Taking a few precautions can help to interpret the results sensibly. The first is to pay little attention to small differences, because these are particularly likely to depend on relatively unimportant aspects of test design. Careful readers of the reports of TIMSS and PISA will see that the authors specify which differences between nations are statistically significant so that readers can ignore differences that are statistically untrustworthy. However, statistical significance tells one only that a given difference was unlikely to have arisen by chance as a result of the sampling of schools and students. It does not indicate how robust the difference would be to reasonable changes in test design.[13] Therefore, it is wise to ignore small differences even when they are statistically significant.

The second precaution is to be wary of relying on the results of a single assessment. No one test, however well designed, should be treated as a "gold standard." An equally good test, designed differently, will often yield modestly different findings and occasionally markedly different findings. When a finding appears in more than one assessment—particularly, assessments that are quite different, as PISA and TIMSS are—then one can have more confidence that the result is not caused simply by the particular choices made in designing a specific test. For example, in mathematics, the United States has always scored far below the developed countries in East Asia—Japan, Korea, Singapore, and Hong Kong. Although the precise size of these differences will vary from test to test—indeed, they differ between TIMSS and PISA—it is a safe bet that other tests of similar domains would also show the United States well behind these countries.

A final complication, for those interested in the performance of students at the end of high school, is that this group is especially difficult to compare across countries. As noted, the one, highly complex attempt by TIMSS to compare performance at the end of school has not been repeated. But comparisons would be hard to interpret even if more data were available. One reason is youth who have left school, either because of completion (in countries where mandatory schooling ends at younger ages) or because of dropping out. The portion of the cohort that leaves school early varies both in size and in characteristics from one country to another. Leaving them out of an assessment can badly bias international comparisons. Including them, however, would be difficult and expensive and would require different sampling methods than those used for in-school youth.

Differences in school leaving were a major reason why the sole TIMSS study of students at the end of high school was problematic. TIMSS reported a "coverage index," which was the percentage of the school-leaving age cohort tested. For the survey as a whole, the best coverage was in Norway and France, where 84 percent of the age cohort was tested. In the United States, 63 percent was tested; in Italy, 52 percent; and in a few countries, 10 percent or less. A comparison involving 84 percent of Norwegian youth and 52 percent of Italian youth is hard to interpret. For a separate comparison of students taking advanced mathematics and physics, the differences were starker yet; for example, this comparison included 86 percent of youth in Slovenia but 4 percent in the Russian Federation and 22 percent in the United States.[14] Moreover, the majority of participating countries, including the United States, failed to meet TIMSS standards for the minimum quality of the sample, which required following specified guidelines for recruiting the sample and meeting specified criteria for participation rates and coverage of the population.[15]

A second reason why comparisons at the high school level are problematic is curricular differentiation—the routing of students into dissimilar instructional programs. In some countries, such as Germany and the Netherlands, students are sorted into various types of secondary schools that differ in selectivity, curriculum, and, in some cases, length of schooling. These differences were another factor that led to the extremely complex design of the single TIMSS study of the final year of schooling. In other countries, such as the United States, most students attend comprehensive high schools, but curricular differentiation within them is typically substantial, particularly in subjects such as

mathematics that are important for admission to selective colleges and universities.

Curricular differentiation is problematic because having useful comparisons across countries in a broad subject area, such as mathematics, requires agreement about the goals of mathematics instruction. To the degree that countries, or educational tracks within a country, differ in their goals, students in countries or tracks whose goals align well with the test will score higher than others. TIMSS approaches this problem by looking for common elements in curricula, but the greater the differences in curricula, the less tenable this approach is, and the more sensitive comparisons will be to the particular makeup of the test. PISA addresses this issue by focusing on application of skills beyond the school context, but even that strategy does not entirely solve the problem. Students are in different instructional tracks in part because the goals for their later use of mathematics differ.

One precaution is to be wary of relying on the results of a single assessment. No one test, however well designed, should be treated as a "gold standard."

As a result, almost all discussion in the press about international differences in the achievement of secondary school students focuses on younger students, either those in middle school (the TIMSS survey) or those

aged fifteen (the PISA survey). These choices do not eliminate the problems above, but they do substantially lessen them.

Key Findings of the International Assessments

International comparisons have been conducted in numerous subjects, but those in mathematics and science have received the most attention. Here I focus primarily on mathematics but describe briefly the results in science and reading.

Performance in Mathematics

The focus of this volume is high schools, so ideally the most relevant of the international studies would be the TIMSS comparison of students at the end of high school. The news from that study, if it were taken at face value, would be distressing. The mean score for U.S. students on a composite of mathematics and science was fourth from the bottom of twenty-one participating countries. The U.S. mean was statistically significantly higher than those of only Cyprus and South Africa, although it was statistically not reliably different from those of numerous other countries, including the Russian Federation and the Czech Republic.[16] Given the concerns about the TIMSS noted above, however—the difficulty of defining a reasonable international comparison at the end of high school, the problem of curricular differentiation, the large disparities in the percentages of youth tested, and the failure of most participating countries to meet minimum standards for the quality of their tested samples—the results are not readily interpreted. In the absence of a solid basis for directly comparing performance at the end of high school, it is necessary to rely on data from earlier in students' secondary education.

Mathematics results from earlier stages of secondary schooling (from students aged

fifteen in the PISA assessments and students in eighth grade in the TIMSS assessments) are not as bleak, but they appear discouraging enough and have dominated discussion in this country for decades. The consistent finding has been that American secondary school students perform less well in mathematics than their peers in many other countries that might be considered either similar or competitors. And this finding can be trusted: it has appeared time after time, in a number of different assessments.[17]

But just how badly do U.S. students perform, and how comparable in this respect are the findings from the two main ongoing assessments, PISA and TIMSS? To answer these questions adequately takes a bit more work because the scales reported—like those of most large-scale assessments—are arbitrary. Is a 20-point difference on the TIMSS scale large enough to worry about, and is it similar in magnitude to a 20-point difference on the PISA scale? (To illustrate this point with a more familiar example, consider the two competing college admissions tests, the SAT and ACT. In a single subject, the SAT scale runs from 200 to 800, while the ACT scale runs from 1 to 36. A 20-point difference on the SAT is trivial, while on the ACT, it is enormous.) A few calculations are needed to make the results of TIMSS and PISA comparable and more easily interpreted.

A common way to solve this problem is to standardize the scores. When scores are standardized, the average score is given a value of zero, and other scores are given values that express how far above or below the mean they are. These distances are expressed in terms of standard deviations, a common measure of the spread of scores. Although unfamiliar to many people, standardized scales have many advantages. They have the

same meaning from one test to the next, and they can be readily converted to other forms. If the distribution of scores roughly follows the bell curve, as scores on most large-scale assessments like TIMSS do, then a score that is one standard deviation above the average (a standardized score of +1) will be roughly at the 84th percentile: roughly 84 percent of students will have scores below this point. Conversely, a standardized score of –1 will fall roughly at the 16th percentile rank: 16 percent will score below –1, and 84 percent above.[18]

When one first glances at the results of the 2003 TIMSS and PISA assessments, the United States seems to fare somewhat worse in the latter: it is further down in the distribution of country means in PISA.[19] But for the same reason that a comparison with an "international average" is not meaningful, comparisons with the entire groups of countries that happened to participate in the two assessments are not particularly useful either. More informative are comparisons with specific countries, and these show important differences between the two assessments.

In the TIMSS assessments, the nations that score the highest in mathematics are always developed countries in East Asia: Japan, Korea, Hong Kong, Taiwan, and especially Singapore. The average difference between these countries and the United States varies a bit from one TIMSS assessment to the next, but it is always large, typically roughly a full standard deviation. In 2003, the gaps ranged from approximately 0.8 standard deviation (Japan) to almost 1.3 standard deviations (Singapore)—meaning that only one in five American students scored above the Japanese average and only one in ten scored above the Singaporean average.

In TIMSS, the United States fares better when compared with European countries and with Australia and New Zealand. In 2003, the highest-scoring European countries were the Netherlands and Belgium, whose averages were well below those of the Asian nations and roughly 0.4 standard deviation above that of the United States (meaning that about a third of U.S. students scored above the averages in those two countries). Some countries that are in many respects similar to the United States—England, Scotland, Sweden, and Australia—had average scores very similar to that of the United States. Norway's average was more than half a standard deviation lower than the American average.

These findings might lead one to the generalization that the United States is far behind East Asian nations but roughly comparable in performance to numerous countries that are more similar, with a few exceptions (high-scoring Holland and low-scoring Norway). If only it were that simple. PISA paints a somewhat different picture, underscoring the risk of placing too much faith in the results of a single assessment.

While confirming that U.S. students do not perform well compared with their peers in many other nations, the results of PISA differ from those of TIMSS in two respects. In one respect, PISA is less discouraging: the United States is not as far behind the highest-ranking countries. In other respects, it is more discouraging: the rankings of countries are somewhat different, and the generalization that the United States performs roughly as well as more comparable nations does not hold up. These differences can be seen by examining the performance of the eighteen countries that participated in both assessments in 2003.

The smaller size of the performance gap between the United States and the top-scoring countries in PISA can be seen by considering countries like Korea and Hong Kong. In figure 1, each circle represents one country's standardized average score. The distribution of scores in the United States was used to standardize scores, so the U.S. average on both tests is zero, and the scores of the other countries represent the fraction of a standard deviation between their averages and the U.S. average. The TIMSS results are arrayed on the horizontal axis, and PISA scores are on the vertical axis. The average score for Korea appears on the far right of the chart because, of the eighteen countries that participated in both assessments, Korea was the highest-scoring on TIMSS. One can see from the figure that the Korean average on TIMSS was a bit more than one standard deviation higher

than that of the United States (to be more precise, about 1.1 standard deviations). However, looking at the vertical axis, one can see that the gap between Korea and the United States in PISA was considerably smaller (about 0.6 standard deviation). Hong Kong shows much the same pattern. Among the eighteen countries, the largest gap with the United States was 1.1 standard deviations in TIMSS and 0.7 standard deviation in PISA.

The more discouraging and more obvious disparity in the results of the two assessments is the performance of the highest-scoring western countries. All of them fell substantially short of the top East Asian countries in TIMSS, but a number of them—Australia, New Zealand, the Netherlands, and Belgium —performed roughly similarly to the Asian countries in PISA and therefore did

Figure 1. Standardized Mean Differences between the United States and Eighteen Other Countries in Mathematics, TIMSS and PISA Assessments, 2003

US   United States
NZ   New Zealand
NL   Netherlands
BL   Belgium
HKG   Hong Kong
KOR   Korea
JP   Japan
AU   Australia
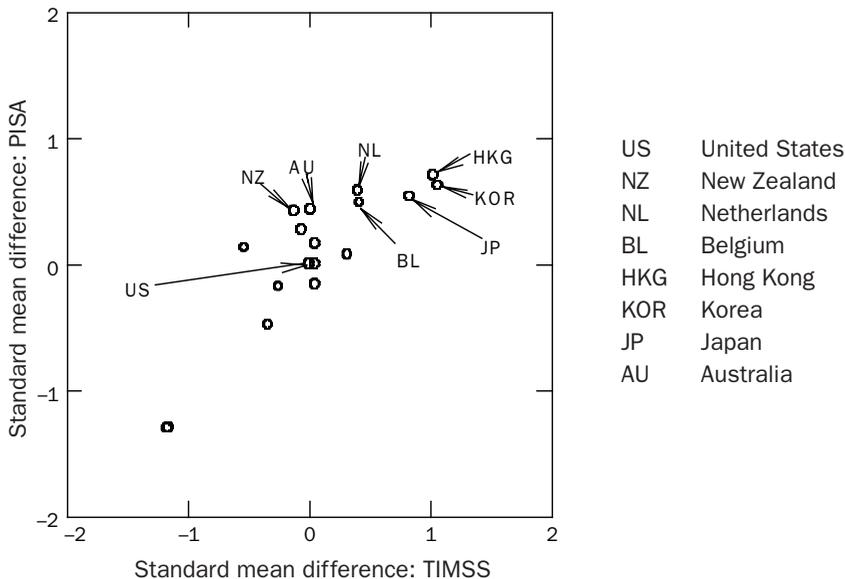
Sources: I. V. Mullis and others, *TIMSS 2003 International Mathematics Report* (Chestnut Hill, Mass.: International Study Center, Boston College, 2004), exhibit 1.1; Organisation for Economic Co-operation and Development, *Learning for Tomorrow's World: First Results from PISA 2003* (Paris: OECD, 2004), figure 2.15a.

considerably better than the United States. (In figure 1, these countries are therefore to the left of the Asian countries but roughly as far up on the vertical axis.) Two of them, Australia and New Zealand, scored almost the same as the United States in TIMSS.

Why are the results of PISA and TIMSS so dissimilar? It would be tempting to attribute the differences to intentional differences in the design of the assessments, such as PISA's greater focus on applications and TIMSS's greater alignment with school curricula. For example, one might conclude that East Asian countries do better than the highest-performing European countries in giving students mastery of the mathematics curriculum but not in teaching them to apply these skills in real-world contexts. However, as satisfying as such an explanation might be, it remains speculative. Although both PISA and TIMSS are carefully designed to serve their primary purposes, they are not well designed to answer questions such as this. The tests cannot be linked, so one cannot say for certain that differences in content account for the disparities in results. And more generally, these studies are well designed to describe differences among countries, but not to explain them. In the language of social science, they are well suited to generating hypotheses but not to testing them.

One often hears speculation that the lackluster average performance of American students in international comparisons arises because many U.S. students attend low-performing schools. That there are huge disparities in performance—and severe inequities in resources—among American schools is unarguable. Many observers therefore assume that the performance of American students is much more variable than that of students in countries that are socially more homogeneous or that have

more equitable educational systems. Therefore, the argument goes, these low-performing students pull down the American average, and international comparisons of higher-achieving students would look different.

One often hears speculation that the lackluster average performance of American students in international comparisons arises because many U.S. students attend low-performing schools.

The argument turns out not to be true: the variability of the performance of U.S. students is unexceptional, and the mediocre achievement of the United States is found across the entire range of performance. To see this, one needs to examine information on the variability of student performance. All of the major reports of both TIMSS and PISA include several indicators of this variation, including standard deviations for each country and performance at a variety of percentiles, but this information has been largely overlooked in the frenzy of attention given to the horse race—that is, the rankings of country averages. Both assessments show that the variability of student performance is reasonably similar among the counties that participated in the studies. And both show that the standard deviation of the scores of American students is well within the typical range. For example, among the eighteen nations participating in both TIMSS and PISA in 2003, almost all had standard deviations between 81 and 101 scale score points. The average

standard deviation was 93. The standard deviation of the scores of American students was 95 points.

Does this mean that inequities have no effect? Hardly. The explanation for this puzzle is a counterintuitive rule in statistics: when scores are highly variable *within* groups, even large differences *between* groups have relatively little impact on the *total* variability of scores. Years ago, to illustrate this principle, I analyzed eighth-grade mathematics and reading scores from two nationally representative American samples, the National Education Longitudinal Study and the National Assessment of Educational Progress. I posed the question this way: if the achievement gap vanished and all of the reported racial and ethnic groups performed exactly like non-Hispanic whites, how much would the total variation (specifically, the national standard deviation) shrink? Very little. Across the four cases, the answer ranged from less than 1 percent to 9 percent. As a determinant of the total variation in scores, the huge variability within each racial and ethnic group swamps the very large mean differences between the groups.

Performance in Science

Both PISA and TIMSS regularly assess performance in science, though these comparisons are somewhat less clear than those in mathematics. Because science curricula vary widely from one country to the next, it is both harder to design a comparative assessment and more difficult to interpret its findings. For this reason, it should not be surprising that the findings in science have been less consistent than those in mathematics.

In PISA, the performance of U.S. fifteen-year-olds in science is similar to their performance in mathematics: mediocre. The U.S. average is far below the averages of the highest-scoring countries, and it is not only East Asian countries that dominate the list. The highest-scoring group includes Finland (by a substantial margin, the best), Hong Kong, Canada, Taiwan, New Zealand, and Australia. The U.S. average is roughly similar to that of Norway, Spain, and Iceland. Many nations that we would consider somewhat comparable, such as the United Kingdom and Germany, are arrayed in between.[20]

TIMSS provides a much more positive portrayal of American eighth graders' performance in science. As in mathematics, most of the highest-scoring countries were East Asian, although Estonia ranked with Japan. However, the United States and a number of other Western countries scored quite well, only a modest distance below some of the East Asian countries. That high-scoring group of Western nations also included the Netherlands, Australia, and Sweden.[21]

In science as in mathematics, one can only speculate about the reasons for the different views provided by TIMSS and PISA. The answer could lie in the nature of the tested material, the nature of the samples (PISA students are older), or incidental characteristics of the studies. However, given the problem of curricular differences in science, it remains a plausible hypothesis that differences in tested content played an important role.

Performance in Reading

Although they have received far less attention in the United States, a number of international studies have compared proficiency in reading. Although reading is not a primary focus of instruction in secondary schools, the reading proficiency of secondary school students—and their proficiency when they enter secondary school—is certainly important.

Two studies, one dated, have shown that the reading proficiency of U.S. students in elementary school is very good by international standards.[22] The limited comparative data about the reading proficiency of secondary school students, while less positive, is still reasonably encouraging. The older of the studies noted above tested middle school students and found that their performance, while relatively speaking not as strong as that of elementary school students tested in the same study, was nonetheless reasonably strong by international standards. More recently, PISA has found much the same thing about the performance of U.S. fifteen-year-olds. The 2000 PISA assessment found that U.S. reading proficiency was very similar to that of many countries we might consider reasonable comparisons (such as Denmark, Switzerland, France, Norway, and Belgium); modestly better than that of some others (Germany, Hungary); but not as strong as that of Finland, Canada, or New Zealand.[23]

Discussion

International comparisons clearly do not provide what many observers of education would like: unambiguous information about the effectiveness of American high schools compared with those in other nations. Most of the data reflect the performance of students years before they complete high school. The findings are in some cases inconsistent from one study to another. Moreover, the data from all of these studies are poorly suited to separating the effects of schooling from the myriad other influences on student achievement. There is no reason to believe that if one dropped students from the United States into schools in Singapore, their performance would match that of Singaporean students, or vice versa, even if one adjusted for the limited range of other factors about which data were collected in these studies.

Despite these limitations, the data can be informative. Used sensibly, they provide us with very valuable descriptive information and a unique basis for generating hypotheses about American secondary schooling. For example, the educational systems of some nations that score particularly well in these surveys differ from systems in the United States in a variety of ways, including governance, curricula, instructional methods, approaches to testing and accountability, and recruiting of teachers. TIMSS and PISA cannot tell us which, if any, of these factors contribute to the stronger performance of these nations, but they provide us with many suggestions that can be tested with more appropriate study designs. Studies designed to explain differences between countries that are socially and culturally similar might provide especially useful suggestions for changes in policy and practice.

As noted, obtaining trustworthy and useful comparisons requires some care. First, one should ignore small differences among countries, as they are too likely to be the result of sampling or unimportant characteristics of the tests. Second, one should ignore the "international average" and select other nations that provide informative comparisons, such as those that are similar or that are particularly high-achieving. Third, when possible, one should consider data from more than one source.

Following these guidelines leads to some important conclusions. For example, TIMSS, considered alone, suggests that the performance of U.S. students is fairly similar to that of students in many similar countries. Adding data from PISA, however, shows that in some other respects, U.S. students fall well behind those in some of those same nations, such as Australia. Both TIMSS and PISA

show that the variability of performance is not anomalously large in the United States, which is contrary to common expectations. This suggests that efforts to lessen educational inequities and other sources of undesirable variation in achievement still must accommodate a very wide range of student performance.

Of course, these conclusions do not reflect performance at the end of schooling. If truly comparable data from the end of schooling were available, they would presumably look somewhat different, though it is unlikely that they would be greatly more optimistic. Other data do not suggest that the final few years of high school in the United States are substantially more effective than schooling in the lower grades, and in recent years achievement has improved less in high school than in elementary and middle school. The National Assessment of Educational Progress has for years shown marked improvements in mathematics in grade four, substantial but somewhat slower improvements in grade eight, but only slow and erratic gains in grade twelve.

In sum, the international comparisons now available do not provide us with a straightforward evaluation of either U.S. secondary schools or the policies that govern them. They do, however, provide rich descriptive information about the performance of our students and a unique opportunity to appraise its adequacy in comparison to that of their peers in competing nations. These studies also provide us with numerous hypotheses about factors that may impede performance or that may be useful in improving it. To evaluate these hypotheses will require other types of data and evidence, some of which are discussed elsewhere in this volume.

Daniel Koretz

Endnotes

1. National Commission on Excellence in Education, *A Nation at Risk* (Washington: U.S. Department of Education, April 1983).

2. S. Cavanagh and E. W. Robelen, "U.S. Students Fare Poorly in International Math Comparison," *Education Week,* December 7, 2004, www.edweek.org [August 20, 2008].

3. TIMSS initially stood for the "Third International Mathematics and Science Study," a reference to two earlier, related studies of mathematics conducted in the 1960s and 1970s. When a decision was made to repeat TIMSS at regular intervals, the name was changed to "Trends in International Mathematics and Science Study."

4. R. Adams and M. Wu, eds., *PISA 2000 Technical Report* (Paris: Organisation for Economic Co-operation and Development, 2002).

5. The TIMSS sample is actually a bit more complex than this. TIMSS surveys students in the two grades that include the largest proportions of nine- and thirteen-year-olds. In most countries, that means grades three and four and seven and eight, but the primary reporting has usually been of the older of the two grades in each pair.

6. I. V. Mullis and others, *Mathematics and Science Achievement in the Final Year of Secondary School: IEA's Third International Mathematics and Science Study* (TIMSS) (Chestnut Hill, Mass.: TIMSS International Study Center, Boston College, 1998).

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8. I. V. Mullis and others, *TIMSS 1999 International Mathematics Report* (Chestnut Hill, Mass.: International Study Center, Boston College, 2002).

9. For a non-technical explanation of this principle and more discussion of its implications, see D. Koretz, *Measuring Up: What Educational Testing Really Tells Us* (Harvard University Press, 2008).

10. Mullis and others, *TIMSS 1999 International Mathematics Report* (see note 8).

11. R. G. Wolfe, "Country-by-Item Interactions: Problems with Content Validity in Scaling," presented at a symposium on "Validity in Cross-National Assessments: Problems and Pitfalls," annual meeting of the American Educational Research Association, May 27, 1997, Chicago.

12. L. S. Gronmo and R. V. Olsen, "TIMSS versus PISA: The Case of Pure and Applied Mathematics," paper presented at the Second IEA International Research Conference, November 8–11, 2006, Washington, D.C.

13. Estimates of statistical significance in the reports of both TIMSS and PISA take into account measurement error as well as sampling error. However, these estimates of measurement error take the design of the test as a given and do not reflect changes in performance that would arise from altering it.

14. Mullis and others, *Mathematics and Science Achievement in the Final Year of Secondary School* (see note 6).

15. Ibid.

50 THE FUTURE OF CHILDREN

16. Ibid.

17. A. E. Lapointe, N. A. Mead, and J. M. Askew, *Learning Mathematics* (Princeton, N.J.: Educational Testing Service, 1992). A. E. Lapointe, N. A. Mead, and G. W. Phillips, *A World of Differences: An International Assessment of Mathematics and Science* (Report No. 19-CAEP-01)(Princeton, N.J.: Educational Testing Service, 1989). A third study with the same finding was the International Assessment of Educational Progress, an extension of the U.S. National Assessment of Educational Progress, conducted in 1988 and 1991, but this study is now rarely noted.

18. In the case of international comparisons, standardization is not entirely straightforward. The standard deviation of the tested population and the average country-level standard deviation are functions of the group of countries tested and are therefore not useful for this purpose. The estimates of within-country standard deviations are not highly stable. The following text uses the 2003 estimates of the U.S. standard deviation. As explained below, choosing another nation's standard deviation would not have greatly changed the results. For a non-technical explanation of standardized score scales and their application to international comparisons and trends in the United States, see Koretz, *Measuring Up* (see note 9).

19. Compare I. V. Mullis and others, *TIMSS 2003 International Mathematics Report* (Chestnut Hill, Mass.: International Study Center, Boston College, 2004), exhibit 1.1, with Organisation for Economic Co-operation and Development, *Learning for Tomorrow's World: First Results from PISA 2003* (Paris: OECD, 2004), figure 2.15a.

20. Ibid.

21. Mullis and others, *TIMSS 2003 International Mathematics Report* (see note 19).

22. W. B. Elley, *How in the World Do Children Read?* (The Hague: International Association for the Evaluation of Educational Achievement, 1992); I. V. Mullis and others, *PIRLS 2001 International Report* (Chestnut Hill, Mass.: International Study Center, Boston College, 2003).

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Falling Off Track during the Transition to High School: What We Know and What Can Be Done

Ruth Curran Neild

Summary

Ninth grade, observes Ruth Curran Neild, marks a critical juncture in American schooling. Students who manage the academic demands of the transition to high school have a high probability of graduating four years later. But those who do not—who fail to earn as many credits as they should during ninth grade—face a substantially elevated risk of dropping out of high school.

Neild examines four theories about why ninth grade poses difficulties for some students. The first is that ninth grade coincides with life-course changes, such as reduced parental supervision and increased peer influence. The second is that in moving to a new school, students must break the bonds they have formed with their middle-school teachers and peers. The third is that some students are inadequately prepared for high school. The final theory is that the organization of some high schools is itself a major source of students' difficulty. Each theory, says Neild, suggests a particular type of policy response.

The strongest evidence, observes Neild, points to inadequate preparation for high school and the organization of high schools. Reform efforts thus far have tended to address high school organization, with or without a focus on instructional quality or helping students to catch up on academic skills. Evaluations of these reforms, says Neild, suggest that both school organization and instructional improvement are necessary to keep ninth graders on track to graduation.

Neild notes that school districts and state departments of education also are addressing the problem. In addition to supporting comprehensive school reform with a focus on ninth graders, districts have created accountability indicators of how well high schools are keeping ninth graders on track. States are helping districts to develop their capacity to maintain and analyze data on ninth-grade progress, including "early warning indicator systems" that identify students who are falling off track to graduation.

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As American students progress through the K–12 educational system, they encounter several key transition points. These transitions generally coincide with the commencement of a new level of schooling: the beginning of elementary school, the move to the middle grades, the start of the high school years. Transitions in schooling are moments of great promise for children, holding the potential for personal growth, new learning, and greater independence and responsibility. At the same time, as any parent will attest who ever has watched a child disappear through the schoolhouse door for the first time, school transitions are moments of peril. Students who do not navigate a school transition well face the possibility of personal and academic turmoil and even falling off track for promotion and graduation.

The entrance to ninth grade marks one such critical juncture in American schooling. For 80 percent of ninth graders attending public schools in the United States, the eighth- to ninth-grade move is a literal one, involving the switch from an elementary or middle school to a high school with a 9–12 grade structure.[1] Regardless of whether a change of school occurs, ninth grade is widely understood to mark the beginning of the high school years and to usher in a new set of academic expectations. From states' high school diploma standards, which typically assume that the task of earning course credits toward graduation begins in ninth grade, we can infer that the K–12 educational system views ninth grade as a new level of schooling.[2] The entrance to ninth grade also may serve as a social marker, signaling to parents that the young person deserves greater independence and to peers that the student is worthy of inclusion in the social activities of older adolescents.[3] Entering ninth grade, then, may be thought of as a transition to a new stage in the life course as much as a transition to a new school.

The high schools that serve the majority of American students in grades nine to twelve have long been aware of the anxiety and confusion associated with starting ninth grade. In response, they have sought to make ninth graders more comfortable by organizing programs and activities that will help freshmen find their way around an unfamiliar school building, tackle more challenging academic material, and negotiate the more complex adolescent social scene.[4] Many students adjust to ninth grade with only minor difficulty and steadily earn course credits toward graduation. For some students, high school provides an academic and social experience that is a vast improvement over the middle grades. For example, ninth grade can mark the point at which some students begin to establish a personally fulfilling social identity. Among students who received grades of mostly C or lower on their eighth-grade report cards, attending a high school with fewer classmates from eighth grade is associated with higher freshman grades, suggesting that there may be some benefit to starting anew with a different set of peers and teachers.[5]

In this article I focus not on the students who experience rather minor stress associated with starting high school or for whom high school represents a welcome relief from the middle grades, but rather on the subset of students for whom the transition to ninth grade is marked by the failure to stay on track to high school graduation.[6] As early as the first and second report periods, these students receive failing grades in some or all of their courses. By the end of the school year, they have not accumulated enough course credits to be promoted to tenth grade.

Evidence is growing that students who fall off track during the freshman year have very low odds of earning a high school diploma.[7] Indeed, analysis of the progression of students through high school suggests that approximately one-third of the nation's recent high school dropouts never were promoted beyond ninth grade.[8] For policymakers and educators, then, the task of increasing high school graduation rates necessitates a serious look at which students experience trouble in ninth grade, the reasons for their difficulty, and what the research evidence reveals about how to help them stay on the pathway to graduation.

Defining What It Means to Be Off Track for Graduation

The most basic definition of being off track for graduation is not having earned sufficient course credits in the normally allotted time.[9] From the moment that students enter ninth grade as first-time freshmen, their fundamental task is to earn credits toward graduation by passing their classes.[10] In many school districts, high school students must earn specific numbers and types of credits (for example, one credit in mathematics, one credit in English) to be promoted to the next grade.

School districts set their own standards for promotion to the next grade, and promotion requirements vary from one district to another. Some of this variation is evident in promotion standards in the largest school districts. For example, students in the Miami–Dade Public Schools are required to earn four full-year credits, including either math or English, for promotion to tenth grade. Ninth graders in the Chicago Public Schools face stricter requirements; they must pass three of their core subject courses and earn at least five full-year credits toward graduation to be promoted to tenth grade.

Freshmen in the District of Columbia Public Schools must earn six credits, including English and Algebra I.[11]

Comprehensive national evidence is not available on the number of school districts that have grade-to-grade promotion standards at the high school level or on the nature of those promotion requirements. A cursory perusal of the promotion policies in large districts suggests that passing five full-year courses is a common standard for promotion to tenth grade. However, given the above examples of cross-district variation in promotion standards, one ought not to infer that a student necessarily is on track to graduation merely because she is classified as a tenth grader during her second year of high school. For districts and schools seeking to determine which ninth graders have gotten off track to graduation, a more informative indicator is whether the student has earned course credits in all or most of the classes taken during the ninth-grade year.

Getting Off Track in Ninth Grade: Educational Consequences

There are obvious short-term educational consequences for ninth graders who fall off track to graduation. At a minimum, because failed courses must be retaken, the graduation date will be deferred unless the student redoubles his efforts to earn the missing credits in time to graduate with his cohort. However, one of the most compelling reasons for focusing on ninth grade is the evidence that getting off track at that point has negative long-term educational consequences. The strongest evidence of these consequences comes from large urban districts with student databases that allow researchers to track the educational progress of individual students from year to year.

Ninth graders from these large urban districts who get off track face a substantially elevated risk of dropping out of high school. Students in the Chicago Public Schools who got off track during ninth grade had a 22 percent on-time graduation rate, compared with an 81 percent graduation rate for students who were on track after their first year in high school. The five-year graduation rate was not much different (28 percent for off-track students and 85 percent for on-track).[12] Similarly, in Philadelphia, just 20 percent of freshmen who were not promoted to tenth grade on time—that is, after their first year in high school—graduated within six years. When statistical controls were introduced for a range of pre–high school student characteristics, the researchers found that each additional course failed in ninth grade increased the odds of dropping out by approximately one-third.[13]

The peril of the ninth-grade year is demonstrated clearly by the number of credits earned by typical high school dropouts. In Philadelphia, one-third of the dropouts were still considered ninth graders, credit-wise, even though most had been enrolled in high school for several years; an additional 25 percent had earned only enough credits to be classified as tenth graders.[14] In New York City's Class of 2003, approximately 30 percent of the students who did not graduate in four years had earned no more than one-quarter of the credits needed for graduation, making them the equivalent of tenth graders, at most.[15]

How Prevalent Is Getting Off Track in Ninth Grade?

Assessments of the prevalence of ninth graders getting off track to graduation have drawn on three types of evidence: the Common Core of Data (CCD), a federally created database of student enrollments by grade and school for publicly funded schools; state reports of the percentage of students repeating ninth grade; and nationally representative survey data. Each of these data sources has strengths and weaknesses. Because each data source relies on reports of grade enrollments rather than credits earned (the latter being a better on-track indicator), these data are most helpful for ruling out the possibility that academic difficulty in ninth grade is limited to a particular type of district or geographic locale. Further, some estimates can be biased by population growth or decline within a geographic area and by student movement between public and private schools. Taken together, however, these data sources point to the transition to high school as a place in the educational progression where students across the United States are at increased risk of getting "stuck."

Evidence from National Databases of Student Enrollment

Comparing the number of students enrolled in ninth grade with the number in eighth grade during the previous school year and tenth grade during the subsequent year provides a rough indication of the extent to which ninth graders are not promoted to the next grade. Enrollment data from the CCD indicate that during the 2003–04 school year, half of the school districts in the United States had a tenth-grade enrollment that was no greater than 95 percent of ninth-grade enrollment. In one-quarter of the districts, tenth-grade enrollment was no greater than 90 percent of that of ninth grade.[16]

Drawing on the same data set, Walt Haney and several colleagues show that during the thirty years from 1970 to 2000, ninth grade increasingly became a primary bottleneck grade. In 1970, there were 3 percent fewer

tenth graders than ninth graders; by 2000, that share had risen to 11 percent. Some evidence indicates that the increasing number of ninth graders is at least partly the result of statewide exit exams, many of which are given in tenth grade; I discuss this evidence later. Some states had ninth- to tenth-grade attrition rates that were considerably higher than the national average: for example, Florida reported enrolling 24 percent fewer tenth graders in 2000–01 than ninth graders the previous year, and South Carolina followed closely with 23 percent fewer ninth graders.[17]

Evidence from the State Reports

Yearly data from 1990 to 2000 on retention by grade, obtained from some twenty-five state departments of education by Robert Hauser, Carl Frederick, and Megan Andrew, show a similar pattern of ninth grade as a major point at which students get "stuck." In the vast majority of states and years in that sample, more than 10 percent of the students were not promoted to tenth grade. Notably, in this sample of state-reported data, the share of students who were not promoted from eighth grade to ninth grade increased rather dramatically from 1990 to 2000.[18]

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Evidence from Nationally Representative Surveys

Using nationally representative data from the Current Population Survey (CPS), a household survey of educational and economic indicators conducted by the United States Bureau of the Census, Hauser, Frederick, and Andrew found that grade retention is highest in kindergarten and first grade, followed by a moderate gradual decline from second to fifth grade, a slight elevation in the middle grades, and a spike in ninth grade.[19] Their analyses suggest that, from 1996 through 2003, approximately 3 percent of ninth graders were not promoted. This estimated retention rate differs considerably from estimates from the Haney study and state reports, both of which suggest that approximately 10 percent of ninth graders are not promoted. One explanation for the lower CPS estimates is that they rely on parent reports of whether the student has been retained in grade. Many parents responding to the survey may assume that a student in the second year of high school is automatically a tenth grader, even though the student who has failed to earn sufficient credits may still be classified as a ninth grader by the school district. CPS estimates of ninth-grade retention also may be lower because the survey covers families with children in private schools as well as those whose children are enrolled in the public system.

Getting Off Track in Ninth Grade: Demographic Correlates from National Data

Although the CPS likely underestimates the share of ninth graders who are not promoted, it provides useful comparative evidence about how the incidence of getting off track in ninth grade varies across race and ethnicity, gender, and family socioeconomic status. During the period 1996–2003, African American and

Latino ninth graders were more than twice as likely as white students to spend an additional year in the ninth grade (approximately 5 percent for African Americans and Latinos versus 2 percent for white students). Ninth-grade boys were retained in ninth grade at almost twice the rate of girls (4 percent versus 2 percent). Likewise, approximately 5 percent of ninth graders whose families were in the lowest income quartile were not promoted, as compared with approximately 1 percent of those whose families fell in the highest quartile.[20]

Analysis of the CCD from the 2002–03 and 2003–04 school years shows that, compared with school districts in rural or suburban areas, districts in large cities are more likely to have a tenth-grade enrollment that is no greater than 90 percent of their ninth-grade enrollment. Fifty percent of the districts in large cities had tenth-grade enrollments that were 90 percent or less of the ninth grade, compared with approximately 30 percent of districts in suburbs or rural areas. School districts with higher shares of low-income students are more likely to enroll fewer students in tenth grade than in ninth. Among districts in which more than 75 percent of the students were from low-income families, the majority had tenth-grade enrollments no greater than 90 percent of their ninth-grade numbers; in districts with no greater than 25 percent low-income students, just over 10 percent of the districts had a disparity of this size between ninth- and tenth-grade enrollments.

Why Do Ninth Graders Get Off Track?

If one were to ask researchers, policy makers, and ninth-grade teachers to explain why ninth graders get off track, their responses most likely could be categorized into one or more of four general types of explanations or theories. Each theory suggests a policy response with a different kind of emphasis. However, the various theories are difficult to separate analytically, and few studies seek to weigh the empirical evidence for each or to assess its independent contribution to getting off track in ninth grade.

Life-Course Changes

The first, or developmental, argument holds that ninth grade coincides with life-course changes that are independent of the structure or academic requirements of schooling itself. Although the transition to ninth grade does not occur alongside the dramatic physical changes of early adolescence, a number of studies have shown that parental influence wanes when children enter high school. Many parents, for example, decide to grant greater autonomy to their children at this transition point.[21] The reduction of parental supervision and support, accompanied by the increase in peer influence that characterizes adolescence,[22] may result in increased risk-taking behaviors and declining academic performance. A study by Christopher Weiss and Peter Bearman provides good national evidence of the increase in drinking, smoking, and drug use between eighth and ninth grade.[23]

If the primary cause of ninth-grade difficulty were life-course changes, then one would expect to see an increase in academic difficulty during ninth grade regardless of whether the student moved to a new school, the degree of his or her academic preparation, or the particular characteristics of the school he or she attends. Although it is likely that such life-course factors as changes in parental supervision, development of romantic relationships, and a perception among older peers that a student in high school is

now worthy of inclusion in risk-taking and illegal activities affect ninth-grade outcomes, the evidence also suggests that they cannot explain fully the difficulty that students encounter in the ninth grade. The evidence reviewed below indicates that students with weak academic preparation are more vulnerable to getting off track during ninth grade and that aspects of high school organization and curriculum can have an appreciable impact on ninth graders' academic success.

The Transition to a New School

A second explanation links ninth-grade problems with the transition to a new school. According to this argument, the transition breaks the social bonds that students had formed with their teachers and peers from the middle grades. Students must negotiate new social relationships and adapt to the practices and routines of the new school.[24] The uncertainty and anomie that result may manifest themselves in behavior problems, weaker attendance, and poor course grades. Indeed, it is common for eighth-grade classmates to disperse to multiple high schools, including private schools. On average, ninth graders attend high school with about 60 percent of their eighth-grade classmates.[25] If the transition itself were the primary source of ninth-grade difficulty, then one would expect to see better ninth-grade outcomes for students who attend the same school for eighth and ninth grade than for those who transition to a new school.

One reason why it is difficult to assess the importance of the transition to a new school for ninth grade is that the vast majority of American students start high school at a new school. The resulting lack of diversity in school structure complicates efforts to estimate the effect of moving to a new school for ninth grade. Using the nationally

representative Add Health data set, Weiss and Bearman found that while grade point averages (GPAs) declined and substance use increased between eighth and ninth grade, students who made the transition to a new high school actually had *better* outcomes than those who remained at the same school for eighth and ninth grade. The "fresh start" of high school appeared to be especially important for students who were less attached to school in eighth grade or who had a history of grade retention. This analysis, viewed in combination with other data suggesting that some students benefit from attending high school with many new classmates, provides suggestive evidence that the transition to a new school is likely not a major source of students' getting off track in ninth grade.[26]

Inadequate Preparation for High School

A third explanation is that students' inadequate preparation for high school is the primary cause of ninth-grade difficulty. When students who struggled academically in the middle grades or who might have earned decent grades but were inadequately challenged before high school enter ninth grade, their lack of knowledge and skills finally catches up with them. According to this theory, students with poor math and reading skills are overwhelmed by the academic demands of high school. Floundering academically, they become discouraged about ever completing high school, may become truant, and finally drop out. A corollary explanation is that, regardless of academic skills, students have learned how to "get by" in earlier grades but do not realize until too late that advancement in high school depends on earning credits. Taken to its logical conclusion, this theory would suggest that the organization and climate of high schools are not the primary culprits for ninth-grade difficulty; rather, the problem lies with

students' weak preparation for high-school work or misconceptions of the diligence required to earn a high school diploma, or both. If inadequate academic skills were a primary source of the difficulty in ninth grade, then one would expect to see few or no off-track students among those with the highest eighth-grade test scores and many off-track students among those with low eighth-grade test scores.

Indeed, for some ninth graders who get off track to graduation, success in school has been elusive for many years; recent research in Philadelphia indicates that approximately 50 percent of the eventual dropouts could be identified on the basis of poor grades or attendance, or both, before entering high school.[27] Approximately 40 percent of the dropouts could be identified using these grade, attendance, and behavioral indicators as early as sixth grade.[28]

The best evidence for the effect of skills, beliefs, and coping strategies acquired (or not acquired) before entering high school comes from analyses of student cohorts in large urban districts. Data from these districts indicate that students who enter high school with academic skills below grade level are at higher risk of getting off track to graduation than those with on-grade skills. For ninth graders in Philadelphia who scored at grade level on a standardized test in mathematics, the odds of not being promoted to tenth grade were 42 percent lower than for those who scored two or more years below grade level. Likewise, for students at grade level in reading comprehension, the odds of not being promoted were 25 percent lower than for those who were reading at least two years below grade level. Moreover, mathematics and reading comprehension skills independently predicted grade retention (that is, they

were not simply proxies for one another).[29] In Chicago, students who scored two or more years below grade level on tests of math or reading had a 50 percent chance of failing a core course or dropping out in ninth grade.[30]

Although data from these districts show a link between eighth-grade standardized test scores and getting off track in ninth grade, studies of cohorts of Philadelphia students showed that failing math or English in the middle grades was a better predictor than standardized test scores of academic difficulty in ninth grade.[31] The stronger effect of course grades relative to test scores provides indirect evidence that, in addition to math and reading skills, academic attitudes, behaviors, and coping strategies developed before high school have an effect on ninth-grade outcomes.

Researchers have begun to identify the specific kinds of academic skills that freshmen need to hone in order to succeed in challenging high school courses. No specific evidence links particular math skills, such as the ability to work fluently with rational numbers, to getting off track in ninth grade. But it is not difficult to follow the chain of logic. Drawing on research in mathematics education as well as the structure of mathematics itself, the National Mathematics Advisory Panel's 2008 report recommended that to succeed in algebra, students need to have acquired a "thorough understanding" of fractions, decimals, and signed numbers during the middle grades.[32] However, students who enter high school below grade level in mathematics have only a weak facility with these intermediate operations.[33]

Ninth graders' ability to read course texts with fluency and comprehension affects their ability to achieve across many classes. Reading

and making sense of information presented in texts is an important component of most tasks that students confront in social studies, science, and English. For students who enter high school below grade level, trying to read and comprehend standard high school texts is deeply frustrating, and many simply give up. Although some ninth graders struggle with decoding (that is, identifying specific words), the greatest challenge for most freshmen is reading with fluency and comprehension, particularly when confronted with more complex passages involving advanced and subject-specific vocabulary.[34]

Studies of cohorts of Philadelphia students showed that failing math or English in the middle grades was a better predictor than standardized test scores of academic difficulty in ninth grade.

High School Organization and Climate
A final explanation suggests that high schools themselves are the major source of the difficulty that some students encounter in ninth grade. The traditional social organization of the high school, in which teachers' primary allegiance is to subject-matter departments and students are hurried from one forty-five-minute class period to another, can leave students feeling anonymous and alienated. Classmates change from one class period to another, and each school year brings a mostly different set of teachers. From the teacher's perspective, there is little opportunity or

incentive to learn more about how the student is doing in other classes. As a result, the responsibility for shepherding the student to graduation falls to no one with firsthand knowledge of how she is doing in her classes.[35] Further, high school teachers often do not have the expertise or inclination to work with students who enter high school with weak academic skills. If high school organization were the primary explanation for ninth-grade difficulty, then one would expect to see dramatically lower percentages of freshmen who get off track in high schools that have certain kinds of organizational features, better instructional quality, or a more positive academic climate.

In fact, although data from large cities show that students with weaker grades and test scores are more likely to get off track in ninth grade, a substantial minority of off-track ninth graders tested at or above grade level or had no course failures or poor attendance in eighth grade, or both. In Chicago, a student who was two years above grade level in reading or mathematics had approximately a 25 percent chance of ninth-grade course failure or dropout.[36] In Philadelphia, about 30 percent of eventual dropouts were students who, despite having no failing grades in core courses and reasonably good attendance in eighth grade, earned few credits or became so disengaged with school that they attended less than 70 percent of the time in ninth grade.[37]

Statistics such as these may point to a negative impact of high school organization and climate on students who appear to be on track for success when they enter ninth grade. The argument that some high school characteristics make a difference for ninth graders is bolstered by analyses that show how, within a single school district, ninth-

grade course failure rates can vary considerably, even after one adjusts for characteristics of the schools' student populations.[38]

Beginning in the 1990s, researchers began to analyze data from a large national study of high schools (the National Educational Longitudinal Study, or NELS), looking for organizational features of high schools that were linked with student achievement. These studies did not address ninth-grade outcomes specifically, but their relevance to the argument that high school organization may contribute to ninth-grade difficulty is clear. Statistical analysis of the NELS data suggested that students attending high schools that were "communally" organized—where there was shared responsibility and decision making among staff, a commitment to a common set of goals, and an emphasis on personal relationships between teacher and students—experienced greater learning gains than their peers at "bureaucratically" organized schools. At these latter schools, staff roles were highly differentiated, decision making was hierarchical, and affective relationships between teachers and students were de-emphasized.[39] Studies based on the NELS data also suggested that student learning growth was greater at high schools that implemented greater numbers of "reform" practices, such as common planning time for teachers, schools-within-a-school, interdisciplinary teaching teams, and a cooperative learning focus, than at schools with more traditional practices.[40] In addition, researchers found that students at smaller schools (typically with fewer than 1,000 students) experienced greater learning gains, particularly compared with students attending high schools with more than 2,000 students. The evidence also suggests that smaller schools may be more important for low-income students.[41]

A case study in a large urban district suggests that teachers who are assigned to ninth graders are more likely than teachers in the upper grades to be uncertified, new to the profession, new to the school, or sometimes all three.[42] Like students in the lowest academic tracks, ninth graders have been considered among the least desirable students to teach at the high school level. It is difficult to quantify the effect on ninth graders of assigning them inexperienced teachers, but common sense suggests that, on average, such teachers are less likely than their more senior colleagues to have the needed classroom management skills, mastery of instructional strategies for ninth graders who need to catch up on academic skills, and access to the various material resources of the school.

Research also suggests that disorganization and chaos at the beginning of the school year has a negative effect on ninth graders' course performance. In a 1997 survey, 40 percent of ninth graders in a large urban district reported that at least one of their classes had not had enough seats for every student during the first two weeks of school (a result of intentional over-registering of students to classes, on the assumption that many will drop out anyway). Almost half of the ninth graders surveyed reported a teacher change in at least one class. Forty percent reported a change in course schedule since school began. Ninth graders who experienced more of this turbulence at the beginning of the school year earned lower GPAs, controlling for a range of demographic and academic characteristics measured in eighth grade.[43]

The best evidence for the effect of specific features of high school climate on ninth-grade outcomes comes from research that examines the relationship between student outcomes and students' reports about their

high schools. Using survey data, researchers in Chicago examined the relationship between school climate (as reported by students) and student outcomes. They found that ninth graders averaged 0.78 fewer course failures at schools with high levels of trust between teachers and students than at schools with low levels of teacher-student trust. Similarly, there were fewer course failures at schools where teachers offered more help with personal problems, gave students more personal attention in class, and held higher expectations for students to work hard, stay in school, and have high aspirations for the future. The relationships between these school climate variables and student outcomes remained after statistically controlling for characteristics of students —including prior achievement levels and family socioeconomic status—that are known to be related to a more positive school climate.[44]

What Can Be Done in Schools to Keep Ninth Graders On Track

Each of the four types of explanations for ninth-grade difficulty suggests a particular type of policy response. If getting off track in ninth grade is explained primarily by adolescent development, then the best response should be to surround young people with supportive and caring adults who can help them navigate the treacherous waters of growing up. If the transition to a new school is the culprit, then the most appropriate response should be to find ways to ease the transition to a new school, postpone the transition to high school, or eliminate the transition altogether. If poor preparation for high school explains getting off track, then policy should be focused on improving instruction in the elementary and middle grades and providing academic catch-up opportunities for students who enter high school without the necessary skills. Or if large, anonymous high

schools are the real problem, the policy focus should be on imagining new ways of organizing high school.

Each of the four theories relies on correlational evidence, rather than on data from experiments that were designed intentionally to gather evidence for and against these explanations. It is difficult, therefore, to disentangle the factors that contribute to ninth graders' getting off track or to assess the specific impact of each. However, the strongest evidence points to students' inadequate preparation for high school and high school organization as primary sources of getting off track in ninth grade. As a result, efforts to keep students on track once they get to ninth grade have tended to address high school organization, with or without a focus on instructional quality or helping students to catch up on academic skills they need to succeed. Further, the school reform models that have been most rigorously evaluated— and therefore provide the best evidence of effectiveness—have also been based on the notion that traditional high school organization requires some redesign.

Rigorously evaluating the effects of school reform models on ninth-grade outcomes is no mean feat. Although the ideal research design would involve dividing a group of schools that were interested in implementing the model into two groups—those who are randomly assigned to implement and those who are randomly assigned not to implement—this design can be difficult to put into practice. It is a major undertaking to build consensus in a high school faculty to engage in comprehensive school reform that may usher in major change in roles, relationships, curriculum, the use of time, and school organization. When model developers encounter a school that shows such a commitment, they are inclined

to implement the model rather than assign the school to "control group" status. Second, evaluators are often brought into the process after the model has been implemented for some time already, making it too late to randomly assign schools to one condition or another. Next to random-assignment studies, one of the methods that provides the most credible evidence is interrupted time-series designs, which compare the trajectories of model schools and a set of similar schools in the same district before and after the intervention. The most rigorously evaluated analyses of comprehensive school reform that have not used random assignment have employed an interrupted time-series design.

The Talent Development High School model places an explicit focus on keeping students on track in ninth grade and allowing them to catch up on the academic skills needed for success in high school.

Comprehensive School Reform Models
Many high school reform models have been designed for high schools at which ninth graders traditionally have struggled. Only some of these models, however, have been evaluated using rigorous methods, and of these, not all have reported results that are explicitly for the ninth grade. I present evidence about two school reform models, Project Transition and Talent Development High Schools, from evaluations that

specifically provided data on the effects of high school reform programs on ninth-grade outcomes. It is important to keep in mind that school reform models are typically multifaceted, involving many different features intended to create a personalized and orderly school environment or an engaging and appropriate curriculum, or both. In other words, comprehensive efforts to re-make the experience of ninth graders occur as packages of interventions. Therefore, research evidence on the effectiveness of these interventions speaks to the intervention as a whole, not to the effect of any specific feature.

The Project Transition demonstration project focused on improving the experience of ninth graders at two high schools. Pulaski High School in Milwaukee participated for two school years (1995–96 and 1996–97); Schlagle High School in Kansas City, Kansas, for a single year (1996–97). Both high schools enrolled high shares of low-income students, and many of their students recently had experienced academic difficulty during the ninth grade. One of the project's key levers for change in student outcomes was a more personalized school environment for teachers and students. To this end, ninth-grade teachers and students were placed on interdisciplinary teams of four core subject teachers and approximately 120 students. In addition, teachers had daily common planning time and a coach whose role was to facilitate teacher meetings, coordinate professional development, and provide constructive feedback on lessons that teachers offered. The coach did not have a discipline-specific role (for example, adolescent literacy or mathematics), and no new curriculum was implemented other than what may have been developed by the teachers as they worked together during the year.

The research design for the evaluation of Project Transition included no comparison high schools. The lack of a comparison school is a significant weakness, because any improvements that were observed could have been a reflection of broader improvements in the district as a whole, rather than of the project itself. Instead, the study compared outcomes from the project implementation year and outcomes from the previous year's cohort of ninth graders. Although it is worth noting the evidence regarding this project, because it focused on ninth grade specifically, it is also important to be aware that findings of any positive effects of the program are not based on the strongest research design.

Project Transition was better implemented at one of the high schools (Schlagle) than at the other (Pulaski). Both schools were able to make the structural changes (teams of teachers with common planning time) called for by the project's designers. However, at Pulaski, teachers never entirely accepted the classroom coach or came to a consensus about the coach's role in the project. At Schlagle, on the other hand, the coach played a more vital role in developing teachers' expertise in new instructional techniques, including interdisciplinary teaching and cooperative learning.

Students at both Pulaski and Schlagle who experienced Project Transition were more likely than the previous year's ninth graders (the comparison group) to report that they knew and felt supported by their classmates. However, it was only at Schlagle that modestly higher shares of Project Transition students than comparison students had average GPAs of 2.0 or above, passed more courses, and reported that their teachers knew them and cared about them and that they liked being with their teachers. For students at Pulaski, there were no statistically significant differences in GPA, course passage, or relationships with teachers.[45]

Although feelings of connectedness with other people are important in their own right, the primary purpose of the project was to improve academic outcomes in ninth grade. The Project Transition findings provide some suggestive clues that organizational changes are insufficient, in and of themselves, to make a difference in student outcomes. Only at Schlagle, which had a collaborative instructional focus in addition to a more personalized school environment, did students earn higher GPAs and more course credits. More rigorous evaluations of subsequent high school programs, described below, also highlight the importance of having an instructional focus accompany more "structural" reforms such as interdisciplinary teams.

The Talent Development High School model is a comprehensive school reform model developed by the Center for Research on Students Placed at Risk, based at Johns Hopkins University, and Howard University. The model places an explicit focus on keeping students on track in ninth grade and allowing them to catch up on the academic skills needed for success in high school. Key features of the model include personalized school environments (including schools-within-a-school and interdisciplinary teams of teachers), curricula specifically designed to help students "backfill" on skills they are lacking and a course schedule to accommodate those curricula, and professional development for teachers.

With the aim of creating a more personalized environment, the model places freshmen in a Ninth Grade Success Academy staffed by several interdisciplinary teams of teachers who instruct the same groups of students and

have daily common planning time. The academy, located in a physically separate area of the high school building, provides a sense of greater security and community by limiting the number of students who enter its hallways. In addition, ninth-grade teachers' close proximity to each other is intended to facilitate communication and problem-solving. In some schools, students who are creating disruptions in the classroom are assigned to an afternoon "Twilight School" until their behavior improves, and those who are not promoted to tenth grade at the end of their first year in high school are placed in a Ninth Grade Repeater Academy with the goal of promoting them to tenth grade by mid-year.[46] Students in the upper grades are placed into thematic academies based on their preferences at the end of ninth grade. Each academy has a principal to coordinate and direct its efforts.

Talent Development schools use the "four by four" block rostering schedule, in which students take four full courses during each semester and potentially can earn eight credits during the school year. Classes meet daily, and each class period is approximately ninety minutes long. To catch up on academic skills, ninth graders take the equivalent of two courses in English and two in mathematics during the year. During the first semester, they take Transition to Advanced Mathematics, a course designed to increase their fluency with rational and signed numbers, hone mathematical reasoning skills, and boost confidence in themselves as math learners. First-semester freshmen also take Talent Development's Strategic Reading course, intended to increase reading comprehension skills, and a freshman seminar that teaches study skills and personal organizational strategies for high school success. These three curricula include specific lesson plans, student materials, teacher manuals, and

manipulatives, thereby requiring teachers to do minimal, if any, development of course materials. English I and Algebra I follow during the second semester of ninth grade.

Despite noteworthy gains in attendance and credit accumulation during ninth grade, many ninth graders at Talent Development schools still had poor attendance and were not promoted on time to tenth grade.

The third key part of the Talent Development model is professional development for teachers who are assigned to the three freshmen courses described above. At the beginning of the school year, teachers participate in several days of training in the curriculum and associated instructional strategies. Throughout the year, teachers receive intensive support from classroom coaches, who preview upcoming curriculum units, provide feedback on lessons that they observe, model key instructional strategies, and research additional instructional materials.

Using an interrupted time-series design, an evaluation of Talent Development High Schools compared outcomes for Talent Development students in Philadelphia with outcomes for students at comparison high schools in the district that were initially similar in demographics and achievement. All of the Talent Development and the comparison schools were neighborhood high schools characterized by low achievement, and all

were either majority African American or Latino. The study found that Talent Development ninth graders' attendance, total credits earned, credits earned in algebra, and on-time promotion to tenth grade exceeded those of ninth graders at the comparison schools. On average, ninth graders at Talent Development schools attended school for about nine days more per year than comparison ninth graders and earned 0.67 more credits. Talent Development ninth graders also out-earned comparison students in algebra credits by 25 percentage points and by 8 percentage points in on-time promotion to tenth grade. The Talent Development students' advantage in on-time promotion after their first year of high school continued through to their third year of high school (the final year of evaluation data); Talent Development students led comparison students in being on-time eleventh graders by 6.5 percentage points.[47]

The fact that the on-time promotion gains persisted into the students' third year of high school suggests that providing a supportive school environment for ninth graders is not simply an exercise in postponing their inevitable difficulty in high school—at least as long as there is a whole-school commitment to shepherding students to graduation. When Talent Development students were promoted to tenth grade and left the Ninth Grade Success Academy, they were taken into another school-within-a-school that attempted to continue the personalized environment to which the students had become accustomed.

At the same time, it is likely that an improved promotion rate among ninth graders will result in a group of tenth graders who have weaker academic skills than prior cohorts of tenth graders. To some degree, these higher promotion rates suggest that tenth-grade teachers (and, indeed, eleventh- and twelfth-

grade teachers) may need new strategies and tools for working with students. Rather than create small learning communities that included students in grade ten through twelve, some of the Talent Development schools developed tenth-grade academies that mirrored the ninth-grade academies in teacher teaming and double-dosing in mathematics and in English.

Despite noteworthy gains in attendance and credit accumulation during ninth grade, many ninth graders at Talent Development schools still had poor attendance and were not promoted on time to tenth grade. On average, ninth graders in Talent Development schools attended less than 80 percent of the time, and, in the one cohort for which several years of data were available, just over 50 percent of the ninth graders were promoted to eleventh grade on time. These sobering data underscore that an exclusive focus on ninth graders is likely to be insufficient to improve educational outcomes in high schools.

Studies of Curricula for Ninth Graders Who Need to Catch Up Academically

As evidence has begun to accumulate that many struggling ninth graders need to make catch-up gains in mathematics and reading skills, a number of new curricula for freshmen with below-grade-level skills have been developed. Some of these curricula have been created in conjunction with comprehensive school reform programs, as in the case of the Transition to Advanced Mathematics and Strategic Reading courses described above. In many cases, the curricula are intended as a supplement to existing courses in mathematics or English. The goal of the curricula is to accelerate learning gains for students so that they can take a traditional college preparatory course sequence before they graduate from high school.

The next step, which is just beginning to be taken, is to conduct rigorous evaluations of the effect of these curricula on the development of student skills. The first large-scale evaluation of two supplemental reading programs for ninth graders focused on the effects of Reading Apprenticeship Academic Literacy (developed by WestEd) and Xtreme Reading (developed by the University of Kansas Center for Research on Learning). Both courses are designed as year-long ninth-grade electives that supplement an English course, and both seek to provide experiences that increase students' reading fluency, vocabulary, writing, and ability to extract meaning from text across the academic content areas.[48] Teachers of the Reading Apprenticeship or Xtreme Reading program receive curriculum materials and professional development.

The ongoing evaluation of these reading programs, which randomly assigns students to experience one of the curricula or neither curriculum, is taking place in ten school districts and thirty-four high schools. Class sizes range from ten to fifteen students. First-year results from the evaluation indicate that students enrolled in Reading Apprenticeship and Xtreme Reading made greater gains in reading comprehension on a standardized assessment than those not enrolled in these programs. While statistically significant, the gain during this first year of implementation was small: less than one standard scale point. There was no statistically significant difference in students' vocabulary knowledge. The evaluation will continue to assess the learning gains of future cohorts of ninth graders. The additional data will be informative because logistical hurdles during the program's first year delayed the start of some courses until ten weeks into the school year and because teachers' proficiency in teaching strategic

reading skills may increase in the program's second and third year.[49]

In mathematics, there is suggestive evidence that catch-up courses may help to accelerate ninth graders' learning. The evidence arises from small-scale studies and awaits more extensive and rigorous evaluation. A small-scale randomized study that compared learning gains for students enrolled in Talent Development's Transition to Advanced Mathematics course with gains of students in the school's traditional math sequence for ninth graders found that students in the Transition course significantly and substantially out-gained those in the control course.[50] A national randomized study of the effectiveness of the Transition to Advanced Mathematics is under way. Cognitive Tutor, a mathematics curriculum that does not specifically target struggling ninth graders but may be effective for them because of its individualized instructional software component, is also being evaluated in randomized trials.

It is worth noting that although there is early evidence that these curricula can help ninth graders with weak academic skills to make faster gains, it is very unlikely that a single catch-up course in ninth grade will allow students to complete a rigorous high school course sequence without additional academic support. For example, although enrollment in the supplemental freshman reading courses described above is associated with greater learning gains, students in the reading courses nevertheless scored at the 25th percentile, on average, at the end of ninth grade. Some schools have found that they need to continue to "double-dose" students, especially in mathematics. The Talent Development High School model offers catch-up courses in geometry foundations

and Algebra II foundations and a second-year supplemental course in reading and writing.

The District Role in Keeping Ninth Graders On Track

Although much of the hard, everyday work of keeping ninth graders on track needs to be done at the school level, school districts also have played a role. They have tried to address the challenge of the ninth grade in two main ways. First, they have created data systems and indicators to assess the share of off-track ninth graders at each school. And, second, they have developed and funded district-wide summer bridge programs for incoming freshmen. In addition, evaluations of comprehensive school reform programs with a focus on ninth graders suggest that there are benefits to high school reform of having district leadership that actively supports the reform with consistent year-to-year funding, appropriate and timely school staffing, minimal bureaucratic interference, and technical resources as necessary. It goes almost without saying that one of the most important things that school districts can do to support ninth-grade reform is to encourage interventions at the school level that have research support.

Data Systems and On-Track Indicators

A notable example of district leadership in the use of data to shine a light on ninth-grade progress is the Chicago Public Schools, which has incorporated an on-track indicator for ninth graders into its school accountability system. The indicator draws on empirical research by the Consortium on Chicago School Research showing that first-time ninth graders in Chicago who are promoted to tenth grade on time and who do not receive any Fs for semester core courses are three and a half times more likely to graduate from high school than students who do not meet these criteria. As part of the district's High

School Scorecard, the share of students at each high school who are on track after ninth grade is reported publicly, along with other indicators of high school performance such as the share of students enrolled in Advanced Placement courses, average daily attendance, and student reports about the quality of their school (gathered from a district-wide student survey).[51] The Consortium on Chicago School Research reports that the on-track indicator contributed to an increase in the share of students who were on track at the end of ninth grade (48 percent in 1994–95, rising to 58 percent in 2003–04).[52] There is no evidence that these gains resulted from the indicator in and of itself, as opposed to other efforts to improve ninth grade outcomes; it would be a mistake to infer that simply putting in place an accountability indicator will transform the freshman experience in a district.

In addition to providing data about student performance after the fact—that is, after the school year is already over—some districts have developed tools that can provide real-time data to help school personnel identify and monitor students who appear to be getting off track. In Philadelphia, a pilot project in the middle grades provides teachers with regularly updated data on student attendance and course grades on the district's data interface. Teams of teachers use these data to decide collectively when students need more intensive interventions, including access to counselors and social workers.[53] This example also illustrates how school districts—far more than individual high schools themselves— can support efforts to prepare middle-grade students for high school.

Summer Transition Programs for Incoming Ninth Graders

Many school districts also offer summer programs that are intended to increase students'

math or reading comprehension skills, teach study strategies, orient them to the layout of the school, and enable them to meet high school teachers and classmates. For example, the Step Up to High School program, offered by the Chicago Public Schools beginning in 2003, targeted students who scored between the 35th and 49th percentiles in reading or math on a nationally normed standardized test. Although these students would not have qualified for other kinds of academic supports offered by the district because their test scores were too high, the district's research showed that the students still had a high probability of performing poorly in ninth grade. The program was voluntary, and participating students attended classes five mornings a week for four weeks during the summer.

Districts increasingly are trying to mine their student databases for clues—attendance below a certain level, GPA, or course failure—that a student is on the path to dropping out of school.

Reports of successful summer bridge programs abound, often drawing on claims by principals of the success of their program or on data assembled by school districts that may or may not have used a comparison group.[54] However, it is exceedingly difficult to identify evaluations of summer bridge programs that use a random-assignment strategy to accept students into the program. The lack

of random assignment means that one cannot be confident about whether any observed differences between program attendees and non-attendees are the result of the program itself, as opposed to other student characteristics that may have an effect on eventual high school success but are difficult to measure. Students who attended the program may have had advantages—such as greater motivation, stronger family support, or less pressure to seek employment during the summer—over students who did not attend the program. Thus, although Chicago's internal district evaluation of the Step Up to High School program found that students who attended the program had significantly and substantially higher rates of being on track after ninth grade (60 percent for participants, 43 percent for students who were invited but did not participate), its lack of a randomized design makes it necessary to interpret the findings with great caution.[55]

Some districts also have developed one-day orientation programs for ninth graders or transition supports such as a "buddy system" in which freshmen are mentored by students in the upper grades. A small-scale study of a transition program that randomly assigned freshmen to be mentored by upper-grade students did not find any statistically significant effects, although the study was likely underpowered.[56] There is little research evidence that these kinds of transition supports, in and of themselves, are able to keep freshmen on track.

The State Role in Keeping Ninth Graders On Track

States have several policy levers to use to improve high schools. One lever is the high school exit exam, which students must pass to earn their high school diploma. About half of the states require students to pass an

exit exam; most are located in the southern or southeastern part of the country. In most cases, the exams are given in tenth grade.[57] A contentious issue among researchers and policy makers is whether these exit exams raise high school dropout rates by providing an incentive for schools to push out lower-performing students who would bring down the school pass rate if they took the exam or by causing discouraged students who fail the exam to leave school on their own, or both. A corollary concern is that exit exams may increase the share of ninth graders intentionally retained in grade by their schools, who do not want lower-performing students to sit for the exam. Because repeating a grade increases the probability that a student will drop out,[58] intentionally holding back ninth graders could be a key mechanism by which exit exams increase dropout rates.

Using data from the CCD and a database of states' exit exam policies spanning the period 1977 to 2002, John Robert Warren and Amelia Corl found two important associations. First, net of a number of other state characteristics such as poverty, unemployment, racial or ethnic makeup, and number of Carnegie units required for graduation, ninth-grade retention rates were higher in states with exit exams that tested high school–level content and in states that gave an exit exam in tenth grade (as opposed to ninth or eleventh grade). Second, states with higher ninth-grade retention rates also had lower graduation rates.[59] A case study of a school district in Texas—a state with a high school exit exam in tenth grade with high-stakes consequences for both schools and students—highlighted how some schools "gamed" the state accountability system by retaining ninth graders. Some schools retained ninth graders who did not pass all of their core courses, thus ensuring that the tenth graders who took the

exit exam were a more select group of students and making it more likely that the school would have a high pass rate. At the end of the retained ninth graders' second year in high school, some would have made up their missing credits, and would be classified as eleventh graders—thereby skipping the testing grade. In other cases, retained students never would be promoted beyond ninth grade. The many ways to game the dropout statistics in Texas meant that schools were less concerned about accountability consequences for having many students drop out than about the consequences for having them perform poorly on the exit exam.[60]

The findings from these two research studies do not necessarily argue against the value of high school exit exam requirements. But they do suggest that one thing that state policy makers should do to support ninth graders is to examine the potential unintended consequences of their accountability plans.

States also may have a role to play in developing statewide data systems with student information, helping districts to develop their own capacity to maintain and analyze data about ninth graders, and providing support for districts to develop empirically based "early warning indicator systems." Statewide data systems, such as those maintained by Florida, North Carolina, or Texas, provide the necessary infrastructure for state departments of education to identify districts where high proportions of ninth graders get off track so that they can be targeted for assistance. Such data systems also allow states to locate districts that are doing better than expected by their ninth graders and to learn from practices that seem to be working.

Districts increasingly are trying to mine their student databases for clues—attendance

below a certain level, GPA, or course failure—that a student is on the path to dropping out of school. As described above, these indicators have been developed for freshmen (the on-track indicator in Chicago) and for students in the middle grades (Philadelphia). However, even if school districts have the data needed to conduct this sort of empirical work, they often do not have the capacity to complete a customized analysis for their own district. Smaller districts without dedicated research staff are especially likely to lack such a capacity. State departments of education could assist these districts by providing technical assistance in data analysis, creating venues for districts that have made strides in developing early indicators to share their analytic process and findings, and testing the feasibility of a statewide set of early indicators.

Concluding Thoughts

In the past several years, new data analyses have shown that the high school graduation rate in the United States is likely between 70 percent and 80 percent.[61] As the article by John Tyler and Magnus Lofstrom in this volume demonstrates, there is good research evidence that students who drop out of school earn less on average than high school graduates, have a high probability of experiencing long stretches of unemployment, participate less in civic life, and are more likely to be incarcerated. The sobering life consequences of high school dropout lend additional urgency to the task of creating the conditions so that more ninth graders stay on track to graduation during their first year in high school.

In a broad sense, the task of helping ninth graders to succeed requires the serious efforts of educators at the pre-K through eighth-grade level to prepare students for the academic requirements of ninth grade; it also requires the involvement of parents in the supervision and support of their children. But, ultimately, it is high schools that bear the most immediate responsibility for putting in place the curriculum, school organizational features, and strong teachers who will increase a ninth grader's chances of making a good transition to high school. There is much to be learned about how to help students succeed when they enter high school, but already there are school reform models and curriculum that—while not silver bullets—show evidence of promise.

Endnotes

1. An additional 5 percent attend a junior high school or middle school for ninth grade and make the transition to high school as tenth graders. The rest of the students attend schools that span the middle and high school years or are K–12 schools. Data are from the Common Core of Data, 2005–06 school year.

2. For example, of the forty states with statewide minimum high school graduation requirements, thirty-six require four years of high school English. A reasonable inference from this fact is that students are expected to take English—and earn English credits—each year from ninth grade through twelfth grade. See Jennifer Dounay, *Alignment of High School Graduation Requirements and State-Set College Admissions Requirements* (Denver, Colo.: Education Commission of the States, 2006).

3. Kathryn Schiller, "Effects of Feeder Patterns on Students' Transitions to High School," *Sociology of Education* 72, no. 4 (1999): 216–33.

4. C. Jay Hertzog and P. Lena Morgan, "Breaking the Barriers between Middle School and High School: Developing a Transition Team for Student Success," *NASSP Bulletin* 82, no. 597 (1998): 94–98; Patrick Akos and John Galassi, "Middle and High School Transitions as Viewed by Students, Parents, and Teachers," *Professional School Counseling* 7, no. 4 (2004): 212–21; Kristen Isakson and Patricia Jarvis, "The Adjustment of Adolescents during the Transition into High School: A Short-Term Longitudinal Study," *Journal of Youth and Adolescence* 28, no. 1 (1999): 1–26.

5. Schiller, "Effects of Feeder Patterns" (see note 3); James Catterall, "Risk and Resilience in Student Transitions to High School," *American Journal of Education* 106, no. 2 (1998): 302–33; David Kinney, "From Nerds to Normals: The Recovery of Identity among Adolescents from Middle School to High School," *Sociology of Education* 66, no. 1 (1993): 21–40.

6. Elaine Allensworth and John Easton, *The On-Track Indicator as a Predictor of High School Graduation* (Chicago: Consortium on Chicago School Research, 2005). Allensworth and Easton were the first to use the "on-track/off-track" nomenclature to describe students' progress toward graduation—terms that have now entered common parlance among dropout researchers, policy makers, and advocates.

7. Melissa Roderick and Eric Camburn, "Risk and Recovery from Course Failure in the Early Years of High School," *American Educational Research Journal* 36, no. 2 (1999); Allensworth and Easton, *The On-Track Indicator as a Predictor of High School Graduation* (see note 6); Ruth Curran Neild and Robert Balfanz, *Unfulfilled Promise: The Causes and Consequences of High School Dropout in Philadelphia, 2000–2005* (Philadelphia: The Philadelphia Youth Network, 2006).

8. Editorial Projects in Education, "The Freshman Blues," *Diplomas Count* 25, no. 41S (2006): 16.

9. More sophisticated, empirically derived indicators of being off track for graduation have been developed in specific locales. For example, Allensworth and Easton define students as off track after their first year in high school if they have accumulated fewer than five course credits or earned an F in a core academic course during either semester. See Allensworth and Easton, *The On-Track Indicator as a Predictor of High School Graduation* (see note 6).

10. Students who have been enrolled as ninth graders for more than one year because of failure to accumulate credits for promotion to tenth grade are sometimes referred to as "ninth grade repeaters."

11. Chicago Public Schools, *Chicago Public Schools Policy Manual,* http://policy.cps.k12.il.us/documents/605.1.pdf; *Miami-Dade E-Handbook,* http://ehandbooks.dadeschools.net/policies/93/secIV.pdf; District of Columbia Public Schools graduation requirements can be found at www.k12.dc.us/offices/ocao/Graduation-Requirements-2007.pdf.

12. Allensworth and Easton, *The On-Track Indicator as a Predictor of High School Graduation* (see note 6).

13. Ruth Curran Neild, Scott Stoner-Eby, and Frank Furstenberg, "Connecting Entrance and Departure: The Transition to Ninth Grade and High School Dropout," *Education and Urban Society* 40, no. 5 (2008): 543–69.

14. Neild and Balfanz, *Unfulfilled Promise* (see note 7).

15. New York City Department of Education, Office of Multiple Pathways to Graduation, *Multiple Pathways Research and Development: Summary Findings and Strategic Solutions for Overage, Undercredited Youth,* http://schools.nyc.gov/NR/rdonlyres/119CD965-BC52-4579-A37A-5E33C1364D2A/31611/Findingsofthe OfficeofMultiplePathwaystoGraduation.pdf.

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19. Ibid.

20. Ibid.

21. Schiller, "Effects of Feeder Patterns" (see note 3); Toni Falbo, Laura Lein, and Nicole Amador, "Parental Involvement during the Transition to High School," *Journal of Adolescent Research* 16, no. 5 (2001): 511–29.

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25. Schiller, "Effect of Feeder Patterns" (see note 3).

26. Weiss and Bearman, "Fresh Starts" (see note 23).

27. Neild and Balfanz, *Unfulfilled Promise* (see note 7).

28. Robert Balfanz, Liza Herzog, and Douglas MacIver, "Preventing Student Disengagement and Keeping Students on the Graduation Track in High-Poverty Middle-Grades Schools: Early Identification and Effective Interventions," *Educational Psychologist* 42, no. 4 (2007): 223–36.

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36. Roderick and Camburn, "Academic Difficulty during the High School Transition" (see note 30).

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Finishing High School: Alternative Pathways and Dropout Recovery

John H. Tyler and Magnus Lofstrom

Summary

John Tyler and Magnus Lofstrom take a close look at the problems posed when students do not complete high school. The authors begin by discussing the ongoing, sometimes heated, debate over how prevalent the dropout problem is. They note that one important reason for discrepancies in reported dropout rates is whether holders of the General Educational Development (GED) credential are counted as high school graduates. The authors also consider the availability of appropriate student data. The overall national dropout rate appears to be between 22 and 25 percent, but the rate is higher among black and Hispanic students, and it has not changed much in recent decades. Tyler and Lofstrom conclude that schools are apparently doing about as well now as they were forty years ago in terms of graduating students. But the increasingly competitive pressures associated with a global economy make education ever more important in determining personal and national well-being.

A student's decision to drop out of school, say the authors, is affected by a number of complex factors and is often the culmination of a long process of disengagement from school. That decision, not surprisingly, carries great cost to both the student and society. Individual costs include lower earnings, higher likelihood of unemployment, and greater likelihood of health problems. Because minority and low-income students are significantly more likely than well-to-do white students to drop out of school, the individual costs fall unevenly across groups. Societal costs include loss of tax revenue, higher spending on public assistance, and higher crime rates.

Tyler and Lofstrom go on to survey research on programs designed to reduce the chances of students' dropping out. Although the research base on this question is not strong, they say, close mentoring and monitoring of students appear to be critical components of successful programs. Other dropout-prevention approaches associated with success are family outreach and attention to students' out-of-school problems, as well as curricular reforms. The authors close with a discussion of second-chance programs, including the largest such program, the GED credential.

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John H. Tyler and Magnus Lofstrom

By most measures, the nation's high schools did a remarkable job of educating the populace throughout the twentieth century. At least in part because of the secondary education they received in American public high schools, hundreds of millions of U.S. citizens have been able and ready to participate in a dynamic democracy and to contribute to and benefit from an ever-changing economy. Many have used public high schools to help them transition from first-generation immigrant to American citizen. To be sure, the opportunities and the rewards have been uneven, varying by gender, race, and geographic region, but if the twentieth century was, as Claudia Goldin has argued, "the human capital century," with America as leader, then the American public high school system deserves due credit.[1]

Even so, in the final decades of the twentieth century, public education, including public secondary education, increasingly became the focus of criticism and controversy because of failures perceived or real.[2] And criticism directed at the nation's schools has not abated in this new century. A recent focus of widespread concern has been the number of students, particularly black and Hispanic students, who never graduate from high school. One high-profile national dropout study, for example, begins ominously, "There is a high school dropout epidemic in America."[3] And the popular press gave widespread and front-page coverage to a Johns Hopkins University study that coined the term "dropout factory" to describe certain high schools and estimated that the nation has 1,700 such schools.

Whether termed a "problem," a "crisis," or an "epidemic," the large numbers of students who do not graduate from high school generate clear and widespread concern. To bring some additional light and clarity to the topic, we examine different facets of the dropout issue. We begin with two questions. Just how bad is the dropout "problem"? And who, exactly, is dropping out? We then turn to the costs associated with leaving school early. We conclude by examining the state of knowledge regarding dropout-prevention and "second-chance" programs.

Dropout Rates: The Magnitude of the Problem and Measurement Issues

Given the importance of graduation rates as a performance metric of the nation's high schools, one might assume the existence of well-defined, well-agreed-upon measures of that performance. One would be wrong. Although each state and the National Center for Education Statistics (NCES) all produce graduation and dropout statistics based on "standard measures," recent heated debates over the "true" rates underscore a general unease about how accurately and consistently officials are able to document school performance when it comes to graduating students.

The NCES provides the nation's most commonly cited dropout and school completion statistics. Using primarily two data sources, the Current Population Survey (CPS) and the Common Core of Data (CCD), the NCES provides four different statistics: event dropout rate, status dropout rate, status completion rate, and averaged freshman graduation rate. Table 1 defines these measures, along with the respective data sources. Figure 1 shows the trends in these four statistics from 1972 to 2005.

Based on figure 1, one might conclude that in terms of historical trends, schools are doing relatively well at moving students to

Table 1. Dropout and School Completion Measures

Rate	Age group	Description	Data source	GED status
Event dropout rate	15–24	Percentage of high school students who dropped out of grades 10–12	Current Population Survey	GEDs do not count as dropouts
Status dropout rate	16–24	Percentage of people who are not enrolled in high school and who do not have a high school credential	Current Population Survey	GEDs do not count as dropouts
Status completion rate	18–24	Percentage of young adults who have left high school and who hold a high school credential	Current Population Survey	GEDs are counted as having a high school credential
Averaged freshman (ninth-grade) graduation rate	NA	Percentage of public high school students who graduate with a regular diploma four years after starting ninth grade	Core of Common Data	GEDs are not counted as graduates

graduation. School attainment appears generally to be on the rise—dropout event and status dropout rates are decreasing and school completion rates are steady (averaged freshman graduation rate) or rising slightly (status completion rate). In 2005, a relatively small share, 3.8 percent, of students dropped out of grades ten through twelve, and almost nine in ten (87.6 percent) of the country's eighteen- to twenty-four-year-olds held a high school credential. But conclusions based on

these government statistics are controversial. Some observers feel that these measures paint too positive a picture of what some call a dropout "crisis," while those on the other side of the debate suggest that the government figures are at least close to the mark and that the "crisis" label is yet another undeserved black mark on the nation's schools. Driving the debate are questions about what data are used to calculate the relevant statistics and who is considered a "graduate."

Figure 1. Dropout and School Completion Rates, 1972–2005
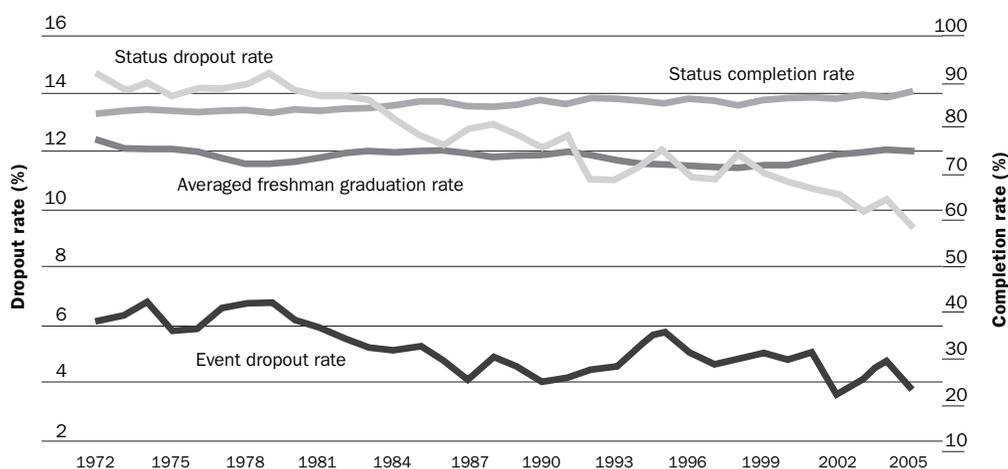
Source: National Center for Education Statistics, "Digest of Education Statistics: 2006" (Washington: U.S. Department of Education, 2007).

Data issues primarily focus on the fact that three of the four widely used national measures—the status completion rate, the status dropout rate, and the event dropout rate—use the CPS. The CPS is a monthly survey of about 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics and is a primary source of information on the labor force characteristics of the U.S. population. But the CPS has some recognized deficiencies as a basis for calculating dropout and graduation statistics.

The more important issue, however, is which individuals are considered to be high school graduates. In particular, it matters substantially whether the data count individuals who leave school and later earn a General Educational Development (GED) credential as high school graduates or as dropouts. In terms of official NCES statistics, people who hold GEDs are not counted as graduates in the calculation of graduation rates, such as the averaged freshman graduation rates, but they are treated as completers in the status completion rate.[4]

The distinction between having a traditional high school diploma or a GED credential would be less important if the two differently credentialed groups had equally favorable outcomes in the labor market and higher education. But in terms of labor market outcomes such as wages and employment, GED holders fare consistently worse than do regular high school graduates, and GED holders also get less postsecondary education than do regular high school graduates.[5] Given that dropouts who hold a GED are not the equivalent of high school graduates on two such important outcomes, it seems problematic to treat GED holders as "graduates" in official educational attainment statistics.[6] Indeed, the adequate yearly progress

requirements of the 2001 No Child Left Behind Act (NCLB) state that only students who receive a traditional diploma should be counted as high school graduates. Furthermore, although the GED program may be beneficial to some dropouts, it may have unintended consequences. Several studies, for example, find that the GED program may induce some students to drop out.[7]

Not surprisingly, there are competing views about the GED credential as a marker of successful high school "completion." For example, some states and local school districts count GED recipients as high school "completers" when computing their own administrative graduation statistics, while others stake out compromises between the two polar positions. In January of 2008, the state board of education in Virginia entertained a proposal to establish a school-level "Graduation and Completion Index" that would give regular high school graduates a weight of 1.0 and GED recipients a weight of 0.75. Satisfactory scores on this index by each school would then be a part of the state's accreditation process.[8]

Policies of the GED Testing Service (GEDTS) seem to establish a clear boundary between enrolled students pursuing a high school diploma and dropouts who pursue the GED credential. GEDTS policy states that the GED tests may be administered only to people who are "at least 16 years of age and not currently enrolled in an accredited high school…."[9] There are, however, exceptions to the requirement that a candidate for the GED credential must be a school dropout.

In response to requests from state departments of education, the GEDTS has authorized in-school "GED Option" programs whereby some students may remain enrolled

in their regular high school as they pursue a GED. Twelve states now have GEDTS authorization to offer GED Option programs to students who meet certain criteria, including credit deficiency, that place them at risk of dropping out.[10] (Before 2002, a few states operated in-school programs that used the GED tests without the authorization of the GEDTS, but they no longer do so.) The ostensible purpose of these in-school GED programs, whether sanctioned or not, is to keep potential dropouts enrolled and involved in high school. Thus, even though the GED program was designed as a second-chance option for school dropouts, it has a secondary focus on dropout "prevention."[11]

Schools have strong incentives to participate in the GED Option program, because it allows them to continue to receive average daily attendance funds for participating students, funds they would lose were the students to drop out and leave the school rolls. A close inspection shows a lack of consistency nationwide in how GED Option students are treated in calculating graduation statistics. Some states may award students who successfully complete the GED Option program a regular high school diploma and count them as high school graduates; others count them as "completers" but not as "graduates" in calculating graduation statistics.[12] No good national data on the size of the GED Option program exist, but a 2007 document from the Mississippi Department of Education concludes that if the state were to count GED Option students as high school graduates, the state graduation rate would rise from 61.1 percent to 62.9 percent.[13]

Comparing the NCES status completion rate, which treats GED holders as completers, with the NCES freshman graduation rate, which does not count GED holders as graduates, makes clear the importance of this issue. In 2005, the NCES status completion rate was 87.6 percent, 13 percentage points higher than the freshman graduation rate of 74.6 percent. The GED is not the only reason for the discrepancy but it may plausibly be the most important. This view is consistent with the work of James Heckman and Paul LaFontaine, who report that graduation rates estimated using data from the October CPS—the data used by NCES to generate the status completion rate—are upwardly biased by 7 to 8 percentage points because they count GED holders as high school graduates. Heckman and LaFontaine conclude that this is the most important source for overstated U.S. graduation rates.[14]

The GED, however, is not the only source of bias in the measures of school attrition and completion. Heckman and LaFontaine report that sample coverage (that is, inclusion or exclusion) of people who are incarcerated, people in the armed forces, and immigrants also creates a bias in secondary educational attainment measures.[15] These coverage issues affect both trends and differences across groups.

Heckman and LaFontaine also find that official statistics that show white and minority graduation rates converging over time are inaccurate, particularly so for males. They note that young black and Hispanic men have been incarcerated at increasingly higher rates than young whites. Such men are not counted in the CPS-based status completion rates because the CPS sample excludes people who are incarcerated. In addition, blacks in particular have been earning GEDs at higher rates in recent years than have whites. Heckman and LaFontaine contend that white-black differences in graduation rates are roughly the same as they were thirty years

ago, about a 15-percentage-point difference favoring whites.

Finally, Heckman and LaFontaine show that when comparable measures are used on comparable samples, a consensus of the graduation rate can be reached across data that have been used by various researchers—for example, the Current Population Survey, the Common Core of Data, the National Education Longitudinal Study of 1988, High School and Beyond, and the National Survey of Youth.[16]

The work by Heckman and LaFontaine helps to reconcile the competing dropout and graduation rate figures computed by researchers such as Jay Greene, Christopher Swanson, and Lawrence Mishel and Joydeep Roy.[17] On balance, the Heckman and LaFontaine estimates suggest that today's overall graduation rates are in the 75 to 78 percent range, with white rates at 84 percent, Hispanic rates at 72 percent, and black rates at about 65 percent. These figures tend to be lower than both official government figures and those put forth by Mishel and Roy. Heckman and LaFontaine's overall graduation rate estimates are higher than the roughly 67 percent rate suggested by Greene, and their minority graduation rates are not as dire as Greene's 50 percent rate.

The apparent confusion and resulting debates over how well U.S. schools are graduating students leads one to consider what kind of data set might be a "gold standard." One possibility would be a national student ID system that would follow students no matter where they were enrolled. Thus, a student who left a school or a district or a state but re-enrolled in another school would remain in the system until graduation or until he or she otherwise left the system. But even an effective national student ID system would not reveal that some ninth graders had dropped out and left the system until they failed to show up as graduates with their age cohort. Of course, the missing graduates could not be counted as "dropouts" without giving them an extra year or two to graduate in case they had been held back a grade in high school or had decided to return to school. The problem is that even with a very good, individual student ID data system, a dropout becomes a dropout when he or she leaves school and the school-leaving often happens without the kind of consultation that would allow for accurate data coding as to dropout status.

The apparent confusion and resulting debates over how well U.S. schools are graduating students leads one to consider what kind of data set might be a "gold standard."

If schools are to do a better job at having up-to-date information on dropout and graduation rates, they must have more accurate and more appropriate data. And although the Heckman and LaFontaine effort may go a long way in quelling the "dropout debates," it provides no information that a state, school district, or school can use to inform practice and policy. Most researchers who have explored this topic agree that the starting point for quality data is with a student-level ID that would allow states to follow students across schools and districts at least within states and over time.

One national effort to promote consistent state information on student performance is the Data Quality Campaign, which provides guidelines for what constitutes "good graduation and dropout data."[18] But even when acceptable data systems are in place, the question remains how administrative units at the state, district, and school level will use those data in their reporting. For example, how will these units count GEDs when the incentives from virtually all sources are to have graduation rates that are as high as possible? New Jersey might provide some insight on this question. Heckman and LaFontaine report that in New Jersey, an individual need only mail in GED test scores that meet the state GED score requirements to qualify for a state-endorsed high school diploma. These newly credentialed individuals are then included in the official state diploma counts. The critical issue here, as Christopher Swanson and Duncan Chaplin have pointed out, is that under the federal system it is states, not the federal government, that have final authority in determining requirements for a high school diploma.[19] Thus, agreement across states on what represents high school completion may be as important as data development and consistency when it comes to developing "well-defined and well-agreed-upon" measures of schools' performance in graduating students. The U.S. Department of Education recently recognized the need for action and tightened the NCLB regulations regarding how states calculate high school graduation rates.

We close this section by suggesting the need to consider current graduation rates in the context of historical trends of this measure and the need to consider both trends and current rates in the context of the current global economy. Our interpretation of the research at hand is that graduation rates have certainly not been increasingly steadily since 1960, as table 1 would suggest. Neither have they been in a steady decline. Rather, the evidence from Heckman and LaFontaine suggests a 2- to 3-percentage-point fluctuation around a relatively flat forty-year trend line centered at about 77 percent. Thus, schools are apparently doing about as well now as they were forty years ago in terms of graduating students. The problem is that just as the competitive pressures associated with an increasingly global economy have increased, the importance of education in determining personal and national well-being has also grown. "Steady as she goes," then, is an alarming rather than comforting reality when it comes to how well the nation is getting students successfully through high school.

Who Drops Out—and Why?

Even the most optimistic assessments of national dropout rates suggest that far too many students are leaving school early. Economic, societal, and equity considerations all point to the need for interventions that could cause some of the roughly one million students who leave school each year to make a different decision. The importance of reducing the number of school dropouts is also reflected in NCLB, which requires states to incorporate graduation rates in their accountability systems for schools and school districts.

A first step in thinking systematically about how to affect dropout decisions is to have a good understanding of the characteristics and lives of students most at risk of leaving school early. That is, who are the students who tend to drop out, and what causes them to leave school? Although researchers know quite a bit about the characteristics of students who leave school, we know much less about the causal factors that lead to the school-leaving decision.

The great bulk of the research on why students leave school comes from post-dropout surveys and interviews of students who have left school. A recent example is "The Silent Epidemic," a study of dropouts supported by the Bill & Melinda Gates Foundation that interviewed 467 sixteen- to twenty-four-year-old dropouts across the nation.[20] Other research relies on student responses to questions posed in data sets such as the National Education Longitudinal Study of 1988.[21] Not surprisingly, students report a variety of reasons for leaving school early, and studies consistently find that a complex set of relationships between student, family, school, and community factors are linked with the dropout decision. Importantly, a substantial body of research suggests that the decision to drop out is often not made suddenly as the result of recent and potentially temporary factors, but rather is part of a longer process of disengagement from school.[22]

Although interesting, the reasons dropouts offer to explain why they leave school do not necessarily reveal the true underlying causes, and hence do not positively identify specific factors that school officials and policymakers can address. But effectively and efficiently addressing the dropout problem clearly requires knowing these underlying causal factors.

Students regularly report, for example, some measure of school disengagement as the primary reason for leaving school.[23] The commonality of these responses ("did not like school" and "classes were not interesting") is often cited as a reason that schools must become more "relevant" and that teachers must learn to structure curriculum and pedagogy so that it is more "interesting" and "engaging" to students at risk of dropping out. Both suggestions may be completely on

the mark and, if enacted on a wide scale, might reduce dropout rates.

But if the causal arrow in the above responses ran the other way, the types of school reform being urged would have a much smaller than anticipated effect on dropout rates. That is, if other nonschool factors cause a student to lose interest in school and drop out, then focusing on school disengagement and ignoring the underlying factors that cause the school disengagement might do little to change the dropout decision. Of course, the goal is to uncover the underlying causes, and it is not clear how well research has done in that realm. As a result, information on the "causes" of dropping out generally rests on a combination of the observable characteristics, behaviors, and outcomes of dropouts, along with their self-reported reasons for leaving school.

Student Characteristics

Student characteristics associated with a higher probability of dropping out, often called student "risk factors," are both numerous and oft-cited as dropout "predictors." Not surprisingly, poor school performance is a strong predictor of dropping out of school. For example, low test scores, course failure, and grade retention have all been found to be strongly associated with leaving school.[24] As noted, weak student engagement, often measured by absenteeism and discipline problems in survey data, is also strongly linked with a higher dropout probability.[25]

Early adult responsibilities have also been linked with a lower likelihood of graduation. One such responsibility is becoming a parent. Although teen parents are more likely than their peers who are not parents to drop out of school, research does not provide a clear picture of whether childbearing has a causal

impact on the probability of quitting school. Not surprisingly, much of the research focuses on women.[26] Early research quite clearly indicates that having a child has a strong negative effect on educational attainment, but more recent work questions this conclusion.[27] Joseph Hotz, Susan McElroy, and Seth Sanders use a creative empirical method in an attempt to obtain causal estimates and find a small negative but statistically insignificant effect of childbearing on teenage mothers' probability of earning a traditional high school diploma.[28] The additional responsibilities and demands of parenthood make this finding surprising. Most recently, Jason Fletcher and Barbara Wolfe, using an empirical approach similar that of Hotz and his colleagues, but also controlling for community effects and using alternative comparison groups, find that teenage childbearing decreases the probability of graduating with a traditional high school diploma by 5 to 10 percentage points.[29]

Out-of-school work also affects the probability of dropping out. Several studies find that students who work while in school are more likely to drop out.[30] A closer look reveals, however, that working a few hours a week has no negative effect and may even have a positive effect on graduating.[31] The negative effect appears with intensive work involvement—more than twenty hours a week—and with certain types of jobs.[32] The effects also vary by gender, race, and ethnicity. Clearly some students who work do not do so voluntarily but as a result of a family situation.

Family Characteristics
Students' family background greatly affects their educational outcomes and is commonly viewed as the most important predictor of schooling achievement.[33] Among the strongest

family domain dropout predictors are parental education, occupation, and income—in other words, socioeconomic status.[34] Although students who need to take a job to help out the family are more likely to drop out of school, Stephen Cameron and James Heckman find that long-run factors associated with parental background and family environment matter the most for students' schooling progress, including graduation from high school.[35] These long-run factors may partially reflect parental involvement in school and the greater human capital investment in children's education in relatively well-to-do families.[36] Family stability, reflected in both family structure and school mobility, has also been linked to quitting school.[37] Potentially important, but less well-researched, are the roles played by family preferences, and attitudes, and how well families are informed about the importance of education in modern society.

School Characteristics
Much of the task of reducing dropout rates falls on the schools. Implicit in NCLB is the notion that schools can affect the dropout decision of students, and research shows that school characteristics do affect student achievement.[38] But although some school characteristics, such as school practices and processes, resources, size, and pupil-teacher ratio, are under the control of school policy, others, such as student composition and location, are arguably not. Russell Rumberger and Scott Thomas find that pupil-teacher ratio, the quality of teachers, and school size all influence the dropout probability of students in the expected direction.[39] And Magnus Lofstrom reports that spending per pupil, school location, and student composition affect students' dropout probability.[40] Furthermore, Cory Koedel finds that teacher quality also determines dropout outcomes.[41]

Accountability and High-Stakes Exit Exams

High-stakes exit exams are the tests that students must pass to graduate. These exams are controversial for a number of reasons, not least because they may lower high school completion rates, especially those of minority students. Existing research does not provide an entirely clear picture of the effect of high-stakes testing. Brian Jacob found that graduation tests appear to have no effect on the probability of dropping out of high school for the average student, but that they make it significantly more likely that the lowest-performing students, who are disproportionately minorities, will drop out.[42] The disproportionately negative effect on low-performing students is also stressed by Thomas Dee and Brian Jacob.[43] Research is decidedly mixed. Several other studies indicate a more widespread negative effect of exit exams on high school completion rates.[44] But one study finds no link between exit exam requirements and high school completion, even for low-achieving students.[45] Overall, most of the evidence suggests that exit exams may not be a graduation barrier for the average student, but that they are for disadvantaged and low-achieving students.

Clearly, of the many factors that affect students' decision to leave school, relatively few, including the economic situation of students' families, are easily affected directly by school policy. But the decision to drop out, once made, is highly costly both to the student and to society.

Costs of Dropping Out

Every year more than a million children leave school without a traditional high school diploma. The costs associated are large, both for the student who drops out and for society as well. Because minority and low-income students are significantly more likely than well-do-do white students to drop out of school, the individual costs fall unevenly across groups and ultimately affect important social issues, such as racial and ethnic education gaps, the income distribution, and health disparities.

Costs to the Individual

The most obvious cost to failing to complete high school is lower expected lifetime earnings. In 2006, the median annual earnings of women without a high school diploma were $13,255; those of men without a diploma were $22,151.[46] The median earnings of women and men with a diploma were, respectively, $20,650 and $31,715.[47] The earnings of women who drop out are thus only about 65 percent of those of female high school graduates—an annual difference of $7,395. The earnings of men who drop out are slightly less than 70 percent of those of men with diplomas—an annual difference of $9,564.

Graduating from high school does not necessarily cause these earnings differences. Because students self-select into schooling levels by the way they perceive the lifetime benefits and costs to themselves of such schooling, it may be wrong to conclude that if a randomly selected individual dropout were to complete high school, his or her earnings would increase by these amounts. But after reviewing research attempting to obtain the causal effects of education on earnings, Cecilia Rouse concludes that "the basic 'cross-sectional' relationship (that is, the mean difference in income between those with and without high school degrees) is a fairly good approximation to the causal relationship."[48] In addition, Rouse shows that relative to high school graduates, dropouts have higher unemployment rates and lower employment

rates. They also work fewer weeks each year.[49] Because of these less favorable employment outcomes, the estimated lifetime earnings of dropouts are $260,000 less than those of high school graduates. Rouse also shows that dropouts are less likely to benefit from employer-provided pension plans and health insurance.[50]

More education may also improve individuals' health in a causal manner. The observed link between low schooling levels, and poor health may be due to other factors, such as income, that are correlated with both schooling and health. Or it could be that the causal arrow runs in the other direction, with poor health preventing the full pursuit of higher schooling. David Cutler and Adriana Lleras-Muney find a clear relationship between education and health that cannot be entirely explained by labor market outcomes or family background and conclude that better health outcomes have to be included as one of the benefits of more education.[51] The flip side of this link, of course, is that poorer health and higher health spending are additional costs that dropouts face.

Costs to Society

The costs of failing to graduate from high school are not limited to dropouts themselves, but also spill over to society. These social costs include lower tax revenues, greater public spending on public assistance and health care, and higher crime rates.

Because dropouts do not perform as well in the labor market as high school graduates, as measured by earnings, employment, and unemployment, they also do not contribute as much in terms of tax revenues. Rouse estimates that dropouts pay about 42 percent of what high school graduates pay in federal and state income taxes each year ($1,600 and

$3,800, respectively).[52] Over a lifetime, Rouse estimates, the difference in the discounted present value of federal and state income tax revenues is about $60,000.[53] Given a cohort of 600,000 eighteen-year-old dropouts, these estimates suggest a yearly loss of $36 billion in state and federal income taxes.

Every year more than a million children leave school without a traditional high school diploma. The costs associated are large.

Public assistance to dropouts is also out of proportion to their share of the population. Jane Waldfogel, Irwin Garfinkel, and Brendan Kelly report that nearly half of single mothers receiving Temporary Assistance for Needy Families (TANF) are high school dropouts and that 27 percent of all single mothers lacking a high school diploma receive TANF (17 percent of high school graduates with no further education).[54] Waldfogel and her colleagues estimate that single mothers with a high school education are 24 percent less likely to be on TANF than are those who are high school dropouts.[55] The authors also estimate that if all welfare recipients who were high school dropouts were high school graduates, welfare costs would fall some $1.8 billion.[56] Public spending on health insurance is also estimated to be higher for dropouts. Peter Muennig estimates that over a lifetime, the discounted average public health insurance spending is $35,000 for school dropouts, compared with $27,000 for high school graduates.[57]

Dropouts are also greatly overrepresented in U.S. prisons. The Bureau of Justice Statistics reports that 68 percent of the nation's state prison inmates are dropouts.[58] Dropouts constitute 62 percent of white inmates, 69 percent of black inmates, and 78 percent of Hispanic inmates. Although these figures represent strikingly strong relationships between education and crime, the extent of causality is unknown. For example, children who grow up in poor, inner-city neighborhoods are more likely both to drop out of school and to engage in criminal activities during the adolescent and post-adolescent years. It is clearly challenging to estimate the causal effect of education on criminal behavior.

In an influential study, Lance Lochner and Enrico Moretti find that education does causally affect individuals' propensities to engage in criminal activities, though with racial differences.[59] Black male high school graduates are more than 3 percentage points less likely to be incarcerated than black dropouts; the share for white males is less than 1 percentage point. Lochner and Moretti also estimate the effect of schooling on different types of crime. They find that, on average, one additional year of schooling will reduce the murder and assault rate by close to 30 percent, motor vehicle theft by 20 percent, arson by 13 percent, and burglary and larceny by about 6 percent. They find no significant negative effect on robbery and rape.[60] Their findings indicate that a 1 percent increase in male high school graduation rates could save as much as $1.4 billion a year, or up to $2,100 for each additional male high school graduate.

Students who drop out may also be less effective at parenting and may participate less often and less effectively in the nation's democratic processes. To date there is little research on these costs of school dropout.

The discussion so far has dealt only with the costs—individual and social—associated with dropping out. A full social cost-benefit analysis would include potential social benefits associated with having students leave school early, such as lower public spending on education. It could also be that relatively high dropout rates improve the education of students who remain in school, especially if the dropouts were students who commanded much teacher time and energy. But almost certainly the high individual and societal costs associated with dropping out make it very hard to come up with a plausible scenario where the "benefits" of dropping out outweigh the costs.

Dropout Prevention

The high costs associated with dropping out make clear the need for programs to help students stay in school. The Dropout Prevention Center/Network lists hundreds of dropout-prevention programs in its online database of "model programs."[61] Only relatively few of these programs, however, have been rigorously evaluated for effectiveness. Even fewer have proved effective in achieving this goal. As Mark Dynarski and Philip Gleason write in a report on dropout-prevention programs, "Dropping out is as hard to prevent as it is easy to do."[62] Based on the evidence, one might add that it is equally hard to identify confidently the programs that are effective.

In what follows, we group dropout-prevention interventions into two categories. The first is interventions that set dropout prevention as the primary goal and that target specific students or groups of students. The second is interventions that have a broader goal than dropout prevention and a broader target audience than "at-risk" students, but that, nevertheless, aim to lower dropout rates. The first category embraces programs in the

regular school or in the community, alternative schools for at-risk students, and smaller learning communities that tend to fit the "school-within-a-school" model and that target at-risk students. The second, broader category includes school restructuring or school reform models. Broadly stated, programs in both categories aim to lower dropout rates through one or more of four mechanisms: increasing school attendance, increasing student school engagement and learning, building student self-esteem, and helping students cope with the challenges and problems that contribute to the likelihood of dropping out.

To date, relatively few evaluations of dropout-prevention interventions could be considered rigorous. One of the largest rigorously conducted evaluations was a late 1990s study of twenty-one different interventions, each funded by the U.S. Department of Education's School Dropout Demonstration Assistance Program (SDDAP). In addition to the SDDAP evaluations, a second source of evidence on the efficacy of dropout-prevention interventions can be found in the Department of Education's What Works Clearinghouse (WWC), which reviews and synthesizes studies of a wide variety of education interventions. The combined findings of the SDDAP evaluation and the WWC synthesis of dropout-prevention programs leave one less than sanguine about the knowledge base about how to lower dropout rates.

The SDDAP evaluation, conducted by Mathematica Policy Research, Inc., included both targeted and broadly defined dropout-prevention efforts. Targeted interventions were usually evaluated through randomized, controlled experiments, while the evaluations of the school-restructuring efforts were quasi-experimental and used observationally similar schools as the comparison group for

SDDAP schools. The evaluation looked at sixteen targeted interventions and five school-restructuring projects. Eight of the interventions took place at the middle school level. Two of the targeted interventions at the high school level were community-based programs aimed at helping students who had already left school acquire a GED.

The key finding from the SDDAP evaluations is that "most programs made almost no difference in preventing dropping out *in general.*"[63] Some SDDAP programs did make a difference on some outcomes, and we will take a closer look at one of the more successful programs. One of the more consistent positive findings in the SDDAP evaluations, however, involves programs to increase GED acquisition among students who have already left school. Although increasing the GED attainment rate of school dropouts may be a laudable outcome, it seems less clear that it should be considered as successful dropout *prevention*.

The picture is hardly any brighter when it comes to findings of the What Works Clearinghouse. To date, the first-wave WWC review of dropout-prevention programs has looked at fifty-nine studies of sixteen programs.[64] From this group, ten of the programs had undergone evaluations that were rigorous enough to make it possible to reach firm conclusions about program effectiveness.[65] These ten programs include a wide range of interventions: counseling and monitoring, school restructuring and curriculum redesign, financial incentives for students and families, and community services designed to mitigate factors that can negatively affect school achievement and success.[66]

Of the ten programs, five showed promise in reducing dropout rates.[67] Two of the five—

Achievement for Latinos through Academic Success (ALAS) and High School Redirection—are no longer active. ALAS, a pilot program launched in San Diego during the early 1990s, was designed to address student, school, family, and community factors that affect dropping out. At the end of the ninth grade, 98 percent of the students who were randomly assigned to the ALAS program were still enrolled, compared with 83 percent of the students in the non-ALAS control group.[68] Meanwhile, three years after random assignment, 43 percent of the students assigned to the High School Redirection program—an alternative high school program for students considered at risk—had dropped out, compared with 53 percent of the randomly assigned control group.[69]

The three remaining positive programs represent three distinct approaches to dropout prevention. One, Check & Connect, is a relatively intensive program for (mostly) high school students; a second, Career Academies, fits the school-within-a-school model; a third, Talent Development High Schools, is best described as whole-school reform. We discuss each in turn.

A Dropout-Prevention Program: Check & Connect

The Check & Connect[70] model, developed through a partnership between the University of Minnesota, local public schools, and local community service organizations, was originally funded by the Department of Education. The Check & Connect model "was initially developed for urban middle school students with learning and behavioral challenges and was designed to promote students' engagement with school and learning, and to reduce and prevent dropping out. The model is currently being replicated and field-tested for youth with and without disabilities in

grades K–12 in urban and suburban communities."[71] Broadly speaking, Check & Connect works with and coordinates services among the student, family, school, and community to help the student succeed and stay in school.

The signature feature of Check & Connect is the assignment of a "monitor" to each student in the program to be the student's mentor and case worker. In the Check component, the monitor continually assesses the student's school performance, including attendance, behavior, and academics. Monitors are trained to follow up quickly at the first sign that a student is struggling in any of these areas. The Connect component combines individualized attention to the student with the coordination of services and information about the student across school personnel, family, and community service providers. The program carries a minimum two-year commitment to students and families, including the promise and ability to follow highly mobile youth from school to school so that students do not lose services when they move from their original program site.

In two separate experimental evaluations, Check & Connect showed positive effects on staying in school and progressing through school. One study showed that ninth-grade students enrolled in Check & Connect were substantially less likely than control group members to have dropped out of school by the end of the year—9 percent compared with 30 percent. Another study showed that by the expected graduation year, 39 percent of students in the Check & Connect treatment group had dropped out of school compared with 58 percent of the control group. The high dropout rate associated with both groups indicates the level of dropout risk present in the population targeted by Check & Connect. The cost of implementing the

Check & Connect model was about $1,400 per student during the 2001–02 school year.[72]

The School-within-a-School Model: Career Academies

Career academies are another intervention that rigorous evidence shows effective in lowering dropout rates, at least for students most at risk of dropping out.[73] The career academy model has three key features. First, it is organized as a school-within-a-school: students in a smaller and more personal learning atmosphere stay with the same teachers over the three or four years of high school. Second, it includes both academic and vocational coursework, with the two integrated in the curriculum and in pedagogy. And, third, it uses partnerships between the academy and local employers to build links between school and work and to provide students with career and work-based learning opportunities.

Begun in the 1970s, the career academy model has both evolved in concept and grown in numbers over time. Today some 1,500 career academies nationwide serve a much wider set of students than the "vocational ed" students who were seen as the original constituents of the academies.

The most important study of career academies is an experimental evaluation of more than 1,700 students who applied for admission to one of nine career academies across the nation. The study found that among high-risk youth, the career academies reduced the baseline dropout rate of 32 percent by 11 percentage points and that in the students' projected twelfth-grade year, 40 percent of the high-risk academy students had earned enough credits to graduate compared with only 26 percent of the high-risk students in the control group.[74] The best cost estimates are that in 2004 the per-pupil cost of

educating a student in a career academy was $600 more than the average per-pupil cost of non-academy students.[75]

High School Reform Models: Talent Development High Schools

High school reform models do not usually state "dropout prevention" as the sole objective for school restructuring. Nevertheless, these reform models often have goals related to dropout prevention, in particular increasing students' school engagement and academic achievement. Common components of many reform models include: reorganizing schools into smaller "learning communities"; focusing instruction and curricula on careers or on intensive or high-level English and math instruction, or both; increasing family involvement; and sometimes focusing on a college preparatory curriculum for everyone.

Many different reform models have been tried over the years, most without rigorous evidence of success. One exception is Talent Development High Schools (TDHS), a reform model for large high schools that face persistent problems with student attendance, behavior, performance, and dropout rates. The model, developed at Johns Hopkins University, calls for schools to reorganize into small learning communities that feature a curriculum designed to prepare all students for high-level English and math courses, along with measures to increase parent and community involvement in the school. Begun as a partnership between Johns Hopkins and a high school in Baltimore, the TDHS program now includes schools in forty-three districts in fifteen states across the nation.[76] The added cost is about $350 per student per year.[77]

A research design that followed twenty cohorts of ninth graders for up to four years

in high school in Philadelphia found that 68 percent of the students in TDHS schools were promoted to tenth grade compared with 60 percent of the comparison group.[78] These positive TDHS findings are notable as it has been hard for high school restructuring efforts to document positive results on outcomes of interest, including keeping students in school. At the same time, the findings should probably be viewed with some caution because they are based on a quasi-experimental research design.

Other Programs

As noted, there are many, many dropout-prevention programs, most of which are "stand alone" programs and many of which are much larger than either ALAS or Check & Connect. As examples, the Valued Youth Program served 108 schools in twenty-four cities in the United States and Brazil during 2002–03, along with an unknown number of schools in Great Britain; the Teen Outreach Program served more than 13,000 students across sixteen states during the 2001–02 school year.[79] These and other larger-scale programs, however, have not been rigorously evaluated, and thus in spite of their apparent popularity, their effectiveness in reducing dropout rates remains unknown.

One program that has been rigorously evaluated through random assignment is the Quantum Opportunities Program (QOP). An intensive and relatively expensive program that offers comprehensive services that begin in the ninth grade, QOP can last for up to five years, providing services even after a student drops out. In six of seven QOP demonstration sites, the cost of the program ranged from $22,000 to $28,000 per enrollee (in 2006 dollars) over the full five years of the demonstration, and labor costs in another QOP demonstration site made the program

there even more expensive. In spite of the high costs and intensive nature of the QOP model, experimental evaluations do not offer evidence that QOP participants were more likely to advance in or complete school than were the control group non-participants.[80] These examples suggest that one cannot use a program's popularity or size, cost, or even intensity as evidence of effectiveness.[81]

Although common risk factors are important in helping to identify potential dropouts, they are relatively inefficient predictors of who will in fact drop out.

Summary

An examination of the dropout-prevention interventions that show measurable results shines some light on what it likely takes to reduce a student's chance of dropping out. Successful programs have some or most of five elements in common. The first element is close mentoring and monitoring of students. With restructuring models, this mentoring occurs as part of the movement to smaller schools or to school-within-a-school models. The normally high adult-student ratio in a smaller learning environment would have to be higher still to reach the level of monitoring found, for example, in Check & Connect. In the High School Redirection model, teachers are encouraged to serve as mentors as well as instructors, and classes are kept small to foster high levels of individual attention. The second element is case management of individual students. Again,

case management is most likely to happen in a restructuring model with a movement to a smaller learning community. The remaining three elements are family outreach; curricular reforms that focus either on a career-oriented or experiential approach or an emphasis on gaining proficiency in English and math, or both; and attention to a student's out-of-school problems that can affect attendance, behavior, and performance.

In closing, we note one complication in designing and implementing dropout-prevention programs. Namely, although common risk factors are important in helping to identify potential dropouts, they are relatively inefficient predictors of who will in fact drop out.[82] For example, the risk factors that best predict dropout for high school students are high absenteeism, being over-age by two years, having low grades, and having a child. Using these factors should help identify a group of students with the highest probability of dropping out. Mark Dynarski and Philip Gleason found that these factors would in fact identify a group where one in three students would actually drop out. Although this rate is higher than the baseline 15 percent dropout rate that Dynarski and Gleason find based on the full sample of high school students, one could still question the use of these predictors to assign students to dropout-prevention programs. After all, a program serving students based on these predictors would serve many students who would not need the services and would fail to serve many students who would need them.[83] Because most programs use a common set of risk factors to target students for intervention, Dynarski and Gleason's work helps to explain why so few programs show positive results, and it challenges program designers and practitioners to develop better ways to identify potential dropouts.

Second-Chance Programs

Many national education systems around the world tend to channel students into particular pathways at an early age, with few opportunities for mid-course corrections. In contrast, the decentralized U.S. system has relatively porous boundaries between different "paths" through the system and, in particular, tends to offer "second-chance" options that can allow for mid-course corrections. We now look at the second-chance options for students who have made the dropout decision.

As measured by sheer numbers, the most important second-chance option for dropouts is, by far, the GED program. Conceived and developed in the late 1940s as a way to certify that returning World War II veterans who had left their high school classrooms to serve in the war were ready for college or the labor market, the program has grown from 50,000 test takers in 1955 to about 670,000 individuals who attempted the exams in 2007.[84]

As noted, GED holders do not fare as well as regular high school graduates in the labor market, and they get much less postsecondary education. What do these findings say about the GED as a second-chance option for dropouts? The answer is that it depends on the skills that are in place when one drops out of school. For an academically able student who leaves school with a solid set of basic cognitive skills, there is little advantage to acquiring a GED *except* to move into postsecondary education.[85] Because the academically able person can probably pass the GED exams with little extra effort or preparation, the GED is unlikely to lead to extra human capital accumulation.

On the other hand, for a person who leaves school with poor reading, writing, or math

skills, it may take substantial work and time to improve these skills enough to pass the exams. For such a person, pursuing a GED could increase marketable skills, making the GED a valuable second-chance option. To the extent that the market rewards these skills, such students could expect better labor market outcomes.[86]

Although the GED is the preeminent second-chance option, students who have left school also have opportunities to get a regular high school diploma, typically in an alternative school operated by the school district. These alternative schools structure coursework and class time to better accommodate the work schedules and parenting responsibilities of students who have left or are contemplating leaving school.

In New York, for example, thirty "transfer high schools" in the 2007–08 school year served some 9,000 students. These alternative schools, which operate out of the Office of Multiple Pathways to Graduation in the New York City Department of Education, are designed for students who are "over-age and under-credited or have dropped out of school."[87] As this target population shows, the line between dropout prevention and second-chance option is not always distinctly drawn: some programs and schools serve both purposes.

A second alternative school option in New York is the Young Adult Borough Centers (YABC), evening academic programs for students "who might be considering dropping out because they are behind or because they have adult responsibilities that make attending school in the daytime difficult."[88] In the 2007–08 school year, twenty-two YABCs served about 5,500 students. When students earn all required credits and pass all required exams, they are awarded a diploma from their regular high school.[89]

New York's transfer high schools and YACBs, like most other alternative school programs such as Chicago's Evening High School Program, try to address dropout risk factors that are more difficult for more traditional high schools to address. Alternative schools tend to be smaller and to have lower student-teacher ratios. They try to offer a more individualized and personalized education experience, and they are often characterized by flexible course scheduling or non-traditional school hours, or both. These schools also tend to offer more support programs for students, such as child care for teen parents, and they often focus on connections to college or work, or both. Although alternative high schools are increasingly seen as an important tool for both dropout prevention and dropout "recovery," researchers as yet know little about how well these schools achieve stated goals.

There are two other routes to a high school diploma for students who have dropped out of school. One requires the student to earn the necessary high school credits that were lacking when he or she left school. These credit-earning programs are often delivered by community-based organizations that have an agreement with a sanctioned diploma-granting organization such as the local school district or with the state department of education. No hard data exist on the numbers of students who receive a high school diploma by going back and earning the necessary credits.

A second route to a high school diploma for school dropouts is through programs that allow individuals to demonstrate that they have high school–level skills. Although some

states have developed and offer a diploma program that relies on demonstration, a national program has been in existence since 1979. Students in the National External Diploma Program (NEDP) demonstrate their high school–level skills by "applying their life experiences in real-life situations."[90] When an NEDP assessor certifies that the applicant has met benchmark skill levels, the cooperating school district awards a high school diploma. This alternative high school diploma program is as yet a very minor part of the second-chance landscape; only 1,700 people nationwide earned a high school diploma through the NEDP program in 2006–07.[91]

In terms of both human capital accumulation and education credentialing, the nation's community colleges provide another second-chance option for dropouts. Most community colleges have an open-enrollment policy combined with placement exams that determine whether applicants are ready for postsecondary education credit programs or whether they first need to complete remediation courses to raise their skill levels. Open admission policies, combined with relatively low tuition and an array of remedial courses, make community colleges a potentially viable second-chance option for school dropouts who wish to move directly into postsecondary education.

Of course many dropouts may well need more from a second-chance program than human capital accumulation or education credentialing. Given the many different factors that are often associated with the dropout decision, dropouts often need help with non-academic issues to get their life back on track. Since most program evaluation studies have focused on the effectiveness of programs in reducing dropout rates or improving educational attainment or labor market outcomes, researchers have little information on how existing programs achieve these goals by improving the overall quality of life of dropouts.

Conclusion

In a world in which education is becoming ever more important, finding solutions to the dropout problem is one of the most pressing issues facing America's high schools. A first step on this path is to accumulate data that will allow for a more accurate depiction of the dropout problem. Most states now have data systems in place that assign unique identification numbers to public school students. These student IDs can be used to link students to school enrollment and graduation data, providing a way to produce accurate enrollment and graduation statistics for students who remain in public schools in the state. These state-by-state systems rarely allow the accurate tracking of a student who leaves a school in one state to re-enroll in another state—a problem given the relatively high dropout rates associated with student mobility. At the same time, states are still likely to be able to obtain rather accurate graduation and dropout statistics because the prevalence of across-state moves for school-leaving-age students is relatively low. The ideal solution would be a national student identifier akin to Social Security numbers that would allow for dropout statistics from the national to the state to the individual school level.

Even if the United States were to move to a national student ID system, it would still be necessary to settle on how the GED credential should be viewed in computing dropout statistics. Should students who are enrolled in high school in a GED Option program be counted in enrollment statistics?

Should students in these programs who get their GED while still enrolled in high school be counted as high school graduates or as dropouts or as partially-weighted high school graduates? How should students who drop out of school and obtain out-of-school GEDs "on time" for their graduation cohort be counted when it comes to computing dropout rates? Given the many students who obtain a GED, answers to these questions will have a large effect on ultimate dropout statistics. Given the evidence indicating that dropouts with the GED credential do not do as well in the labor market, or pursue postsecondary schooling to the same extent, as traditional high school graduates, treating GED holders as equivalent to high school graduates seems inappropriate.[92]

Finally, what is to be done to lower dropout rates and increase high school graduation rates? The research base for answering this question is woefully inadequate. Although hundreds of dropout-prevention programs exist, from small, discrete programs to whole-school reform models, little hard evidence reveals what does and does not work to decrease the probability of dropping out. The direction for future research is thus clear: more rigorous studies of dropout-prevention strategies are needed. Studies that take advantage of lottery assignment mechanisms in programs that tend to have more applicants than places can produce powerful results that can withstand scrutiny. Likewise, pilot programs can often be designed to generate a rigorous and convincing evaluation, as did the previously discussed ALAS program in San Diego.

Increasing the minimum school-leaving age is another possible, partial, policy solution to the dropout problem. States vary both in minimum school-leaving age, between sixteen and eighteen, and in the extent to which they offer exemptions to the rule based on, for example, parental consent or student-related work reasons, or both.[93] Research has quite consistently shown that students in states with a higher school-leaving age stay in school longer.[94] But before concluding that all states should raise to eighteen the age at which students may legally leave school, it is necessary to recognize that the most recent research indicates that raising the minimum drop-out age above sixteen will not fix the dropout problem. Philip Oreopoulos estimates that such a change would decrease the dropout rate about 1.4 percentage points.[95] He also finds that enforcing the school-leaving age is a factor and recommends that "if states are serious about lowering dropout rates through compulsory schooling, they need to better enforce these laws." Overall, minimum school-leaving-age policies appear to be a tool that, used properly, can have some, but not a large, effect on dropout rates.

Although researchers have much to learn about which dropout-prevention programs work, they do know that trying to keep students in school is not cheap. They have also learned, however, that the costs to society of each student who fails to graduate from high school are high. What lies ahead is learning not only how to keep students in school, but also how to muster the public will to fund and support programs that are proven effective in doing so.

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61. National Dropout Prevention Center/Network (www.dropoutprevention.org/ndpcdefault.htm [March 15, 2008]).

62. Mark Dynarski and Philip Gleason, "How Can We Help? What We Have Learned from Evaluations of Federal Dropout-Prevention Programs," Report for the U.S. Department of Education (Princeton, N.J.: Mathematica Policy Research, Inc., 1998).

63. Ibid. Dynarski and Gleason go on to say that this result is consistent with what was found by two earlier U.S. Department of Education–sponsored evaluations of other dropout-prevention programs.

64. Institute of Education Sciences, "Dropout Prevention: Overview," What Works Clearinghouse (http://ies. ed.gov/ncee/wwc/reports/dropout/topic/ [March 15, 2008]).

65. Because participation in dropout-prevention programs is not a random event, simple comparisons of dropout statistics between program participants and nonparticipants are unlikely to provide information on the true effectiveness of programs. In general, program evaluation studies are considered to be "rigorous" if the study design is either a randomized, controlled experiment or is a strong quasi-experimental design.

66. Institute of Education Sciences, "Dropout Prevention Overview" (see note 64).

67. A sixth intervention, Financial Incentives for Teen Parents to Stay in School, also showed some positive dropout-reduction results. However, this intervention is part of state welfare programs and thus not a dropout-prevention program per se.

68. K. A. Larson and Russell W. Rumberger, "ALAS: Achievement for Latinos through Academic Success," in *Staying in School. A Technical Report of Three Dropout Prevention Projects for Junior High School Students with Learning and Emotional Disabilities,* edited by H. Thornton (Minneapolis: University of Minnesota, Institute on Community Integration, 1995).

69. Institute of Education Sciences, "WWC Intervention Report: High School Redirection," What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/pdf/WWC_HS_Redirection_041607.pdf [March 10, 2008]).

70. Information on the Check & Connect program was largely synthesized from information found on the Check & Connect website at http://ici.umn.edu/checkandconnect/.

71. Check & Connect, "Check & Connect: A Model for Promoting Students' Engagement with School" (http://ici.umn.edu/checkandconnect/ [July 1, 2008]).

72. Institute of Education Sciences, "WWC Intervention Report: Check & Connect," What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/pdf/WWC_Check_Connect_092106.pdf [March 15, 2008]).

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74. James J. Kemple, "Career Academies: Long-Term Impacts on Labor Market Outcomes, Educational Attainment, and Transitions to Adulthood" (New York: MDRC, 2008). We note two additional facts about the career academies evaluation. First, among moderate- to low-risk students, there were no differences in dropout rates or earned high school credits between the academy and non-academy students. Second, a longer-term follow-up study found no differences between academy and non-academy students in terms of high school completion. We note, however, that high school completion in the later study included both receiving a high school diploma and obtaining a GED.

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76. Center for Social Organization of Schools, "Talent Development High Schools" (www.csos.jhu.edu/tdhs/about/model.htm [March 15, 2008]).

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79. C. A. Lehr and others, "Essential Tools: Increasing Rates of School Completion: Moving from Policy and Research to Practice" (Minneapolis: University of Minnesota, Institute on Community Integration, National Center on Secondary Education and Transition, 2004).

80. Institute of Education Sciences, "WWC Intervention Report: The Quantum Opportunity Program," What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/pdf/WWC_QOP_070207.pdf [March 15, 2008]).

81. We note that an early study of a QOP pilot program did show positive results, but flaws in this study leave one uncertain as to the reliability of the results.

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84. General Educational Development Testing Service, "1980 GED Statistical Report" (Washington: American Council on Education, 1981); General Educational Development Testing Service, "2006 GED Testing Program Statistical Report" (Washington: American Council on Education, 2007); National Center for Education Statistics, "Digest of Education Statistics: 2006" (U.S. Department of Education, 2007).

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89. School and enrollment information on New York's transfer high schools and YABCs was provided via personal communication on July 1 and July 2, 2008, with John Duval of the Office of Multiple Pathways to Graduation in the New York City Department of Education.

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91. In 2008, about $573 million in federal funds were directed toward adult education programs for individuals of all ages who lack a high school diploma. See U.S. Government Office of Management and Budget, "Budget of the United States Government, Fiscal Year 2008" (www.whitehouse.gov/omb/budget/fy2008/pdf/budget/education.pdf [July 16, 2008]). Unfortunately, there are few rigorous evaluations of the effectiveness of the adult education programs toward which these funds are directed.

92. Cameron and Heckman, "The Nonequivalence of High School Equivalents" (see note 5); Tyler and Lofstrom, "Is the GED an Effective Route to Postsecondary Education for School Dropouts?" (see note 5).

93. National Center for Education Statistics, "Digest of Education Statistics: 2006" (U.S. Department of Education, 2007).

94. Joshua D. Angrist and Alan Krueger, "Does Compulsory School Attendance Affect Schooling and Earnings?" *Quarterly Journal of Economics* 106, no. 4 (1991): 979–1014; Philip Oreopoulos, "Should We Raise the Minimum School Leaving Age to Help Disadvantaged Youth? Evidence from Recent Changes to Compulsory Schooling in the United States," in *An Economic Framework for Understanding and Assisting Disadvantaged Youth,* edited by Jonathan Gruber (Cambridge, Mass.: National Bureau of Economic Research, forthcoming 2009).

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Improving Low-Performing High Schools: Searching for Evidence of Promise

Steve Fleischman and Jessica Heppen

Summary

Noting that many of the nation's high schools are beset with major problems, such as low student reading and math achievement, high dropout rates, and an inadequate supply of effective teachers, Steve Fleischman and Jessica Heppen survey a range of strategies that educators have used to improve low-performing high schools.

The authors begin by showing how the standards-based school reform movement, together with the No Child Left Behind Act requirement that underperforming schools adopt reforms supported by scientifically based research, spurred policy makers, educators, and researchers to create and implement a variety of approaches to attain improvement.

Fleischman and Heppen then review a number of widely adopted reform models that aim to change "business as usual" in low-performing high schools. The models include comprehensive school reform programs, dual enrollment and early college high schools, smaller learning communities, specialty (for example, career) academies, charter high schools, and education management organizations. In practice, say the authors, many of these improvement efforts overlap, defying neat distinctions. Often, reforms are combined to reinforce one another.

The authors explain the theories that drive the reforms, review evidence of their reforms' effectiveness to date, and suggest what it will take to make them work well. Although the reforms are promising, the authors say, few as yet have solid evidence of systematic or sustained success.

In concluding, Fleischman and Heppen emphasize that the reasons for a high school's poor performance are so complex that no one reform model or approach, no matter how powerful, can turn around low-performing schools. They also stress the need for educators to implement each reform program with fidelity to its requirements and to support it for the time required for success. Looking to the future, the authors suggest steps that decision makers, researchers, and sponsors of research can take to promote evidence-based progress in education.

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Steve Fleischman and Jessica Heppen

Improving the nation's high schools, particularly those that are low-performing, is a task whose challenges are far easier to catalogue than to surmount. Readers familiar with the current state of American high schools, and efforts to improve them, can cite their own favored grim statistics and stories that illustrate the extent of the problem. Many of those stories and statistics may be gleaned from companion pieces in this volume.

In this article we take a cautiously optimistic approach that highlights promising—but not proven—reform programs and strategies for turning around what many consider a failed education system. Our optimism is based on our own research review work, in which we have identified several comprehensive school reform models that we found to be demonstrating notable improvements, particularly in high-poverty, low-performing schools. As well, we are heartened by the increasing amount of evidence being produced through high-quality studies, including randomized trials. One example is the strong evidence of positive effects now available for career academies. Finally, we are impressed by the increase in options available to those interested in high school improvement. We leaven our optimism with a call for all reformers to consider the evidence and take into account the particular needs and circumstances they confront before adopting any models.

In this article we identify some approaches that *may* help to achieve the goal that all students will attend, stay and succeed in, and then graduate from high school well prepared for further learning, successful careers, and engaged citizenship. In particular, we focus on reforms targeted at the nation's lowest-performing high schools, although the same approaches could be used in many of the country's more than 18,000 high schools.

We begin by placing the search for effective programs to improve high schools within the context of the two-decade evolution of the standards-based reform movement, a movement that simultaneously exposed the flaws of the education system and helped policymakers and educators create a road map for improving it. With reformers constantly defining, demanding, and measuring better performance, educators set about imagining and implementing a variety of approaches to meet this goal.

Against the backdrop of standards-based reform, we review the promise of some leading reform models, such as comprehensive school reform, charter schools, and smaller learning communities. By model we mean a set of specified practices or ideas that have been, or are intended to be, replicated widely. Models typically have a group of coherent elements, driven by an expectation that these elements—when well executed—will accomplish a desired goal, such as to reduce dropouts or improve student achievement.

Some models are instructional in focus. "Ninth-grade academies," for example, provide special "catch-up" courses and curricula for students who arrive at high school academically unprepared. Other models, such as smaller learning communities, in a general sense seek to reform the way in which the high school is structured. Still others—such as charter schools, education management organizations, and some comprehensive school reform programs—focus at least in part on how schools are governed. In practice, many reform efforts overlap, defying neat distinctions. Often, reforms are combined to reinforce one another, as when a

charter high school seeks to be a small school, or introduces a ninth-grade-academy format and extends the school day or school year.

We identify some approaches that may help to achieve the goal that all students will attend, stay and succeed in, and then graduate from high school well prepared for further learning, successful careers, and engaged citizenship.

We explain the theories that drive these structural and programmatic reforms, review evidence of their effectiveness to date, and suggest what it will take to make them work well. When reviewing the evidence, we discuss its quality and quantity and point out any potential problems that make it difficult to draw conclusions regarding the effectiveness of an individual model or the class of intervention it represents.

We stress from the outset that no one reform model or approach, no matter how powerful, can turn around low-performing schools. The reasons for a high school's poor performance are complex and cannot be addressed piecemeal. Furthermore, as many experts have pointed out, school-based reform can have only limited effects on improving educational attainments and reducing societal inequalities. As a group of leading sociologists pointed out recently, narrowing the nation's education gaps "requires reducing poverty, as well as

improving the schools that poor children attend."[1] Because no one reform can get the job done by itself and schooling cannot attain all the improved outcomes we seek, we hope that the efforts we review here will be seen as parts of the solution, to be used judiciously and in comprehensive reform efforts that give due consideration to the contexts in which the changes are implemented.

Understanding Improvement Options

By exposing the failure of the nation's school system to provide all students with acceptable levels of education, the assessment and accountability measures of standards-based reform—including those embodied in the No Child Left Behind Act (NCLB)—have served as a dynamic engine, driving the search for demonstrably more effective programs and practices for low-performing schools. The desire to find evidence-based solutions has been further energized by the NCLB requirement that underperforming schools adopt reforms supported by "scientifically based research."

Particularly in high schools, however, the search for and implementation of effective reforms are complicated by the many challenges that schools face, such as the low reading and math achievement of entering students, the high dropout rates, the growing numbers of English-language learners, the lack of safety in some schools, the inadequate supply of effective teachers in the neediest schools, and the intense focus and effort required to restructure complex organizations.

It is not surprising that in this environment a great many reform approaches have arisen, each promising to address the challenge of improving high schools. In this section, we review a range of reform models. Our

definition of "model" is intentionally loose and reflects our experience with how both education decision makers—such as school board members, superintendents, central office administrators, principals, and school staff—and federal and state policy makers think about their improvement options.

When decision makers consider effective reform approaches, they do not make the fine distinctions that researchers might make. Decision makers with whom we have worked over the past decade are much more eclectic in their consideration of options. Thus, they may at the same time explore whether to adopt a program such as First Things First, or an education management organization, or a homegrown professional-development initiative to promote greater literacy for entering high school students, or whether to split a large school into smaller academies or convert it into a charter school. In fact, NCLB may promote this eclectic approach by outlining five equivalent options for "restructuring" the schools that are most persistently the lowest performing.[2]

Our review of reforms is not exhaustive. Our selection of approaches to highlight is based on our research regarding key challenges faced in improving high schools and on our professional judgment regarding which options are most prevalent across the country and which models decision makers are most likely to consider in the coming years.[3] We have examined research on evidence-based reforms as well as "gold standard" research reviews produced by organizations such as the What Works Clearinghouse.

We seek to avoid the "either-or" thinking that often prevails in education. For example, reformers seeking to improve high schools need not choose between improved

professional development or smaller schools. Furthermore, we argue that all schools must have strong curricula and instruction in place, as well as ways to meet the nonacademic social and emotional needs of students. Each model we review has strengths and limitations. A combination of several models may be needed for success. In our conclusion, we return to the need for coordinated systemic solutions.

Making Evidence Matter

More than ever, education decision makers considering reform approaches are asking two questions. Does it work? How do we know? As yet, the growth of evidence on the effectiveness of reform models has not caught up with educators' understandable desire to have multiple research-proven options. A number of randomized controlled trials, considered the "gold standard" in evaluation research, have already provided evidence regarding the promise of some approaches, such as career academies.[4] Other rigorous studies are now under way. Through our own work at the American Institutes for Research's Comprehensive School Reform Quality Center we have rated the quality and effectiveness of eighteen leading middle school and high school comprehensive school reform models and examined factors that may contribute to their success.[5] In addition, the What Works Clearinghouse continues to review evidence regarding the effectiveness of dropout-prevention programs and may focus on other high school topics in the future.[6]

But despite the encouraging growth of research on the effectiveness of high school reform models, the evidence is still quite limited both in quantity and quality. For example, in our report on middle and high school comprehensive school reform models, we identified more than 1,500 potential

studies to review; of these studies, only forty-two met our standards for quality and rigor. Even when studies are conducted using rigorous methods, judging a model's impact can be very difficult, given the complexity of the reform models, the variability of settings in which they are implemented, and the importance of implementation as a significant variable affecting outcomes. Furthermore, in many evaluations of school reforms, the measures used to evaluate the impact are not aligned with the outcomes that the reform model seeks to affect. An additional challenge is timing—school reforms are dynamic, and even the best research studies are able to capture them only at distinct points in time.

Recognizing the pressure to improve high schools and the current limits of the evidence base, we recommend that policy makers take a "best available evidence" approach to selecting from among viable alternatives. Policy makers should judiciously weigh existing rigorous evidence, along with other important considerations, such as the support that the model has in the local education community, the "readiness" of a school or district to incorporate a reform into other efforts already under way, and the commitment and ability of an external service provider or the district to provide the long-term implementation support necessary for success. In the end, ignoring rigorous evidence means risking disappointment, but waiting until "all the evidence is in" does not meet the urgently felt need for positive action.

Reviewing the Models

In what follows, we review a number of widely adopted approaches to changing "business as usual" in low-performing high schools. The models include comprehensive school reform (CSR) programs, dual enrollment and early college high school (ECHS),

smaller learning communities, specialty (for example, career) academies, high school charter schools, and education management organizations (EMOs). Although these approaches represent many of the most prevalent whole-school efforts to reform low-performing high schools today, we stress that this is not a comprehensive review of all of the high school reform models available. For example, many dropout-prevention programs exist, and some, such as the Check & Connect program, show compelling evidence of effectiveness. Other programs focus on improving literacy (for example, supplemental literacy programs such as SRA Corrective Reading and Language! and literacy programs across content areas, such as the Strategic Instruction Model) and on reducing school violence (for example, Positive Behavior Supports). Other models have been locally developed.

These approaches vary widely in their assumptions about how they will bring about improvement. Few have solid evidence of systematic or sustained success. For example, high school CSR models—such as America's Choice, Coalition of Essential Schools, First Things First, High Schools That Work, Project GRAD, and Talent Development High Schools—present themselves to schools as effective programs. But in our 2006 review of leading middle and high school whole-school reform models (that includes those listed above), we found just five widely adopted models that we felt had a solid body of evidence regarding their effectiveness.[7]

To succeed, policy makers must match carefully the models they choose to the outcomes they seek to promote. To help orient readers and support policy makers' matching process, we propose a two-part decision-making framework. First, decision

makers should consider five outcomes that any chosen model should be designed in part, or in whole, to help achieve. Second, they should consider the instructional, structural, and governance elements within each model.

The five reform outcomes, drawn from research on secondary school reform conducted by MDRC, can be thought of as mediators of improvement.[8] Decision makers can use these five outcomes as a comprehensive road map for reform and as a way to consider which models help to meet their needs, singly or in combination.

To succeed, policy makers must match carefully the models they choose to the outcomes they seek to promote.

The first outcome is a personalized and orderly learning environment. Researchers have pointed out the importance of creating a school atmosphere that supports effective learning for all students. Such an atmosphere may be particularly important in large, comprehensive high schools where students can get lost in the crowd and thereby fail to receive the academic support they need. Impersonality may also contribute to behavioral problems and increased violence in schools. Efforts in this area are in line with the growing realization that successful schools focus on academic, as well as social and emotional, learning.[9]

The second outcome is the capability to assist students who enter high school with poor academic skills. Scores on the National Assessment of Educational Progress confirm that a significant percentage of students enter high school poorly prepared for academic success. Particularly troubling is weakness in the literacy and reading skills that form the foundation of most academic endeavors.[10] Almost all high school reform models recognize and seek to address these challenges.

The third outcome is improved instructional content and practice. Leading experts in standards-based reform consistently identify the lack of a strong instructional focus and effective practice as one of the central deficiencies in low-performing high schools.[11] The academically neediest students are often educated by the least well-prepared and least experienced teachers, in terms of teaching out-of-field and having fewer than five years of experience.[12] Some models reviewed below address this issue by providing new curricula and by offering extensive, targeted professional development.

The fourth outcome is the capability to prepare students for the world beyond high school. Many high schools are failing to prepare students well either for postsecondary education or for careers.[13] In today's global economy, students with only a high school education face far lower career earnings and greater chances of being unemployed than their college-educated peers.[14] Moreover, most of the good jobs being created in the new economy, particularly the best-paying ones, require postsecondary education. Some, but not all, of the models below address this desired outcome directly.

The fifth outcome is positive change in overstressed high schools. All high schools, being complex systems, are difficult to change. Low-performing schools offer all the

expected challenges of reforming an already complex organization, with the additional difficulty of having to do it in a setting with diminished administrative and instructional capacity and heightened physical disruption and psychological pressure. These challenges are often exacerbated by accountability demands and adverse publicity. Compared with reforming other schools, creating positive change in these low-performing schools may take more skilled leadership and time, greater moral and fiscal support from the district, efforts by external reform organizations, cultural changes in terms of expectations and behavior, and more staff learning of new habits, skills, and ways of doing things. Models reviewed below address the need to support change at the school level in a variety of ways, including by creating new or smaller schools.

In what follows, we describe reform models in ways that allow decision makers to compare how the models seek to achieve the five desired outcomes or mediators of improvement, what outcomes the models do not directly help to achieve, and whether the models do or do not now show evidence of effectiveness in helping improve high schools.

The second part of the decision-making framework involves the instructional, structural, and governance elements within each model. Models with strong instructional components focus on improving teaching and learning through refining a school's existing curriculum, introducing new and often more structured curricula, and providing professional development and other supports that enhance teacher quality. These models seek to strengthen both the content and delivery of instruction to provide a rigorous and relevant learning experience for all students.

Models with strong structural elements tend to focus their attention on how a school is organized to deliver educational services to students. Some model variants may, for example, extend instructional time in key subject areas, lengthen the school day or school year, create smaller learning communities within the larger school, reduce the size of the school, offer new ways to improve connections to the community, or break down the barriers between high school and college through strategies such as "dual enrollment."

Models with strong governance elements directly address the operations and management of schools and change how high schools are run—usually by creating new authority structures to run the schools. Leading examples of governance models are charters or third-party education management organizations that run schools. Changes often include personnel policies.

In practice, most models combine all three elements, but some focus predominantly on one. Because changes in all three may be required to achieve improved outcomes, decision makers should have clearly in mind which changes a model seeks to make and how well those changes align with local improvement plans. For example, high schools that struggle with student performance in particular areas such as literacy or mathematics should orient clearly toward improvement options with a strong instructional focus. High schools such as some of the nation's "dropout factories," which are struggling in all areas and are seeking to restore order, might consider models or third-party providers that address school governance. Finally, some of the lowest-performing high schools considering restructuring options might tend toward the primarily structural approaches, such as converting into smaller learning communities.

Characterizing models in this way gives decision makers a frame of reference that can help them match their most acute needs with potential solutions.

In what follows we provide summaries of a representative and illustrative set of high school reform options. For each, we indicate which of the reform elements (instructional, structural, governance) are typical features of the model, summarize its theory of action or approach to achieving the five desirable outcomes, and review the current evidence of its effectiveness.

CSR is intended to be systemic and to address every aspect of a school, from curriculum to scheduling to management to family and community involvement.

Although our comments regarding effectiveness are tentative, they are guided by the best available rigorous evidence and well-conducted evidence reviews. We rely heavily on the findings of several studies that we published in 2006 and 2007, which reported on systematic reviews of the evidence of effectiveness and quality of leading high school models and education management organizations. When the evidence base is still emerging, we point out the limits of what is known. In addition, although we seek to generalize the evidence of effectiveness of these models as a set or approach (for example, comprehensive school reform or specialized academies as a whole), individual programs that represent a model type vary widely in

effectiveness. Thus, for example, one type of specialized academy may be much more effective than another. Policy makers should use the following information as a way to orient their thinking about which reform options to pursue. They should also keep in mind that effective reform involves programmatic and nonprogrammatic changes in schools and that these changes are often beyond the scope of any model.

Comprehensive School Reform

Comprehensive school reform came into being during the 1980s but grew in importance during the late 1990s with the support of Congress, which created the Comprehensive School Reform Demonstration Program (later the Comprehensive School Reform Program), and with the sponsorship of New American Schools.[15] Although not a centerpiece of No Child Left Behind, it nevertheless remains a reform approach that has the support of major foundations and remains of interest in the education community. One indication of its prevalence is that more than 5,000 schools had implemented the eighteen models that we reviewed in 2006.

Whether implemented with the support of an external provider or through the efforts of individual schools or districts, CSR is intended to be systemic and to address every aspect of a school, from curriculum to scheduling to management to family and community involvement. Its integration of research-based practices into a unified program is designed to give a school's reform effort coherence—instructionally, organizationally, and culturally—leading to improved student achievement. Depending on their design philosophy, individual representatives of this approach vary in the level of curricular or structural support that they provide to a school. With some exceptions, such as the

School Development Program described below, CSR programs typically do not change governance structures in the schools. Some of the best-known CSR high school programs are America's Choice, Coalition of Essential Schools, First Things First, High Schools That Work, Project GRAD, and Talent Development High Schools.[16]

As one might expect from its name, comprehensive school reform seeks to achieve all five of the desirable high school outcomes.[17] Individual CSR programs differ, however, in how they meet these objectives; our discussion illustrates the range of solutions that they provide.[18]

To achieve personalized learning environments, for example, First Things First features theme-based smaller learning communities that bring a core group of students and teachers together for all four years of high school. To meet the same objective, the Talent Development High Schools program creates both a "Ninth-Grade Success Academy" and career academies at the upper high school grades. The America's Choice program organizes its high schools into small schools and "houses."[19] Taking a different approach to meeting this same goal, the Coalition of Essential Schools focuses on helping schools design their own approaches—through professional development, the creation of learning communities, and so forth—to meet ten core program principles, including "personalizing teaching and learning."[20]

Talent Development's ninth-grade academies also serve as an example of how some CSR programs seek to address the needs of students who enter high schools with weak academic skills. These academies offer catch-up courses and a "Freshman Seminar" to support the development of academic and

social skills necessary for high school success.[21] Another example is America's Choice, which offers "ramp up" courses in math and reading to accelerate progress for students who enter high school behind academically.[22]

CSR programs differ widely in whether they provide support to improve high school instructional content and practice. While many programs focus on professional development and creating teacher learning communities to improve instruction, few provide a curriculum. One model that does provide instructional content is America's Choice, which offers its own curriculum in reading, writing, and mathematics.[23] Another is the Talent Development High Schools, with the previously noted catch-up curriculum.

Talent Development High Schools and America's Choice also include "career academy" components intended to prepare students for the world beyond high school. In another approach, the High Schools That Work program merges the requirements for completing a college-preparatory academic core with those of completing a planned sequence of career courses or further academics. In this way, the program seeks to prepare students well for whichever postsecondary options they choose.

Leading CSR programs take a variety of approaches to help make positive change in low-performing high schools. In fact, many of these programs were created because reformers recognized that overstressed schools need external support to improve. Models provide such support in many ways. They provide training, professional development, change-process consulting, school-based coaching, and implementation visits. They promote innovative structures, such as academies or houses, and teacher professional learning

communities. They foster changes in structure, such as the introduction of block schedules, different forms of student assignment, and common planning time. Sometimes they foster changes in the way the schools are governed. For example, the School Development Program, created by James Comer, offers a structure and process for school improvement based on mobilizing teachers, administrators, and community members to support students' maturation along six developmental pathways: physical, cognitive, psychological, language, social, and ethical. Schools that adopt the program must alter their organization and governance to create three key structures to run the school: a school planning and management team, a student and staff support team, and a parent team.

Making overall statements about the effectiveness of CSR as an improvement approach for high schools is difficult. Nevertheless, several pieces of evidence suggest its promise.[24] Geoffrey Borman's 2002 meta-analysis of the evidence of effectiveness of twenty-nine leading CSR programs, including those operating at the high school level, synthesized 232 studies and concluded that the overall effects of CSR are significant and meaningful relative to effects of other interventions used in similar contexts.[25] Borman found that a significant factor in the strength of CSR models' effects is the maturity of the programs; that is, models in place for more than five years yielded the strongest effects. Because many experts believe that it is harder to improve high schools than elementary schools, we take a closer look at CSR outcomes at the high school level.

In our own 2006 systematic review of eighteen secondary CSR models, we gave four (America's Choice, First Things First, School Development Program, and Talent

Development High Schools) a rating of "Moderate" in the category of "evidence of positive effects on student achievement." We derived this rating from our review of findings reported in studies in which we have confidence based on their research designs (that is, studies with comparison groups and longitudinal designs). In most cases, the findings reported in these studies are a mix of positive effects and no significant differences in student achievement for students in schools implementing these CSR models compared with students in schools that are not. It is important to note that a rating of "Moderate" is the second highest rating achieved by any of the nearly fifty models we have reviewed.[26] Given the difficulty of improving low-performing schools and the relative newness of some of these models, we consider the finding that four programs are moderately effective in raising student achievement to be promising evidence for high school CSR.

Despite its promise, though, some caution is necessary. Although four programs did receive a "Moderate" rating, we gave several other widely adopted programs a "Zero" rating, indicating that we could find no evidence that they had positive effects on student achievement.[27] Decision makers must therefore choose carefully among CSR program options. And even the most comprehensive of these programs has gaps that must be identified and addressed to provide an effective total package of reforms for a school.

Dual Enrollment and Early College High Schools

Dual enrollment programs allow high school students to take college courses and earn credits toward an associate's or bachelor's degree. Once available only to students performing well beyond grade level, today dual enrollment is becoming increasingly

popular as a way both to reach a wider pool of students who can benefit from college coursework and to decrease the need for remediation in college.[28] Research has shown that postsecondary success is predicated on both rigorous academic preparation and a clear understanding of the expectations in college. Thus, state policy makers are increasingly turning to dual enrollment to accelerate learning and to bridge the transition to postsecondary success after high school graduation.[29]

Making overall statements about the effectiveness of CSR as an improvement approach for high schools is difficult. Nevertheless, several pieces of evidence suggest its promise.

State and local dual enrollment policies vary substantially in terms of tuition and eligibility requirements, funding, and program characteristics. Dual enrollment is primarily a structural reform approach, in that its focus is on aligning systems in K–12 with postsecondary goals. Unlike traditional high schools, many schools with dual enrollment opportunities operate on college campuses (approximately 80 percent in 2005).[30] Other dual enrollment programs are implemented in high schools or through distance-learning providers.[31] These structural differences produce variations in the instructional elements of reform—specifically, in the ways that high school students receive college-level instruction, including taking classes at the high school taught by college-accredited teachers and taking classes directly at the college.[32] Finally, implementing dual enrollment programs can also

involve a change in school governance. For instance, many dual enrollment high schools are also charter schools (for example, about one-third of schools participating in the Early College High School Initiative are charter schools), and the success of all dual enrollment programs requires partnerships with local community colleges and universities.[33]

Depending on their structure, dual enrollment programs seek to improve student achievement through all five of the desired outcomes for high school reform models. Most seek to create a personalized learning environment that is part of a college-going culture. For example, they often incorporate the use of "advisories" and other formal mentoring structures. Although some dual enrollment programs have entrance requirements, many assist students with poor academic skills by serving students who are traditionally underrepresented in postsecondary education.[34] To improve instruction and to prepare students for the world beyond high school (the third and fourth desired outcomes), the dual enrollment approach enables students to earn credits toward a high school diploma and toward a college degree concurrently, thus providing access to more rigorous curricula and instruction. By aligning the content and pedagogy with college expectations, the approach aims to help students become better positioned to succeed in college and beyond.[35] Finally, all of the reforms associated with implementing dual enrollment approaches seek to achieve the fifth desired outcome, eliciting positive change in overstressed high schools. In particular, implementation of dual enrollment programs emphasizes cultural changes in terms of expectations of students and adoption of new ways of supporting student success in increasingly challenging course settings.

No definitive evidence shows that dual enrollment programs are consistently achieving the objectives identified above, and there is not yet strong evidence of the overall effect of dual enrollment on student achievement and postsecondary outcomes. Correlational studies suggest that dual enrollment opportunities are associated with increased academic achievement and educational attainment.[36] For example, a U.S. Department of Education study reported in 2004 that earning college credits while in high school increases the likelihood of graduation and reduces the average time it takes to earn a college degree.[37] Because this study is a descriptive analysis of longitudinal data and does not include a control group, however, we have limited confidence in these findings, which may be explained by students' own self-selection into college credit–bearing courses while in high school.

Two specific dual enrollment programs that have been evaluated are middle college high schools and the Early College High School Initiative. Middle college high schools (MCHSs) are alternative high schools, located on college campuses, whose goal is to increase access to college among traditionally underrepresented students. They maintain small enrollments, aiming to personalize learning, and offer relevant, career-related course experiences to students. Instructional strategies include collaborative, peer-assisted learning groups, team teaching, and the use of alternative assessments, including portfolios.[38] One rigorous, experimental study evaluated a MCHS program implemented in the Seattle Public Schools in the early to mid-1990s.[39] The study found that dropout rates for students with access to the program were statistically equal to those of students in the control group (36 percent vs. 33 percent) and that a similar share of students in both groups earned a diploma or GED (40 percent vs. 38 percent). Based on this study, evidence is not strong that middle college high schools are effective at keeping at-risk students in school. However, it is worth noting that since the mid-1990s, the model has been revised and aligned with the early college high school model and to our knowledge, there are no newer or more definitive studies of current evidence of its effectiveness.

The Early College High School Initiative is a dual enrollment program developed by the Bill & Melinda Gates Foundation. Schools in the initiative adhere to an established set of core principles that includes providing students with the opportunity to earn up to an associate's degree or two years' worth of college credits toward a baccalaureate degree, finding public resources to cover the cost of the college credits, and rewarding mastery and competence in high school classes with enrollment in college-level courses. Targeting a student population that includes those who are traditionally underrepresented in postsecondary education, the initiative encompasses the broad goal of serving these students with more rigorous instruction, relevant curricula, and supportive relationships.[40]

A descriptive, longitudinal study is now examining the implementation and outcomes of this national initiative. The students attending the schools under study are recruited by the schools, all of which generally seek to enroll low-income students, students of color, and English language learners. Some of the schools have explicit selection criteria that include minimum (and maximum) achievement requirements for entrance.[41] Findings to date suggest that schools in the initiative are recruiting and enrolling low-income students and are serving student populations with minority compositions that exceed those of their feeder districts; however, survey

results also indicate that students attending early college high schools are more likely to have college-educated parents than the national average (in 2006–07, 33 percent of ECHS tenth-grade students had parents who graduated from college, compared with 17 percent of tenth-grade students on a nationally representative survey).[42]

The research also provides suggestive evidence that early college high schools can establish personalized learning communities involving students and teachers (based in part on high average attendance rates and other survey-based and qualitative measures of personalization). It also seems that students attending these schools are engaged academically and are taking college courses in sizable proportions, particularly in schools that are new "start-ups" (compared with those converted from existing schools) and schools that are physically located on the campus of a two- or four-year institution of higher education (compared with those not located on a college campus).[43] Because there is no comparison group, however, it is not possible to discern the extent to which the ECHS model as a whole produces positive outcomes for students. Students who attend these schools are clearly motivated to do so, as they self-select into the programs, and they would need to be compared to similarly motivated students not attending ECHSs to generate stronger evidence of effectiveness. Despite a lack of definitive evidence, the national-level descriptive studies of this widespread and growing high school reform model provide useful information about implementation and trends over time.

In general, dual enrollment programs are now widely used to increase access to college courses for a broader range of high school students. Exposing students, particularly at-risk students, to college campuses and college-going culture can potentially ease the transition to postsecondary education, as well as improve outcomes for students while they are still in high school. Although the full benefits of these programs are as yet unknown, the continued study of specific programs such as middle college high schools, early college high schools, and other programs that operate in states across the country should provide a clearer picture of the extent to which and the conditions under which dual enrollment approaches achieve the five desired outcomes of high school improvement.

Smaller Learning Communities

Smaller learning communities (SLCs) include a variety of school redesign initiatives intended to create smaller theme-based units of organization, including schools within schools, academies within buildings, and free-standing small schools. These communities include structures such as freshman academies organized around career interests or other themes, "houses" in which small groups of students are taught by a cadre of core-subject teachers and remain together throughout high school, and semiautonomous schools within a school.

This approach to high school reform is primarily structural in focus, although it can result in governance and instructional changes. Smaller learning communities are formed in differing ways, depending on funding sources and political and physical constraints. While small learning environments have many structural variations, among the most common and practical approaches is to divide an existing large high school into small units. These "conversion" strategies include schools within schools, which often take the form of subprograms within a host school, and schools within a building, such as

academies with career themes or curricular focus areas. The autonomy over scheduling, staffing, and budgeting varies for conversion SLCs. In some cases, even schools within a building can have their own principal; in other cases, administrators are shared. A free-standing small school is typically located in its own building and has its own principal and autonomy over budget. There is no universal agreement about the optimal size for small high schools, but free-standing small schools usually enroll fewer than 600 students.[44] Unlike redesigned large high schools broken into smaller units, free-standing small schools are often started up from scratch, typically beginning with one grade (for example, ninth grade) and adding grades over time. Furthermore, in many cases, high school reform into smaller learning communities also includes or emphasizes an instructional element. For example, the establishment of these communities with themes may require curricular reform that includes a shift in content and pedagogy.

The U.S. Department of Education's Smaller Learning Communities program, authorized under NCLB, awards grants for up to sixty months to local education agencies to plan and implement SLCs in high schools with more than 1,000 students. A recent report on schools in the first cohort (a total of 119 schools first funded in 2000) shows that the SLC structures most commonly implemented are freshman and career academies, followed by non-themed schools within schools.[45]

Of the five desired outcomes of high school improvement, personalization is the primary goal in creating SLCs. The underlying rationale is that the educational experience for students—particularly at-risk students—will improve when they attend smaller, more intimate schools where they feel known and cared for by their teachers and become more engaged in learning. While SLCs take many different structural forms, all share the objective of personalization for high school students. Personalization strategies enacted in the 119 schools in the federal SLCs program include the use of individual assessments, integration of a cooperative learning focus into the curriculum, mentoring programs such as teacher advisories and formal mentoring, and interdisciplinary teaming.[46]

Although changing the school structure to create a more personalized learning environment is a primary objective of SLCs, achieving this outcome is intended to be a catalyst for the other four desired outcomes for high school improvement. The idea is that changing the culture by decreasing the size of high schools will create the enabling conditions for schools and teachers to provide better supports for students who enter below grade level, to improve instruction, and in so doing, to better prepare students for postsecondary success. Together, these reforms are designed to elicit positive change in overstressed high schools (the fifth outcome), by promoting structural and cultural changes in low-performing high schools.

Some evidence is emerging that students in small high schools do experience benefits. Research on small schools over the past two decades generally indicates that smaller high schools can achieve the goal of personalization. Findings, from mostly descriptive and matched comparison studies, indicate that SLCs can provide more personal learning environments that reduce alienation of students and teachers, increase school safety, improve working conditions for teachers, and foster greater student engagement in school.[47]

Some studies suggest encouraging findings about the benefits of SLCs on student achievement outcomes, while others suggest mixed or even negative results.

Consistent with these findings, an analysis of seven-year trends among schools participating in the federal SLC program suggests positive trends in terms of student participation in extracurricular activities and ninth-grade promotion rates and downward trends in school violence, disciplinary action, and the use of drugs and alcohol.[48] The research further suggests that the size of the high school matters most for minority and low-income students.[49] In particular, several studies of high schools redesigned into SLCs in large U.S. cities—including Chicago, Baltimore, Boston, and New York—have reported improvements in school climate, culture, and student attitudes and short-term student outcomes including ninth- to tenth-grade promotion, in comparison with students in large comprehensive high schools.[50]

However, the effect of implementing SLCs on student achievement, graduation rates, and postsecondary success has not been definitively established with rigorous research. Two primary challenges emerge from a review of the evidence regarding the effect of school size on these student outcomes. First, many of the studies on school size are correlational in design, often based on large national databases. These studies

may use sophisticated methods, but they are unable to remove the possible bias that results from the facts that students and teachers self-select, rather than being assigned randomly, into schools and programs and that attrition from these programs is also nonrandom. Second, as noted, SLC is not a single program but rather a term that represents a variety of possible approaches, often in combination with other reform strategies, making it difficult to make overall statements regarding effects. So, although the research suggests that creating smaller learning environments can, indeed, foster more personalization, a definitive link from these changes to effects on student achievement in SLCs has not been clearly established with rigorous research.

Given these limits in the research, some studies suggest encouraging findings about the benefits of SLCs on student achievement outcomes, while others suggest mixed or even negative results. For example, a recent study in New York City reports that students in the New Century High Schools were more likely to graduate on time than students citywide.[51] Another recent evaluation of the formation of SLCs through the "Focus on High Schools" initiative in Boston Public Schools uses an interrupted time series design to examine outcomes for students before and after implementation of the initiative, over a twelve-year period. The key features of the initiative are the breaking down of Boston's twelve large comprehensive high schools into "educational complexes" of SLCs and a curricular and instructional focus on English and language arts. The estimated effects showed positive trends over time for outcomes related to student engagement such as absences, suspensions, and ninth- to tenth-grade promotion. But language arts and mathematics scores on the Massachusetts

Comprehensive Assessment System tests actually declined relative to the projected trend in the absence of the initiative.[52]

The Bill & Melinda Gates Foundation, among the many supporters of high school redesign strategies that focus on reducing school size, has invested more than $900 million in improving U.S. high schools since 2001. The foundation's High School Grants Initiative has provided grants to intermediary organizations tasked with redesigning existing schools and starting new high schools. Small school size is considered in this program to be a "necessary but not sufficient" condition for creating effective learning environments for students. A comparative, longitudinal evaluation of the initiative from 2001 through 2005 demonstrates that, as the foundation expected, implementing new schools is easier than converting existing schools. That is, free-standing small schools that start up from scratch seem better able to create conditions for learning that are consistent with the attributes of high-performing high schools than are schools within schools or schools within buildings that are converted from large, comprehensive high schools. Findings from this research indicate that students in foundation-supported new schools, but not in redesigned schools, exhibited positive trends (in attendance and in ninth- to tenth-grade progression rates). With some exceptions, however, average test scores in both new and redesigned high schools remained below district averages.[53] These findings are similar to those in the Boston study and were also replicated in a longitudinal evaluation of foundation-supported small school reform in Baltimore City Schools. There, students at new (called "innovation") schools outperformed comparison students in conversion high schools and large comprehensive high schools on state assessments in English and algebra.[54]

The evaluation of the foundation's High School Grants Initiative suggests, consistent with other research, that explicit attention to implementing instructional changes is vital to the effectiveness of SLCs.[55] This finding is echoed and emphasized in a recent report to the Gates Foundation that synthesizes current research and discusses the challenge of converting large high schools to SLCs.[56] It may be that instructional change is particularly difficult to achieve when large high schools are converted into smaller high schools, and this may partly explain why conversion SLCs are less likely to succeed.

It is important to note that the implementation of SLCs is a key program feature in several of the comprehensive reform models reviewed above, including Talent Development, First Things First, and High Schools That Work. Thus, the results demonstrated in evaluations of these models may be, at least in part, attributed to the use of SLC structure as a fundamental element. However, no study has established the contribution that SLCs make to the outcomes of comprehensive school reform models.

Specialty Academies

The formation of specialty academies, including career academies and academies with a curricular focus such as science, technology, engineering, and math, is often part of a structural change into SLCs. The units that result from downsizing a large, comprehensive high school often are formed around particular themes, although in many cases students and teachers are able to cross SLC boundaries. For the purpose of distinguishing this approach to high school reform from SLCs more broadly, we define specialty academies here as schools that are largely self-contained and committed to the career or curricular theme, so that most of the

experiences of the students are related to that theme. However, it is worth noting that most schools implementing SLCs are using career academies as their model.[57] Specialty academies are most focused on making changes to the instruction and structure of schools.

Specialty academies are designed to achieve nearly all of the five desired outcomes of high school improvement. In particular, they seek to create personalized learning environments, often with small enrollments and stable student-teacher groupings across grades. They also seek to address instructional content and pedagogy, focusing on particular curricular areas with increased rigor in some cases (for example, STEM academies, which feature science, technology, engineering, and math), and increased relevance in others (for example, career academies). This approach perhaps most specifically seeks to address directly the challenge and desired outcomes of preparing students for the world beyond high school, both for postsecondary education and for the world of work. Some types of specialty academies do include components of support for students who enter high school with poor academic skills; however, it is important to note that, depending on their eligibility and selection policies, selective academies may not address this desired outcome.

Career academies as a program have been in existence since 1969 and are now operating in more than 2,500 schools in the United States.[58] Career academies operate as a school-within-a-school structure, where students have the same teachers across grades, teachers have common planning time to share in decision making, and students take at least one occupational course each year related to their academy's career theme. Partnerships with local businesses are a key feature of career academies. Local employers provide internship opportunities for students and help schools in developing curricula for occupational courses.

A relatively strong body of evidence is available for the effect of career academies on student outcomes. Studies (mainly quasi-experimental) conducted between 1985 and 2000 suggest that students in career academies outperform non-academy students on measures of academic success in high school, although differences in postsecondary education and employment are less consistently positive and statistically significant.[59] However, it is important to note that these studies, although they use analytic techniques to control for observed differences between academy and non-academy students (for example, prior achievement), are not based on random assignment of students to career academies. For example, studies by David Stern and several colleagues found that students attending ten career academies in California posted higher attendance and grades, earned more credits, and were more likely to stay in school than matched comparison students.[60] Using propensity score matching, Marc Elliott, Lawrence Hanser, and Curtis Gilroy reported similar findings in a comparison of students in different types of academies located in large cities.[61] Although the outcomes after high school examined in this research are mixed, some positive findings reported in some studies include higher participation in postsecondary education for academy students, lower rates of college remediation, and higher rates of bachelor's degree completion, compared with statistically similar non-academy students.[62]

Because of its rigorous research design using random assignment, we have high confidence in the findings reported in a fifteen-year-long

evaluation of career academies conducted by James Kemple at MDRC.[63] In the early years of the study, the researchers found that the career academies model provided students with more support, career guidance, opportunities to take technical classes, and work experience than the schools attended by students not in career academies. Retention rates among high-risk students were higher among career academy students compared with their counterparts while still in high school. Although no effect was found on achievement scores while students were in high school or on postsecondary education attainment after high school, the analysis of long-term labor market outcomes reveals significant effects. The ten- and fifteen-year follow-up reports indicate that career academies produced positive and sustained effects on labor market outcomes, particularly for young men. Young men—even those at the highest risk of dropping out of high school—who attended career academies posted earnings 18 percent higher than non-academy students four years after they left high school. Eight years after leaving high school, career academy students (women and men) earned 11 percent more than non-career academy students; for men, real earnings for academy students were 17 percent higher (earnings were $3,731 higher per year on average over the eight-year period) than those for non-academy students.[64]

Based in part on the findings reported in MDRC's experimental, longitudinal study of career academies, the What Works Clearinghouse review of the effectiveness of career academies as a dropout-prevention intervention in 2006 concluded that the career academies model has "potentially positive" effects on staying in school and progressing in school but "no discernible effects" on completing school.[65]

Thus, promising evidence shows that the career academies approach can improve outcomes for students, particularly in the longer term. Not much evidence yet exists, however, on the potential effect of other types of specialty academies in attaining the goals of improving instruction in high schools and preparing students for the world beyond high school.

Thus, promising evidence shows that the career academies approach can improve outcomes for students, particularly in the longer term.

Charter Schools and Education Management Organizations

Charter schools and education management organizations (EMOs) epitomize an approach to improvement that focuses on how schools are run. Their approach suggests that, by altering their governance, schools will have greater opportunities to make required instructional and structural changes that can lead to improvement. The approximately 900 charter high schools[66] around the country reflect this approach, which is focused on governance reform and most directly addresses the desire to bring positive change to overstressed high schools.

The underlying rationale for charter schools is that autonomy and flexibility in governance, and the creation of market competition among schools, will allow charter schools to develop the attributes of effective schools.

Public charter schools are exempt from many state regulations but are held accountable for improving student achievement. This means that charter schools generally have greater fiscal control, more discretion over hiring and firing of teachers and school staff, and more freedom to implement programs (such as those reviewed in this chapter) than do traditional public high schools. In exchange for these exemptions, charter schools have agreements or contracts with state-approved authorizing agencies that make explicit the schools' accountability to demonstrate improved student achievement.[67]

Although charter high schools vary extensively in focus and operation, many share a mission that, in theory, addresses nearly all five desired outcomes for high school improvement. To foster a personalized and safe learning environment, many charter high schools are small in size and use strategies such as advisory programs to support students and improve student engagement. Often located in inner cities, charter high schools' primary goal is typically to create a safe environment for learning that provides social and academic support for traditionally underserved students.

EMOs are either for-profit or nonprofit education organizations that contract with new or existing public, charter, or private schools and school districts to provide comprehensive services to schools. These services include, but are not limited to, educational programming and administrative services. Educational programming includes curriculum design, professional development, and tools for student assessment. Administrative services include operation-management (for example, student enrollment, school marketing), financial management (for example, payroll assistance, budget oversight), facilities management (maintenance and use of facilities), and human resources management (hiring and training staff, staff benefits). Many of the services provided by EMOs are comparable to those offered by whole-school improvement providers, such as comprehensive school reform models.[68] EMOs are included in this discussion because they often run charter schools and, in addition, often manage low-performing schools for districts. Although not all charters are run by EMOs and EMOs do more than run charters, charters and EMOs share in common the fundamental premise that schools will be more successful if they are governed differently.

Many EMOs focus narrowly on administrative operations, but some take a more comprehensive approach and also address some or all of the five desired outcomes defined earlier. For example, the organizational structure of Edison's Whole School Management model is designed to create small, flexible schools within schools, known as academies ("Senior Academies" for students in grades nine to ten; "Collegiate Academies" for students in grades eleven to twelve), for the purpose of fostering a more personalized environment.[69]

Charter high schools and EMOs vary widely in the extent and ways in which they assist students who enter high school with poor academic skills. Charter high schools often implement strategies to involve parents and community members, some of whom become part of tutoring and mentoring programs.

Vast differences exist in how charter high schools and EMOs address explicitly the curriculum and instructional challenges that must be met to achieve the goal of improving content and pedagogy in high schools. Some charter high schools seek to make the

instruction rigorous, relevant, and innovative; many struggle to meet this goal.[70] Many charter schools implement other whole-school reform models. As noted, about one-third of current schools participating in the Early College High School Initiative are charter schools.[71]

Some EMOs do not address content and pedagogy at all; instead, they focus squarely on improving how the school is run. Other EMOs do address classroom practice. The Edison School design, for example, includes curricular programs, either selected or developed by Edison, for all core academic subjects. In the Senior Academy, curricula are designed to prepare students for advanced placement (AP) courses that are offered in the Collegiate Academy. To prepare students for college, Edison partners with Princeton Review to focus on SAT or ACT preparation and provides college and career counseling.

Research comparing outcomes of charter school students with those of students attending traditional public schools is emerging, but studies on the overall effectiveness of charter high schools are lacking. For example, a study on California charter high schools finds that, after adjusting for enrollment size and student characteristics, charters that are "classroom based" score higher than non-charters on performance indicators, including the percentage of students proficient or above on the California High School Exit Exam in English and Math.[72] These findings are suggestive but not at all definitive because students self-select into the charter schools, and factors other than their charter school experience may explain their higher performance.

As with the other models we discuss, charter schools come in many forms. An important question, therefore, is what features of

charter high schools are likely to produce positive outcomes for students. A recent analysis of charter high schools took on this question by identifying schools with good track records in terms of graduating students who go on to postsecondary success. The analysis reports that successful charter high schools seem to maintain a focus on higher education and foster a safe, orderly learning environment and positive school culture.[73] The practices observed in these high-performing charter high schools are aligned to all five desired outcomes of high school improvement; however, it is important to note that this study sample is small and has no comparison group.

As with charter high schools, we lack definitive evidence about the effectiveness of EMOs as a whole for high school improvement. Through the Comprehensive School Reform Quality Center, we conducted a systematic review of the effectiveness and quality of seven widely implemented EMO models, five of which serve students in K–12 and none of which exclusively serves high school students. Our rating for the overall effectiveness on student achievement of the EMO Edison Schools was "Moderate."[74] The rating was derived in part from our review of a five-year quasi-experimental evaluation of Edison Schools conducted by RAND, which reported mixed results for reading and math achievement for Edison School students compared with students not in Edison Schools.[75] We stress that our rating applies to Edison's K–12 model and none of the studies we reviewed isolated the effects of Edison Schools on high school student outcomes. The other six models in our review of EMOs received a rating of either "Zero" or "No rating," both signifying a lack of strong research that demonstrates positive effects on student outcomes. Therefore, we conclude that, as a

whole, there is not yet reliable evidence that EMOs can have a positive impact at the high school level.

Although it is as yet impossible to assess the effectiveness of charter high schools and EMOs in improving high school student outcomes, including achievement and postsecondary success, both approaches are important options for education decision makers to consider. By focusing on school governance, charter high schools and EMOs can address head-on the organizational and institutional capacity issues of low-performing high schools, thereby potentially stimulating change in overstressed high schools, the fifth desired outcome in high school improvement.

Implementation Is Crucial

One piece of evidence regarding research-based reform is probably more consistent and may be more important than all the others. Implementation is a critical factor in reform success. This observation may seem so obviously a matter of common sense that it hardly needs to be stated or supported with evidence. But educators, for all their good intentions, habitually defy both the strong research evidence and the common sense behind this observation by implementing education reforms with neither the fidelity nor the long-term support required to allow them to succeed and sustain themselves.

The authors of a recent large-scale synthesis of research concerning the implementation of evidence-based practices and programs across a number of industries and social service arenas observe that it is often more difficult to implement an effective model successfully than to design it.[76] This observation points not only to the difficulty of implementation but also to how crucial it is in getting good results.

Furthermore, a program or practice is worth implementing only when it is likely to have the desired results. Again, this may seem obvious, but anyone who has spent any time in the education arena has heard people observe that "If you do *anything* well, you will get results." But as the authors point out, "Desired outcomes are achieved only when effective programs are implemented well."[77]

The field of CSR lends further support to the need to implement programs with fidelity and then to support them for the time required for their success. In their recent multiyear, quasi-experimental study of CSR implementation and impact involving 650 elementary and middle schools in twenty-one districts across seventeen states, Daniel Aladjem and several colleagues found a positive relationship between the level of fidelity of implementation and the level of student achievement.[78] The study identified several conditions associated with higher achievement gains among the CSR study schools than their matched comparisons. CSR must be implemented with high fidelity to the model generally, fidelity must be high during later years of the model's introduction, and fidelity must be consistently high across the numerous model components and not just in a few.[79]

The finding that implementation fidelity is a significant factor for success should not obscure a number of important considerations. Amanda Datnow and Sam Stringfield have pointed out that, based on their review of the findings of sixteen studies and more than 300 school case studies conducted from the mid-1980s into the late 1990s, implementation of external reform models is a complex process, which requires the model providers to work together with schools and districts to "co-construct" the reform's implementation.[80]

No model is adopted wholesale and implemented in exactly the same way in all locations. Simply put, implementation is not a mechanical process but an adaptive one that must be conducted taking due account of the structural, financial, political, and cultural environments of each school and district.

Taken together, these studies offer significant policy lessons. First, precious time and resources will be wasted by selecting ineffective models to improve high schools. Some models are likely to be more effective than others, regardless of the contexts in which they are implemented. However, the models that are most likely to have significant impact in any given situation are those effective models that engender the commitment of school and district staff and leaders. Finally, once effective models are selected and implemented at schools, additional time and resources will be wasted by failing to give them the time and support they need to succeed.

Conclusion: Evidence-Based Models Are Necessary but Insufficient for Change

Overall, evidence for the effectiveness of the high school improvement models we have reviewed is sparse. There are, however, glimmers of hope. Some models have an emerging evidence base of effectiveness, and more research is under way that can help to identify the models and approaches that demonstrate the most promise. But having solid, research-based evidence of model effectiveness is just the first step in improving high schools. The second, and equally important step, is to implement effective models with care and with fidelity to the requirements of the models. Finally, improving high schools requires taking a holistic view—focusing simultaneously on the desirability of a number

of outcomes and recognizing that high schools can be improved not by adopting piecemeal programs or actions but through systemic, coordinated action that may involve combining many approaches.

Looking to the future, we suggest steps that decision makers, researchers, and sponsors of research can take to promote evidence-based progress in education. We believe that decision makers should demand rigorous evidence of effectiveness before they consider a model for widespread adoption. They can get this evidence by consulting reliable third-party review organizations, such as the What Works Clearinghouse, or by seeking advice directly from researchers and organizations with expertise in judging research quality. If, as is likely, no models or approaches under consideration have strong evidence of effectiveness, decision makers should implement programs on a pilot basis—and engage in a rigorous evaluation of effects—before proceeding to widespread scale-up.

Researchers should join with decision makers in helping to design and execute small-scale, cost-effective tests of promising models. They should also design larger studies that create the types of planned variation in the implementation of models that make it possible to identify program elements that seem particularly critical to success. Identifying these critical elements would help to assure fidelity of implementation to the "required" elements of the model and those areas available for "co-construction" in which individuals implementing the model have greater leeway to experiment. These planned variations will also produce the evidence necessary to design future, more effective models.

Finally, sponsors of research should consider funding the types of studies suggested above.

They should also commit resources to long-term funding of a stream of research that can result in more definitive answers about which models do work, under what conditions, and for which types of students.

Although the knowledge base regarding promising strategies and programs to improve high schools is stronger today than ever before, it is still not yet robust enough to truly promote evidence-based practice in high school reform. Over the coming years, policy makers must continue to demand, and researchers to supply, better evidence. If they do, we believe that high school students will be able to look toward a brighter future.

Endnotes

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U.S. High School Curriculum: Three Phases of Contemporary Research and Reform

Valerie E. Lee and Douglas D. Ready

Summary

Valerie Lee and Douglas Ready explore the influences of the high school curriculum on student learning and the equitable distribution of that learning by race and socioeconomic status. They begin by tracing the historical development of the U.S. comprehensive high school and then examine the curricular reforms of the past three decades.

During the first half of the twentieth century, the authors say, public high schools typically organized students into rigid curricular "tracks" based largely on students' past academic performance and future occupational and educational plans. During the middle of the century, however, high schools began to provide students with a choice among courses that varied in both content and academic rigor. Although the standards movement of the 1980s limited these curricular options somewhat, comprehensive curricula remained, with minority and low-income students less often completing college-prep courses.

During the 1990s, say the authors, researchers who examined the associations between course-taking and student learning reported that students completing more advanced coursework learned more, regardless of their social or academic backgrounds. Based largely on this emerging research consensus favoring college-prep curriculum, in 1997 public high schools in Chicago began offering exclusively college-prep courses. To address the needs of the city's many low-performing ninth graders, schools added extra coursework in subjects in which their performance was deficient. A recent study of this reform, however, found that these approaches made little difference in student achievement.

Lee and Ready hypothesize that "selection bias" may explain the divergent conclusions reached by the Chicago study and previous research. Earlier studies rarely considered the unmeasured characteristics of students who completed college-prep courses—characteristics such as motivation, access to academic supports, and better teachers—that are also positively related to student learning. Although the Chicago evaluation is only one study of one city, its findings raise the worrisome possibility that the recent push for "college-prep for all" may not generate the improvements for which researchers and policy makers had hoped.

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For well over a century, practitioners and policy makers have grappled over the fundamental purposes of secondary education. At the center of these discussions lies the fact that as adolescents move through the educational system, the focus of schooling typically shifts from developing individual children toward preparing students to be future workers and citizens. This acknowledgment of students' imminent adult roles raises serious questions about the appropriate content of secondary education. All *children* should learn to read, but do all *employees* need trigonometry? Since the emergence of the comprehensive high school in the late 1800s, two rival philosophical camps have offered quite disparate answers to this question. These opposing views dispute the extent to which students' future social and economic roles should determine their academic experiences in high school. Should all students be exposed to the same academic material, or should curricula reflect students' interests, abilities, and potential adult occupations? Who should make such decisions—parents, schools, or the students themselves?

In this article we present an interpretive review of recent research on the high school curriculum and its effects on student outcomes. After briefly describing the historical development of high school academic structures, we focus on the contemporary high school curriculum. The narrative of curriculum reform over the past three decades has, in one sense, been quite consistent. It can be characterized as a general movement to narrow curricular offerings and to infuse more rigor into the academic experiences of all high school students. We organize this review around three phases of research and reform. We conceptualize Phase I as part of the broader standards-based reform movement predominant during the 1980s, which required students to complete more courses in core subjects to earn a high school diploma. Although the reforms of the 1980s produced lasting curricular change in the nation's public high schools, research during this period focused more on policy implementation and on the politics behind the adoption of legislation than on the consequences of the reforms for student outcomes. Studies that did examine the link between state graduation standards and student learning typically were methodologically weak. For example, such studies seldom considered that a great deal of variability in both student course-taking and student learning lies within rather than between schools.[1]

Phase II shifted the focus from how many courses students should take to which courses students should complete. In many ways, Phase II can be seen as a more sophisticated research effort that examined naturally occurring variation in the concentration and rigor of academic course-taking both within and across schools and school districts. Methodologically stronger than the research in Phase I, the Phase II research began with comparisons of course-taking and student learning in public and Catholic high schools. The finding from these studies—that student achievement growth was higher in Catholic schools, where students generally follow a college-prep curriculum—was then extended beyond cross-sector comparisons as researchers explored how course-taking differences within public high schools affected student achievement, as well as the equitable distribution of that achievement by student social background. This body of research is now beginning to have a direct impact on educational policy.

The thrust of Phase III, now in its infancy, has been to implement reforms based on the findings of Phase II research by requiring high schools to provide only college-prep courses. An ancillary aspect of this reform model is that initially low-performing students may be required (or urged) to take a "double-dose" of coursework in subjects in which their incoming performance is deficient. Although this reform phase is growing fast at the state level, research on its effects remains scarce. Thus, our discussion of Phase III centers on the implementation of the new policy in a single location: the public high schools of Chicago. Research evaluating this curricular reform in Chicago is emerging, and one of the authors (Lee) is part of the evaluation team. Although other states and districts are moving in this direction, Chicago is in the vanguard of Phase III reform, and recently available data make such research possible.

Brief History of the High School Curriculum

As secondary school attendance became nearly universal over the past century, public controversies regularly erupted about the fundamental purposes of secondary education. The controversies centered on basic issues of what students should learn, whether all students should learn the same thing, and who should make decisions about such matters. On one end of this philosophical continuum was the belief that all students—regardless of their academic or occupational futures—should experience intellectually challenging coursework that prepares them equally well for college or work. This more custodial view of curriculum held that students' academic needs were quite similar and that their current aspirations or interests should be a secondary concern to schools. A formal statement of this view was issued in

1893 by the Committee of Ten, a national commission studying high schools that was headed by Charles Eliot, then president of Harvard University.[2] The Committee of Ten suggested that students should be permitted little curricular choice and that all high schools should offer a narrow academic curriculum that did not differentiate students heading for work from those bound for college.

Cardinal Principles of Secondary Education, published twenty-five years after the Committee of Ten's report, was perhaps the antithesis of the earlier treatise.[3] According to "social efficiency," the philosophy underlying the Cardinal Principles, secondary school students' coursework should be driven by their future occupational and educational plans. Schools should offer a broad and diffuse curriculum, one that included a wide range of academic and vocational offerings that varied not only in content but also in rigor. Supporters of social efficiency argued that offering only traditional academic courses overlooked two essential facts about high school students: they enter high school with different academic skills, and they aspire to disparate occupational futures. Advocates of the Cardinal Principles considered that requiring all students to complete academic courses was inequitable, in that it ignored students' social realities.[4] Psychologist Edward L. Thorndike declared that a high school should "have in mind definitely the work in life its students will have to perform and try to fit them for it."[5]

The social efficiency argument came to dominate the organization of public high schools during the first half of the twentieth century.[6] Comprehensive high schools represented the "social machine" through which adolescents' diverse backgrounds and skills would be matched to society's needs.

College-bound students completed an academically oriented course of study, whereas students bound for work were directed to courses preparing them for vocations and trades. This "differentiated curriculum" thus contained different courses for different students, whom the schools typically organized into vocational, general, and academic "tracks" that determined their coursework. The prevailing educational philosophy was that "high schools would serve democracy by offering usable studies to everyone, rather than dwelling on academic abstractions that would interest only a few."[7] Supporters of this curriculum organization also maintained that a "relevant" curriculum would increase student interest and motivation, leading more students to remain in school until graduation.

Movement toward Student Curricular Choice

The tracking process that matched students to courses remained quite stable for at least four decades. During the 1960s, however, the ways in which high schools sorted students began to evolve.[8] Rather than rigid curricular tracks that dictated which courses students would take, high schools slowly implemented more flexible structures that relied on student curricular choice.[9] Whereas traditional tracking placed students into predetermined courses and permitted little movement between academic, general, and vocational programs, the new approach allowed students to choose among dozens (or even hundreds) of courses and to create their own courses of study based on their future plans, interests, abilities, and motivation. Despite the elimination of formal tracking, the differentiated curriculum remained in place, and students' academic experiences continued to vary substantially within the same school.[10] As one author noted, "The curriculum remained stratified, but the logic of the strata became

submerged."[11] Expansion of choice-driven curricula continued throughout the social upheavals of the late 1960s and early 1970s. Drawing on justifications similar to those put forth in *Cardinal Principles,* many high schools created courses deemed more "relevant" to students' lives, especially to the lives of racial and ethnic minority youth.[12] Organizations as politically varied as black militants and business roundtables agreed that students' social and academic diversity required curricular differentiation.[13]

Rather than rigid curricular tracks that dictated which courses students would take, high schools slowly implemented more flexible structures that relied on student curricular choice.

We now refer to this choice-driven academic structure as the "comprehensive curriculum," which comprises many sets of courses aligned both vertically and horizontally.[14] Vertically aligned courses share similar titles, but differ in difficulty (and often substance). For example, many high schools permit students to select among three distinct levels of eleventh-grade U.S. history: regular, honors, and Advanced Placement. Horizontally aligned courses are those through which students advance year by year. Once students complete prerequisite courses, they can decide how many years they will study a foreign language or whether to take calculus or physics (which few school districts require). As such, although stratified curricula remain in the comprehensive high school,

students are permitted to track *themselves* through their choice of courses, deciding which levels of courses to complete and how far to advance through the curriculum.

Phase I: The Standards Movement

The comprehensive high school (and its differentiated curriculum), which had enjoyed widespread support during the 1960s and 1970s, began to experience intense public scrutiny during the early 1980s. The emergence of the standards movement coincided with publication of the landmark study *A Nation at Risk*.[15] The report's scathing assessment of U.S. public high schools focused on a perceived lack of academic rigor. Its central theses were economic: first, that U.S. competitiveness was tied directly to the quality of public education and, second, that the educational foundation of the U.S. economy was "being eroded by a rising tide of mediocrity."[16] The educational free markets that characterized the comprehensive high school curriculum drew an especially sharp critique. The report charged that most secondary schools offered "a cafeteria style curriculum in which the appetizers and desserts can easily be mistaken for the main courses."[17] The report recommended that all high school graduates complete what it called "the New Basics": a minimum of four years of English and three years each of mathematics, science, and social studies. In this sense, *A Nation at Risk* echoed many of the sentiments expressed by the Committee of Ten almost a century earlier. The report's recommendations, as well as the curriculum reforms that emerged from it, represented the start of a cultural shift away from the social efficiency argument—the notion that students' social and academic diversity required different academic experiences—toward a counterargument for a more common academic high school curriculum.[18]

State Curricular Reform Initiatives

Motivated partly by the charges leveled in *A Nation at Risk*, states engaged in education policy making as never before. Indeed, education reform became the central legislative activity of state governments during the 1980s.[19] Between 1983 and 1987 alone, state allocations for public education increased 21 percent.[20] The most common state reform initiatives of the 1980s involved an expansion of the number of courses (particularly in core subjects) required to obtain a high school diploma.[21] From 1980 to 1993, the average number of credits required to graduate increased from 17.3 to 19.8.[22] Many states viewed these stronger graduation requirements as the most direct means of increasing the rigor of secondary schooling. States often justified the new requirements by citing the notion of "opportunity to learn"—students cannot learn academic material to which they have not been exposed.[23] By the close of the 1980s, forty-five states had strengthened high school graduation requirements.[24] Their efforts found broad public support and were quickly adopted,[25] in part because they were relatively easy to implement—the teachers, classrooms, and courses they required were already largely in place.

The new, more stringent curriculum standards did not influence all students equally. They did not target (and rarely affected) course-taking among college-bound students, most of whom surpassed the standards even before their adoption. But they had considerable impact on non-college-bound students. For example, enrollment in vocational courses declined considerably during the 1980s, whereas participation in core academic courses and the arts increased. Comparisons of random samples of high school transcripts gathered in 1982 and 1987 suggest a 17 percent increase in the number of

mathematics credits completed (from 2.54 to 2.98 courses), and a 20 percent increase in science credits (from 2.19 to 2.63 courses) during the five-year period.[26] Roughly one-quarter of students completed an extra year of mathematics, and one-third completed an extra year of science by the end of the decade.

These Phase I curricular reforms targeted the number of credits students earned and (ostensibly) the subject matter of courses associated with those credits. However, the mandates often allowed school districts to decide which courses met the requirements or even which students were required to meet the standards.[27] Many students were permitted to earn credits for courses in subjects that were non-academic or consisted of low-level or even remedial content.[28] For example, Pennsylvania considered that "business math" fulfilled a core mathematics requirement.[29] Within schools, multiple levels of the same course often satisfied the same requirement, even though the courses often differed substantially in both content and rigor. Thus, the increased graduation requirements constituting Phase I reform likely influenced academic rigor only marginally. In fact, the majority of new courses that high schools added to their curricula were at basic, general, or remedial levels. The move seemed understandable, however, given that the new requirements were mainly targeted at low-achieving students. One scholar summarized these efforts as "a national experiment in offering lower-level academic courses to middle- and low-achieving students who previously took something else (vocational courses, various electives)."[30]

Phase I Research

Research on these Phase I reforms often focused more on the extent to which they effected fundamental educational change

rather than on whether and how they influenced student learning. In general, the standards movement demanded "more of the same"—more courses, more days of school each year, and more hours of school each day. In this sense, the mandates entailed quantitative rather than qualitative changes to the high school curriculum.[31] They rarely focused on school restructuring or classroom teaching and learning.[32] Indeed, the curricular standards movements may have affirmed rather than transformed educational practice; students, teachers, and schools were simply asked to do more of what they were already doing.[33] Despite the clear limitations of these Phase I efforts, the curricular reforms associated with the standards movement remain largely in place more than twenty years later—a rare feat in the history of education policy making. Along with expanded use of standardized testing and increased (and more equitable) education funding, tougher graduation requirements may be the most lasting and important element of the larger standards-based reform movement.

Researchers have offered various explanations for the popularity and longevity of these Phase I reforms. From the standpoint of successful policy implementation, these legislative efforts reinforced norms and notions already held by parents, teachers, and students, and they legitimated the activities in which schools were already engaged. By contrast, initiatives that seek to fundamentally transform teaching, learning, and content are quite difficult to implement and sustain.[34] Reforms that assume that improving student performance requires only additional exposure to the "treatment" are likely to garner wide support, because they demand little real change—from either students, parents, teachers, schools, districts,

or local and state governments. Phase I reforms assumed that contemporary approaches to teaching and learning were adequate; increasing learning simply required that students become more deeply engaged with these processes. Schools and districts were generally quite comfortable with the approaches and content that the standards required. Perhaps most important, teachers retained the ability to craft their own instruction, and teacher autonomy—a central appeal of the profession to its practitioners—was preserved.[35]

> *Beginning in the 1980s, academic researchers and education advocates mounted concerted and unified attacks on curricular differentiation.*

Phase II: Research on the Constrained Academic Curriculum

Although the Phase I reform efforts instituted somewhat tougher graduation requirements, they left the differentiated curriculum essentially intact. One result was that the strong links between student socio-demographic background and course-taking also remained. During the 1990s, more than 80 percent of high school students in the top third of the household income distribution completed geometry, compared with only 46 percent of students in the bottom third of the income distribution. Likewise, 30 percent of students in the top income category completed trigonometry, compared with only 10 percent of low-income students.[36] Comprehensive high schools thus continued to be internally segregated and stratified.[37]

Beginning in the 1980s, academic researchers and education advocates mounted concerted and unified attacks on curricular differentiation.[38] A host of studies criticized the free-market curricular structures that typified most public high schools.[39] The studies, which generally used qualitative methods to examine small numbers of high schools, did not seek to quantify the relationship between course-taking and student outcomes. Rather, they focused on curriculum structures, how students were matched to courses within those structures, and the relationship between course-taking and student social and academic background. Unlike many Phase I studies, this Phase II research recognized that a great deal of variability in course-taking lies within schools and that student curricular choice generally increases variability in students' academic experiences. These studies maintained that stratification in course-taking was partly related to the fact that high-achieving and motivated students (often guided by their parents) more often sought demanding teachers and courses. Conversely, social and institutional pressures, combined with the well-established links between social background and academic performance, often guided minority and low-income students toward low-level academic courses.[40]

Clearly, minority and low-income students are less likely to enroll (or be enrolled) in upper-level courses. An important question, however, is whether these relationships are the result of bias on the part of school personnel or are simply the consequence of links between academic achievement, socio-demographic background, and course-taking. In other words, are these course-taking patterns among socially disadvantaged students caused by unjust school practices, or are they appropriate given the lower average

achievement among low-income and minority students? Several quantitative studies conducted during the 1970s and early 1980s attempted to isolate these interconnected relationships. The authors generally agreed that measured achievement was the strongest predictor of curricular placement, but diverged on the extent to which race and social class effects on course-taking remained after adjustments for student achievement.[41]

An emerging research consensus favored a narrower, more academic, and more universal secondary school curriculum. John Goodlad proposed "a common core of studies which students cannot escape."

Apart from the fairness or appropriateness of curricular placements, many of these Phase II studies argued against differentiated curricula, simply because they included courses with modest levels of academic rigor and low expectations for student performance. The authors maintained that such courses should not be available to students, regardless of their academic abilities. The free-market curriculum structures operating within the typical "shopping mall high school," they argued, allowed students to select the path of least academic resistance and to decide how deeply to engage the academic content of high school.[42] As one study concluded, "Adolescents care about things they have to care about, and they do not have to care about academic engagement very much."[43]

Other researchers reported that teacher effort varied as well. In some classrooms, when low student and teacher expectations coincided, "treaties" resulted; teachers agreed to pass students if they were not disruptive, and students agreed to be cooperative if teachers demanded little effort from them.[44] This system was described as the "conspiracy for the least," meaning "the least hassle for anyone."[45]

An emerging research consensus favored a narrower, more academic, and more universal secondary school curriculum. John Goodlad proposed "a common core of studies which students cannot escape."[46] Other well-known writers, including Mortimer Adler in his *Paideia Proposal*, argued for the complete elimination of the differentiated curriculum.[47] The century-old normative questions of "who should learn what" resurfaced. Politically disparate groups that had previously coalesced behind broad curricula now found fault with the resulting stratification of students' opportunities to learn. In a rare example of cooperation, business leaders—interested in maintaining international competitiveness—and progressive academics and activists—concerned about educational inequality—collectively challenged the curricular differentiation that had pervaded the U.S. comprehensive high school for almost a century. In the ensuing decade, these authors and advocates would find empirical support for their conjectures, bolstered by new data and analytic techniques that allowed researchers to better estimate the links between course-taking and student learning.

Cross-Sector Comparisons
During the late 1980s, researchers began to examine associations between course-taking and achievement using new analytic

techniques and data. One strand of this research was conceptualized within a school-effects framework, focusing on curriculum structure as one element of school academic organization. The work began with comparisons of the effectiveness of Catholic and public high schools. A host of studies reported that not only were average achievement gains greater in Catholic schools, but relationships between students' social background and their achievement gains were weaker: Catholic schools were associated with increases both in excellence and in equity.[48] One explanation for these findings was straightforward: the "constrained academic curriculum" required in most Catholic high schools. Students in Catholic high schools generally complete challenging courses of study regardless of their academic and socioeconomic backgrounds or their plans for the future. Unlike comprehensive public high schools, Catholic high schools generally organize their curriculum in line with the custodial Committee of Ten recommendations—a rigorous, narrow academic program that is followed by all students.[49] These schools decide what all their students should learn, based on the philosophy that virtually all students should gain the same high-level knowledge. The ability to offer such a curriculum reflects a general consensus among adults about what is best for students—the unwritten idea being that high school students are not always competent judges of their long-term interests.

Beyond Sector Comparisons

The research linking student course-taking to the social distribution of student outcomes was extended from comparisons of Catholic and public high schools toward a broader and more general focus on curriculum structures. Findings from these studies were relatively consistent: students attending high schools offering a constrained academic curriculum—one with few remedial courses and with most (or all) students following a college-preparatory course sequence—learned more, and the learning was more equally distributed by race and ethnicity and by social class.[50] Several Phase II studies conceptualized curricular pathways as "pipelines," measuring how far students progressed through the mathematics and science curriculum in their school (for example, Algebra II versus trigonometry; biology versus physics). Even after one adjusts for student social and academic background, students who completed the more advanced courses exhibited higher achievement gains.[51]

Although neither the sector comparisons nor the curriculum-effects studies were experimental (the "gold standard" research design), many studies used large and nationally representative samples of high schools and students and analyzed the data with multi-level statistical methods (that is, students were "nested" within schools).[52] Moreover, these studies adjusted for many pre-existing differences in student characteristics, including prior achievement, student race and ethnicity, and social class. Thus, the Phase II research was methodologically stronger than research evaluating the Phase I reforms. Although the conclusions about the high school curriculum in both Phase I and II studies favored more rigor in students' courses of study, the form that "more rigor" should take differed considerably. Whereas Phase I research focused on adding more required courses in core subjects, Phase II studies focused on which courses students should (and should not) take. Moreover, Phase I studies drew few conclusions about what should be available within the high school curriculum from which students could choose, whereas Phase II studies suggested

that student choice should be constrained—fewer non-rigorous courses should be available, and remediation should take a different form. Clearly, a course sequence consisting of consumer math, pre-algebra, and Algebra I is quite different from a diet of Algebra I, geometry, and Algebra II. If many undemanding and remedial courses are available in a school's curriculum, some students will choose such courses and others will be counseled into them.

An additional consideration is that all Algebra I courses are unlikely to contain identical academic content. The Phase II studies cited above generally used nationally representative samples of high schools and drew their information about what courses students took either from students' high school transcripts or from self reports. The content of the courses—beyond their course titles—was unavailable in the data used for these studies. Clearly, it is possible that course titles could change to sound more rigorous, but course content could remain undemanding. Different forms of research, including field studies that examine the content of courses with similar titles (for example, Algebra I), would be required to explore this possibility.

Where Do Phase I and Phase II Curriculum Studies Lead?
The conclusions drawn from the Phase II studies seemed to lend support to universalizing the constrained academic curriculum in the nation's public high schools. Explicitly or implicitly, the research concluded that requiring college-preparatory coursework for all students would lead to many desirable outcomes: student achievement would improve, stratification of achievement by students' social background would decrease, and all students would be better prepared to go to college. Despite their methodological

sophistication compared with the Phase I research, the Phase II curriculum-effects studies cited here were typically conducted using data from public comprehensive high schools, which offered a diffuse curriculum and considerable student choice. As such, these Phase II studies were not experimental in design: students were not randomly selected but instead were self-selected into particular courses from within a broad and differentiated curriculum. Moreover, the schools also selected which courses to offer, typically based on several criteria: state and district mandates, as well as the interests, future plans, capabilities, and demonstrated achievement of the students and families they served (that is, supply responds to demand). The ways in which students are selected into courses turn out to have important implications for the Phase II research. We address the validity of drawing inferences for universalizing the high school curriculum from the Phase II studies in the following section.

Phase III: "College Prep for All" in Public High Schools
Worldwide, demands for greater investments in human capital development are raising once again the broad historical question of the relationship between students' academic experiences in high school and their future economic roles. Changes in the U.S. and world economies, increased demand for college, and a set of relatively consistent findings from research about the high school curriculum have led policy makers and informed citizens in the past decade or so to call for even more rigor in what all American students should learn in high school to prepare students for the workforce of the new economy. There is general agreement that too few students, especially those from socially disadvantaged backgrounds, graduate from high school. Even among students who

graduate, many do so without the high-level skills needed for college and for the contemporary workforce. Increasingly, policy makers have come to recognize that the skills students need to succeed in the workforce are no different from the competencies needed to succeed in college and that undemanding coursework is insufficient to prepare students for a successful life after high school.

A key element in this policy shift is the recommendation that high schools offer only college-preparatory courses and that they eliminate remedial courses. With such a curriculum, all high school students—regardless of their academic records, current interests, motivation, or post–high school plans—would follow a college-preparatory curriculum. Although our focus in this article is on the U.S. high school curriculum, other industrialized countries are moving in a similar direction. Several European countries, such as the United Kingdom and Germany, which have traditionally supported tracking both within and between schools, have begun to question such policies as global economic structures call for better prepared workers.

High School Curriculum Reform in Chicago

The U.S. policy thrust toward a universal college-preparatory curriculum has begun to influence high school curricula across the nation. New York tightened its graduation requirements in 2001, Texas did so in 2003, and both states now mandate that all high school students complete a college-prep course sequence.[53] Thirteen states now require a college-prep curriculum, and sixteen more plan to adopt such requirements in the near future.[54] One large urban school district, Chicago, took action more than a decade ago.[55] In 1997, the Chicago Public Schools (CPS) reformed the high school

curriculum based on the philosophy of "College Prep for All." Not only are all Chicago high school students now required to take four years of English and three years of mathematics, science, and social science (reforms following the spirit of the Phase I reforms), but they are also required to take particular courses in core subjects: Algebra I, geometry, and Algebra II in mathematics; survey literature, American literature, European literature, and world literature in English; biology, earth science, and chemistry or physics in science; world studies, U.S. history, and one elective in social sciences. Reformers have also dramatically expanded the number of Advanced Placement courses offered in the upper grades and—quite important in the Chicago context—eliminated remedial courses.

Many students in Chicago, however, enter high school unable to succeed in the ninth-grade college-prep courses. In response, in 2003 CPS instituted a policy that requires additional support classes in reading and mathematics for incoming ninth graders who score below national norms on standardized tests in those subjects at the end of eighth grade. Qualifying students—close to half of all incoming ninth graders—are automatically enrolled in the support courses in addition to the regular ninth-grade English and mathematics courses. These low-performing students get, in essence, a "double dose" of required coursework in mathematics or English, or both. Students receive credit for the support courses, although the courses do not count toward graduation requirements. For the purposes of this article, we consider this type of curriculum policy—a college-prep curriculum for all students, expanded AP offerings, support courses in ninth grade, and the suspension of remedial courses—as Phase III of curriculum reform. Although such a

curriculum has long been available to some students in many high schools, what differentiates this phase of curriculum reform is its universality—all students in these public high schools must follow essentially the same curriculum.

Evaluating "College Prep for All" in Chicago High Schools

A team of researchers from the Consortium for Chicago School Research (CCSR) and the University of Michigan has received generous multi-year federal grants from the U.S. Department of Education and the National Science Foundation to evaluate this curriculum reform in Chicago. The first evaluation—the only one we know that examines outcomes of Phase III high school curriculum reform—has focused on the ninth-grade classes (Algebra I and survey literature). We provide some detail about the evaluation in this article, because it is not yet available to readers in published form.[56]

Here we briefly describe the analysis of how enrollment in the two ninth-grade college-prep courses has influenced a broad array of student outcomes. The research team could not use an experimental design for its evaluation, because all students received the "treatment." Rather, the research employed a cohort-comparison evaluation design and an extensive longitudinal data archive containing complete administrative records, achievement scores, and high school transcripts to compare students who began high school in 2004 (post-policy) with their statistical counterparts who attended the same Chicago high schools in 1994 (pre-policy). The analyses explored effects of college-prep course enrollment on fifteen short-term and long-term outcomes, including credit accumulation, course failures, course absences, grade point averages in both individual courses and

cumulative over four years, performance on standardized achievement tests in English and mathematics given at the beginning of tenth grade, high school graduation, and college attendance. The analytic models were constructed as three-level hierarchical linear models, with students nested in cohorts, which were nested in schools. Moreover, anticipating that the effects of this new curriculum reform might influence different types of students differently, the models estimated effects separately by student ability.[57] Although the research examined whether effects increased as the new curriculum was in place longer (that is, between 1997 and 2004), it did not find such a change. Thus, it retained the 1994 and 2004 comparisons.

What differentiates Phase II curriculum reform is its universality—all students in these public high schools must follow essentially the same curriculum.

Early findings regarding the new curriculum policy are mixed—and unexpected. One positive finding is that the policy has been broadly implemented. That is, as of 2000 in English and 1997 in mathematics, close to 100 percent of Chicago ninth graders have been enrolled in Algebra I and survey literature, whereas a decade ago less than half of the city's students took these courses in ninth grade. Unsurprisingly, enrollment in these courses proceeded somewhat more slowly for lower-ability students. However, close to 10 percent more lower-ability students have earned credit

for Algebra I and about 30 percent more lower-ability students have earned credit for survey literature. A surprising positive finding, given the expectations of policy makers about implementing such a curriculum for all students, is that the dropout rate did not increase. With close to half of all students who enter Chicago high schools failing to graduate, it is difficult to extol this positive finding—but it is also difficult to ignore.

Among the chief negative findings is that lower-ability students were more likely to fail these classes in 2004 than in 1994 (an 8 percent increase for failure in Algebra I). Absenteeism from these ninth-grade courses was also somewhat higher for upper-ability students in 2004 than it was for their counterparts in 1994 (about two more missed days in English, three more in algebra). Moreover, grades were lower for lower-ability students in their ninth-grade math and English classes in 2004 than they were in 1994 (0.15 standard deviation units lower in both subjects). Fewer students in the lower-ability quartile (but not the lowest) were likely to attend a four-year college after graduating from high school (3 percent fewer, compared with the pre-policy cohort).

Across many dimensions, the early findings indicate no differences between the pre-policy and post-policy groups. Across ability groups, the results suggest no significant policy effects on either standardized achievement scores or the number of credits earned in high-level mathematics courses. In sum, despite samples that include the full populations of CPS high school students in these two cohorts, elaborate analytic models, and many statistical controls at the student and school levels, the evaluation has identified few effects of this profound curriculum reform policy.

In many respects, the findings from this first evaluation of the Chicago "College Prep for All" high school curriculum differ considerably from the findings reported in many Phase II studies that used nationally representative samples of high schools and their students. The Chicago research team has offered eight possible explanations for the differences. First, the Phase II research on high school curricula may not be entirely applicable to the Chicago policy implementation, because of issues of selectivity bias. (We discuss this matter in detail below.) A second possibility is that many Chicago students enter high school without sufficient skills to succeed in courses with high-level content and high expectations for performance. This phenomenon persists despite Chicago's efforts to end social promotion—particularly from eighth to ninth grade—and a Summer Bridge program to boost promotion. Third, instruction in the college-prep courses may not be of high quality, particularly for lower-ability students. Many teachers of Algebra I and survey literature in Chicago had previously taught the discontinued remedial reading and math courses. Changing the content of courses without also changing how they are taught may not be enough to induce higher learning. A related fourth explanation involves classroom composition and peer effects. Before the policy was implemented, students were generally tracked and attended classes with similar-ability peers. After the policy was implemented, courses enrolled students of all ability levels, but teachers were not provided with professional development regarding how to teach these subjects to lower-ability students, particularly in heterogeneous settings. Fifth, some students may simply be unable to handle high-level content. The research team is reluctant to accept this hypothesis, which is behind the philosophy that has governed most public

high schools for more than a century. Sixth, it may be that implementing a demanding curriculum without attending to students' non-cognitive skills and behaviors—such as absenteeism, failure to complete homework, lack of engagement, and disruptive classroom behavior—is unwise. Student learning may be unlikely to improve without attention to these behaviors and attitudes. Seventh, it is possible that although the courses are described and labeled as Algebra I and survey literature, their content may not live up to their titles: these courses could simply be "old wine in new bottles." The final hypothesis for the surprising findings of the evaluation involves the context of the new policy. The share of students who would have been taking remedial courses was much higher in some schools than in others. Implementing such a "sea change" in those high schools was particularly difficult. However, the evaluation grouped all high schools together.

The Problem of Selectivity Bias in Research about Curriculum

Although each of these hypothetical issues deserves more discussion, space limitations allow us to expand only on the first. The body of research on curriculum effects from Phase II is extensive, and the evidence from these studies is generally quite positive: in schools where students typically complete rigorous course sequences in high schools, students learn more, and the learning is more equitably distributed. However, the conclusions drawn by much of the Phase II research—that schools should extend the college-preparatory curriculum to all students—may have been premature. The studies are likely plagued by selectivity bias, which, as noted earlier, potentially operates at two distinct levels: student allocation to coursework is a phenomenon that occurs both *within* and *between* schools.

The Phase II studies cited above were generally conducted using nationally representative samples of high schools, the majority of which were comprehensive public high schools that offered students choice within broad curricula. Moreover, the fact that these studies used multi-level analytic methods means that students were compared with other students in the same high schools (that is, schools with the same sets of courses available). The concern with selectivity bias here is that students who select rigorous courses (or have them selected for them) are also more likely to come from socioeconomically advantaged families, to be more motivated than other students in their school, and to possess unmeasured personal characteristics beyond academic ability that allowed them to do well enough in previous courses to move on to advanced coursework. Statistical controls for students' academic and social backgrounds—the typical methods of addressing student selection to courses—would not capture unmeasured characteristics, such as student motivation, personality traits, or access to social and academic supports. However, these characteristics affect student outcomes independent of course selection. For example, important differences likely distinguish a low-income, average-achieving student who completes trigonometry from a low-income, average-achieving student who stops at geometry. These unmeasured differences are probably also related to how much mathematics each student learns during high school. In addition, more effective teachers often teach the advanced courses within schools, which could influence student outcomes above and beyond the effects of curricular content. When schools are mandated to teach Algebra I or English to all ninth graders, the people who teach these courses will likely not change, even if the course offerings are revised.

The conclusions drawn by much of the Phase II research—that schools should extend the college-preparatory curriculum to all students—may have been premature.

Selection bias in student course-taking likely exists not only within schools but also between schools. The background of students in different types of public high schools and of students in public and private schools varies widely. Selection bias at the school level may thus occur because high schools offer a broad array of courses in response to the perceived needs and desires of their students and families. Schools serving large proportions of students with disadvantaged backgrounds often do not offer a full array of challenging and advanced courses, either because of a lack of demand from parents or perceptions that their students cannot handle rigorous material. Schools that do provide access to advanced courses may be college-oriented in other ways beside the curriculum. They may enroll larger proportions of motivated students, have greater "academic press," and have teachers and staff who know how to prepare students for college. The Phase II studies that compared the link between course taking and achievement in Catholic and public schools must therefore contend with considerable self-selection in who chooses to attend such schools.[58] Studies focused on public high schools must also consider self-selection, as schooling is typically tied to residential location. Thus, in

addition to within-school selection bias, between-school biases may exist, in that students who typically complete demanding course sequences are those who also attend schools where such courses are available and have families that have selected particular schools for them to attend. In this regard, it would appear that almost all research on curriculum effects on student outcomes is—almost by definition—plagued by some form of selection bias.

Differences between Chicago schools and those in much of the United States raise still more selection bias issues. In Chicago, many students enter high school with low achievement. Although some students in Chicago are similar to the students in the Phase II studies, in that they choose college-preparatory coursework, many are quite different from that group of students. Most important, the curriculum structures of schools in the Phase II studies also differ, in that students in those schools were allowed to choose from a wide array of courses, some of which were rigorous, some of which were not, and some of which were remedial in nature. In Chicago, such choices were eliminated during the early high school grades. In theory at least, all courses are rigorous, none are remedial, and students have no choice (at least not in English and mathematics at grade nine). At this level, there is no selectivity bias in the Chicago study, precisely because all students—regardless of their social or academic background—are enrolled in college-preparatory coursework. This fact may well explain the conflicting Chicago and Phase II results. Both the Phase II and Phase III studies take background characteristics into account, but the organizational context (that is, the structure of the curriculum) in the Phase II and Phase III research is quite different.

The pervasiveness of these concerns about selection bias suggests that the findings of the Phase II studies may not be generalizable to schools that enroll high proportions of low-performing students. Students who would be affected by ending remedial coursework would predominantly be low-achieving students who would have otherwise been counseled into low-level courses, if such options were available (as they were in Chicago before 1997). In the Phase II studies, those low-ability students who took college-prep coursework would have been a very select group and may not be representative of most low-ability students (including those in Chicago). It is not clear from the Phase II research whether curricular effects differ for low-ability and high-ability students, who should be better able to handle higher-level content.

Whatever the explanation for the Chicago evaluation findings, they call into question the conclusion of the Phase II research that the constrained academic curriculum reduces social stratification in educational outcomes and raises achievement across the board.[59] It is possible that the findings from the Phase II studies simply cannot be generalized to the Chicago context because of selection bias. It is also possible that the "College Prep for All" curriculum cannot be successfully implemented without attending to many other issues plaguing high schools, such as unmotivated and unprepared students, lackluster instruction, or teachers unprepared to instruct heterogeneous classes. In any case, the Chicago evaluation requires policy makers, practitioners, and researchers concerned about issues of excellence and equity in secondary education to focus anew on what is the most appropriate high school curriculum, especially for initially low-performing and possibly unmotivated adolescents.

Conclusion

Two somewhat contradictory ideals are at play within contemporary public high schools. A democratic ideal demands that all students be afforded equal educational opportunities, thereby providing equitable prospects for social and economic advancement. The second ideal, related to America's fervent belief in the value of individual choice, argues that the diversity of students' interests, efforts, and abilities requires that schools permit students choice among their varied academic offerings. However, allowing choice in virtually any context, by definition, induces variation in the actions and decisions of groups and individuals. Herein rests the contradiction. Do students really have the same opportunities to learn if they are permitted to choose among different courses, unless all courses are equally demanding and contain equally valuable content?

How schools, school districts, and states can best balance these competing ideals is complicated, and the dilemma is implicit in all levels of policy making. For example, the tension can be seen at the national level in simultaneous calls for both increased standards and increased school choice options. Although market-oriented curricular structures complement America's fervent support for all types of choice, they may not serve low-income and minority students well. Traditionally disadvantaged students are less likely to select advanced courses or programs, and the knowledge and skills *not* gained by these students may affect their educational and economic futures. But mandating that these students take such courses, without attending to the surrounding issues that would make them succeed in the courses, seems to be questionable at least on the basis of the evidence from Chicago.[60]

We close by returning to the broad questions we raised at the beginning of this article. What should students learn in high school? Should all students learn the same thing? Who should make the decisions about what to learn and who should learn what? Despite decades of research on the links between high school curricula and student outcomes, the historical arguments outlined a century ago by the Committee of Ten and the *Cardinal Principles* remain both salient and unresolved. Nevertheless, we can point to one area in which a general consensus has been reached. Based partly on normative notions of fairness and equity, few contemporary policy makers support a return to traditional tracking and the segregating and stratifying effects of the comprehensive high school curriculum. In this sense, the pendulum has—at least for the moment—swung away from the arguments espoused in the *Cardinal Principles.* However, policies requiring common coursework taken by all students may themselves be accompanied by undesirable consequences. Thus, policy makers, although knowledgeable about the outcomes associated with each curriculum structure, are likely to be unclear as to which approach is most appropriate. Social differences in exposure to advanced academic material exacerbate inequalities in student learning, but mandating such exposure may not necessarily improve outcomes for low-achieving students. This suggests to us the inevitability of additional phases of reform and research on the high school curriculum, as well as continued debates about the purpose and meaning of secondary education.

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52. Many of these studies employed data collected by the National Center for Education Statistics, particularly High School and Beyond (HS&B), and the National Educational Longitudinal Study (NELS: 88).

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55. The Chicago Public Schools make up the third-largest school district in the country, with a school population that is 50 percent African American, 38 percent Latino, 9 percent white, and 3 percent Asian. More than half of all Chicago students qualified for meal subsidies.

56. Members of the research team are also engaged in another series of studies on the efficacy of the double-dose reform element in ninth-grade mathematics and on student outcomes of the increase in AP course offerings and enrollment in Chicago. Results of those studies are not yet available.

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59. Readers should note that both authors of this article have been directly involved in both the research and policy process related to the Chicago Public School curriculum reforms in the 1980s through the present. Thus, our perspective on the nature of these research findings and efficacy of the reform initiatives may have been influenced by this involvement.

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Instruction in High Schools:
The Evidence and the Challenge

Tom Corcoran and Megan Silander

Summary

The combined effects of standards-based reforms and accountability demands arising from recent technological and economic changes, say Tom Corcoran and Megan Silander, are requiring high schools to accomplish something they have never been required to do—ensure that substantially all students achieve at a relatively high level. Meeting that challenge, say the authors, will require high schools to improve the effectiveness of their core technology—instruction.

The authors first examine how organizational structures affect instruction. Most high schools, they say, organize instruction by subject or discipline, thus encouraging an isolated and independent approach to teaching rather than one in which teachers are guided by a shared vision or goals. Many schools have focused on increasing teacher collaboration, often through teaming, interdisciplinary teaching, or professional learning communities. Citing limited evidence that these reforms improve instruction and learning, Corcoran and Silander urge researchers to examine whether the changes help schools implement specific instructional reforms and support sustained efforts to improve instruction.

Next the authors explore the effects on student learning of instructional strategies such as interdisciplinary teaching, cooperative learning, project-based learning, adaptive instruction, inquiry, and dialogic teaching. The evidence suggests the power of well-designed student grouping strategies, of allowing students to express their ideas and questions, and of offering students challenging tasks. But, the authors say, less than half of American high school students report working in groups, and little class time is devoted to student-centered discussions.

The authors conclude that schools should promote the use of proven instructional practices. In addition, teachers should systematically monitor how students vary in what they are learning and adapt their instruction in response to students' progress and needs, in the process learning more about what variations in instruction respond most effectively to common variations in students' learning. The authors argue that such "adaptive instruction" has the greatest potential for success in today's standards-based policy environment with its twin values of equity and excellence.

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Tom Corcoran and Megan Silander

The American high school is often characterized by reformers as a failing institution, a place in which teaching is teacher-centered, boring, and impersonal, where students are expected to master a fragmented curriculum disconnected from the world outside the school, where too many students fail to graduate and many others graduate lacking skills essential for success in college or the workplace. Is this a fair portrayal of American high schools at the beginning of the twenty-first century? We want to say right off that in our view it is not. While it is true that national graduation rates and scores on the National Assessment of Educational Progress have been stagnant for decades and that there are too many weak, bureaucratic, and impersonal high schools, there are many more that offer good teaching and engaging and relevant programs, and even some that have made dramatic improvements in student performance in recent decades.[1] In most communities in the nation, parents, students, community leaders, and policy makers are happy with their local high schools and believe their schools are changing to keep pace with the demands of the twenty-first century. Forty-seven percent of those surveyed in 2007 in the Phi Delta Kappa/Gallup poll gave their local high schools an A or a B, up from 32 percent in 1981.[2] The images of alienation, stagnation, and failure so often portrayed in the media arise primarily from a focus on the large, under-resourced schools characteristic of the nation's inner cities and older suburbs, and here the situation is alarming enough that calls for action are being heard from all quarters.

The performance of many of the high schools serving low-income and minority students has been dismal at best, and pressure from school reformers, policy makers, business leaders, and the public for significant improvement of these schools has built to a crescendo. Rising academic expectations, however, are posing unique challenges for the nation's high schools regardless of whom they serve because of the widespread belief that the curriculum for all students should be more challenging. Most states have raised their course requirements for graduation at least once over the past twenty years, and many have adopted graduation tests. Now state policy makers are considering raising the bar once again. Some are reviewing their standards. Others are making their graduation tests tougher. Some have begun to specify the content to be covered in high school courses. But at the same time that high schools are being asked to offer more rigorous preparation for larger numbers of students, they are also being asked to ensure that all or almost all students meet rising academic standards and that dropout rates decline.

To meet these challenges, high schools will have to improve the effectiveness of their core technology—instruction. As conventionally used, the term "instruction" focuses solely on teacher behavior and is defined as a formal act of helping someone learn a skill or acquire new knowledge. We take a broader view, following David Cohen and Deborah Ball and others, who define instruction as the interactions between teachers and students around curriculum content,[3] and James Hiebert and Douglas Grouws, who modify this definition by focusing as well on learning goals.[4] We define instruction as the interactions between teachers, students, and content directed toward helping students achieve learning goals. Instruction is a narrower concept than "teaching," which includes such responsibilities as guidance, supervision of students (in loco parentis), and curriculum development.

Some argue that it is difficult to improve instruction in high schools and support their argument by contending that instruction in high schools has not changed much in recent decades. But in fact it has changed a great deal. Among the many instructional reforms that have swept through the nation's schools are reductions in tracking (the grouping of students in classes by their prior achievement or measures of academic potential), mainstreaming of special education students, increased use of technology, increased focus on measured outcomes as a result of new state assessments and graduation examinations, the introduction of block scheduling to provide more time for student work and investigations, and the expansion of participation in Advanced Placement courses. Yet it seems to be true that the basic patterns of classroom interactions between teachers and students have remained relatively stable.[5]

What is it about instruction that most influences student learning? What changes should educators be trying to make to the instruction offered in high schools? Does research offer guidance about how to make instruction more effective? Answering these questions would help high school faculties meet the challenges they face. Because other articles in this volume focus on two of the three key components of instruction—students and curriculum—we emphasize in this article the contributions of teachers and their instructional approaches to student learning. Although it is not possible to discuss what teachers do instructionally without touching on their interactions with students and content, our focus is on how teachers can improve their work and contribute to a school's capacity to offer good instruction.

We address two central topics—the organization of instruction in high schools and the effectiveness of various instructional methods—and explore what researchers know, or don't know, about how each affects learning. First we examine the evidence concerning how different organizational structures affect instruction, and then we turn to the evidence about the efficacy of various instructional strategies. Finally, we consider the implications for instruction of standards-based reforms and the demands for higher levels of performance.

In most communities in the nation, parents, students, community leaders, and policy makers...believe their schools are changing to keep pace with the demands of the twenty-first century.

In each case, we examine the quality of the research evidence, highlight the major findings, and consider the warrant the evidence provides for taking action. We identify the gaps in the knowledge base concerning high school teaching, and we conclude by discussing the issues raised by the research evidence with regard to improving teaching, including issues of equity and the impact of current policies.

How Is Instruction Organized in High Schools?

In most of the nation's high schools, instruction is organized by subject or discipline. Most teachers spend each day independently teaching topics in one content area, such as English, mathematics, science, and history, to

groups of twenty-five to thirty-five students for forty-five to sixty minutes at a time, working with from one hundred to one hundred and eighty different students over the course of a week. Work outside the classroom is also highly compartmentalized, with teachers organized into departments by their subject matter specialty.[6] These prevailing norms reinforce an isolated and independent approach to teaching in high school classrooms. The technical core of instruction often seems to be only loosely coupled to institutional goals and demands, and the prevailing norm is that the larger organizational structures of the school should not interfere with the autonomy of the teacher.[7]

But researchers examining how instruction is organized have found that organizational structure often, although not necessarily intentionally or consistently, does affect instruction in meaningful ways.[8] And, in fact, some educational reform strategies employ structural changes to try to improve instruction, particularly by reorganizing large comprehensive high schools into smaller, more focused learning communities or teacher teams. Implicit in these reform efforts is the idea that the new organizational structures will affect the relationships among teachers and between teachers and students and that these new relationships will alter the ways in which high school teachers teach and students learn.

The Roles of Departments and Teams

Two of the most common and persistent features of high schools are the division of instruction into specific disciplines and the corresponding organization of teachers into departments by academic disciplines.[9] The resulting organizational structure shapes assignments of teachers to various courses and categories of students. It also affects

teachers' opportunities for support and collaboration, the norms governing their professional responsibilities and instructional practice, the content and focus of their professional development opportunities, and the nature and strength of their professional commitments.[10]

Until the 1990s, the role of departments, almost universal in the structure of high schools, remained relatively unexamined.[11] In recent years, however, researchers have begun investigating the role and strength of departments and their influence on teachers' work lives and classroom practices.[12] Studies have found, for example, that strong departments can increase teachers' opportunities for collaboration or innovation and for sharing and dissemination of practices. Strong departments can also foster the development of shared internal accountability norms for teacher and student performance. But they can also be associated with maintenance of the status quo, the use of narrower and fragmented curricula, low expectations of students, and resistance to changes in instruction.[13]

Leslie Siskin provides a particularly compelling story of subject departments through case studies based on three years of observing three comprehensive public high schools.[14] The academic departments in these high schools varied in their strength and salience, and they differed both in their social cohesiveness and in their commitment to a common purpose. Most, however, ranked high in cohesiveness but low in commitment to a common purpose. Affiliation was the glue that held them together, not the possibility of higher achievement. Their members focused more on their individual interests than on collective goals. Department members might share resources, eat lunch together, and

discuss common students, but they taught according to their personal styles and preferences rather than being guided by any shared vision or goals. In addition to forming social worlds for teachers, these departments allocated and distributed resources. They also made decisions about textbook selection, equipment, tracking policies, and teacher assignments to courses—often basing those decisions on teachers' seniority or training rather than on their instructional effectiveness. Siskin's study suggests that departments with high levels of social cohesion and commitment to common goals and purposes can be powerful mechanisms for establishing shared norms and goals for instruction. But in most of the departments that Siskin examined, instruction was influenced by the department context only when individual teachers chose to seek out and use the resources and instructional strategies of their colleagues.[15] Still, the salience of the department as a place for teachers to interact suggests that efforts to improve instructional approaches should take into account their role and its variation within and between schools. For example, when schools have strong departments, designers of instructional improvement initiatives might wisely strengthen the role of department leaders and build their expertise about instruction and coaching.

The organization of departments by subject matter also shapes instructional strategies by reinforcing understandings and beliefs about instruction and learning commonly associated with specific disciplines. Susan Stodolsky and Pamela Grossman, for example, examined how teachers' conceptions of their subject matter affected their curricular activities.[16] The study, based on teacher survey data from approximately 400 teachers in sixteen private and public high schools in California and Michigan, found significant differences by discipline in whether teachers perceived their subjects as defined, static, or sequential. Teachers of mathematics and foreign languages, for example, were much more likely than English, science, and social studies teachers to perceive their subjects as sequential, static, and defined. The way teachers perceived their subject was associated with differential decisions about course content, sequence, and pacing, as well as their views and practices regarding the curriculum. For example, social studies teachers, who were less likely to consider their subjects "well-defined," were also least likely to report department agreement about course content and less likely to report developing curricula together with other teachers. Mathematics teachers, most likely to perceive their subject as static and unchanging, were more likely to agree that they "follow the same teacher routines every day."[17] Teachers' beliefs about student tracking—grouping students by prior achievement—also differed by discipline. Mathematics teachers, who were most likely to perceive their subjects as sequential, were also most likely to agree that instruction was most effective when students were grouped by past academic achievement, while social studies teachers were least likely to agree.[18] The researchers did not observe directly how these differences in perceptions affected classroom instruction, although it seems likely that they would.

Within disciplines, teachers' beliefs and practices about curriculum varied as well, suggesting that subject "subcultures" might shape some beliefs and instructional practices without systematically determining them. The primary lesson of these studies is that taking into account common subject-based perspectives on content and pedagogy, and identifying how differences in underlying

conceptions of subject matter relate to and interact with conceptions of good instruction, might enhance the effectiveness of instructional improvement initiatives.

Teacher Teaming

Some reformers aiming to improve instruction have focused on team teaching. Teaming can range from having two teachers work together to plan instruction to making small groups of interdisciplinary or grade-level teachers responsible for a subset of students within a school, working together to plan group activities or even interdisciplinary units of instruction.[19] Teaming first became popular in middle schools and has since been adopted by some high schools. The underlying assumption of these reforms is that creating small teams of teachers or work groups will foster more collegial environments, more opportunities for teacher collaboration and knowledge sharing, better coordination of instructional efforts, greater involvement in instructional decisions, and higher staff morale and job satisfaction.[20] Teacher teaming rests on the same theories that underlie the adoption of autonomous work groups in industry and public sector institutions. It can also serve as a governance reform, providing teachers more opportunities to participate in school management under the supposition that increased self-management will lead to greater job satisfaction, responsibility, and commitment, and thus less teacher turnover, greater work effort, and better student outcomes. In the private sector, similar approaches have found that flatter hierarchical structures allow for more creativity and innovation.[21] But empirical evidence on the relationship between teaming and student learning is limited to small case studies, usually conducted in elementary and middle schools, that tend to focus on team functioning and other mediating factors rather than

changes in instructional practice or student learning. What evidence there is suggests that teacher teaming may facilitate changes in instructional strategies and discussions of students' learning that might lead to improved student outcomes. The lack of rigorous evidence that teaming has systematic effects on student achievement means that researchers do not yet know if these reforms pay off.

Evidence…suggests that teacher teaming may facilitate changes in instructional strategies and discussions of students' learning that might lead to improved student outcomes.

For example, one study examined a K–12 teacher teaming reform in the Cincinnati Public Schools in which teachers were organized into teams of three to five core academic subject teachers who remained with the same group of students over two years. In addition to teacher teaming, the reforms included a more focused curriculum, new instructional methods and materials, and increased professional development opportunities. Findings from this study, although limited to elementary and middle schools, showed that overall, compared with student performance in similar schools that did not team teachers, teaming did not improve student test scores. But the effects varied by the type of work in which the teacher teams engaged. Teams that focused on the relationship between instruction and student work made greater student learning gains, while

teams that worked together but did not focus on instructional practice did not.[22] The study suggests that teaming can contribute to improved instruction and higher performance but only if the work of the teams is focused on these outcomes.

More empirical evidence is available on the effectiveness of teaming in other public sector institutions. For example, a meta-analysis of experimental and quasi-experimental empirical research on health-care delivery suggests that team care can lead to better clinical outcomes than can non-team care and that larger, more diverse teams tend to be especially effective.[23] Some of these findings are likely applicable to education as well. It is clear, however, that the context within which teams work can affect their effectiveness. Indeed, the research review found that team effectiveness varied by context and discipline and that organizational characteristics, such as leaders' focus on quality improvement, the length of time teams worked together, the physical proximity of team members, and deeply rooted institutional norms about practice, affected the efficacy of teaming.[24] This evidence offers lessons for education, where norms of teacher autonomy and disciplinary differences in beliefs about teaching and learning might prove to be barriers to the effective use of teams in some schools.

Professional Learning Communities

Reformers have also tried to increase teacher collaboration and learning by establishing professional learning communities within departments or grades, across a school, or across disciplines outside of schools. Definitions of professional learning communities vary, but all aim to increase teacher collaboration to build teachers' knowledge about students and about teaching and learning, to encourage teachers to share resources, and to create shared norms and views about teaching and learning practices.[25]

Although not focused specifically on professional learning communities, a study by Valerie Lee and Julia Smith, using data from the National Education Longitudinal Study of 1988, examined the relationship between student achievement and teachers' cooperation and collective responsibility for student learning. Looking at student gains in achievement from eighth to tenth grade in math, reading, history, and science, and controlling for student demographics and prior achievement and school demographics, Lee and Smith found a positive link between student learning and both teacher cooperation and collective responsibility for student learning. Because the study is cross-sectional, a snapshot in time, and not conducted over multiple years, it is impossible to conclude that reforms to increase collaboration and collective responsibility for student learning necessarily would affect student learning. The authors themselves suggest that teachers' beliefs about the limitations of students' ability to learn—a key component in the collective responsibility factor—may not be mutable.[26] It also may be that working in schools in which students are making progress leads to stronger feelings of collective responsibility and willingness to collaborate among teachers. Moreover, other research, such as Andy Hargreaves' study of "contrived collegiality," suggests that compulsory teacher collaboration can be less effective than collaborative relationships that evolve naturally from within a teacher community.[27]

Small learning communities (SLCs) of teachers *and* students are a variation on professional learning communities. SLCs can be developed in newly created small schools or in large high schools that are divided into smaller communities. They can take multiple

forms, ranging from partial models such as ninth-grade academies and vocational or career academies within existing comprehensive high schools to full wall-to-wall models in which all faculty and students in a building are part of one or more SLCs.[28]

The rationale for creating both smaller schools and SLCs is that smaller groups of teachers and students will form stronger communities. As a consequence, teachers will provide better guidance and more personal attention for students, and student-teacher relationships will be stronger, resulting in fewer disciplinary problems and safer school environments. Advocates also claim that SLCs will lead to increased teacher empowerment, leadership, and collaboration within and across disciplines, as well as a more efficient administration and a more responsive and focused curriculum.[29]

The article by Steve Fleischman and Jessica Heppen in this volume surveys research on small schools and small learning communities in depth, so here we simply summarize the empirical research. Researchers have found that free-standing small schools have higher rates of attendance, more positive climates and fewer disciplinary problems, and higher retention and graduation rates, but the evidence of effects on student academic outcomes is mixed.[30] The findings from research specifically examining small learning communities and schools within schools are even more mixed, and although they suggest that SLCs can lead to higher academic achievement, the effects seem to be modest and varied.[31] Moreover, restructuring large schools into smaller communities often results in greater stratification of student outcomes by race and ethnicity, class, gender, special education status, academic achievement, and behavior.[32]

The evaluation of a Gates Foundation initiative to establish new small schools and redesign comprehensive high schools into small learning communities found mixed and modest academic effects, with higher student achievement gains in reading than in mathematics. The evaluation also examined instructional methods and found that teachers in the Gates-funded schools were more likely to assign students work relevant to the real world and that assignments tended to be more rigorous in those schools for English, but not for mathematics. Effects on school culture were more uniformly positive: students had higher attendance rates, and both teachers and students reported better school climates, including more personalization and shared goals and focus.[33]

Interdisciplinary Teaching

Despite the apparent primacy of the disciplines in high schools, some reform efforts have attempted to blur the boundaries among subjects, seeking to help students make stronger connections across different domains of knowledge. Research on interdisciplinary teaching is not extensive, particularly at the high school level, and there is no experimental evidence or even quasi-experimental evidence—that is, a research design in which the experimental and comparison, or control, groups are not randomly assigned—to support contentions that interdisciplinary teaching produces different or better outcomes. Further, the body of research is difficult to summarize given the differing conceptions and approaches to interdisciplinary curriculum.

One review of studies of interdisciplinary programs and teaching found that most focused on integrating English and social studies.[34] Researchers found that integrating instruction in these two disciplines increased

the amount of student writing and the use of original texts in classes. For example, an evaluation of an integrated social science and literature program in Los Angeles schools found that students in the program had more writing assignments, that their writing was higher in quality and revealed greater conceptual understanding, and that teachers had higher expectations of students in the program than they did of students not in the program.[35]

A more recent study by Arthur Applebee, Mary Adler, and Sheila Flihan used an ethnographic case study approach to examine the curricula and teaching practices of thirty seventh- through eleventh-grade teachers serving on eleven interdisciplinary teams in New York and California. The study found that their interdisciplinary efforts fell into several categories along a continuum: correlated curricula in which the two disciplines followed parallel lines chronologically or by region; shared curricula in which major concepts were taught across disciplines; and reconstructed curricula in which understandings and concepts were merged across disciplines.[36] The finding suggests that organizing instruction by integrating disciplines does not necessarily result in *systemic* changes to instruction. Barriers to interdisciplinary instruction identified in this and other studies included the extra time and effort required of teachers as well as conflicting beliefs across disciplines about subject matter and the ways in which subject matter should be taught.[37]

Do New Organizational Forms Improve Teaching and Learning?

In summary, the empirical evidence suggests that changes in the way teachers' work is organized can affect student learning, but only when reforms give explicit attention to instruction. The most promising evidence—

though based largely on qualitative cross-sectional studies—relates to the potential efficacy of teacher teaming and professional learning communities and the opportunities they provide for teachers to share and build knowledge about individual students and about teaching and learning. Researchers should examine whether these new organizational forms make it easier for schools to implement specific instructional reforms and whether they lead to sustained efforts to improve instruction.

Instructional Approaches

Does it matter how teachers teach? Is there persuasive evidence about "best practices" that can help students learn more and achieve deeper understanding of the curriculum content? Or is good teaching idiosyncratic to the individual teacher, dependent on the educator's philosophy, personality, general intelligence, and subject matter knowledge? Here again we take the broader view of instruction put forth by Cohen and Ball, and use "instructional approaches" as our unit of analysis.[38] An instructional approach is characterized by certain regularities in the ways in which teachers and students interact with each other and with instructional materials that can be described, evaluated, and replicated. Among the instructional approaches used by teachers in various disciplines in high schools are interdisciplinary teaching, student teaming or cooperative learning, project-based learning, adaptive instruction, inquiry, and dialogic teaching. We have already discussed interdisciplinary teaching and the evidence on its effectiveness; we next define and discuss the others. While each has ardent advocates, they overlap and can be combined. Project-based learning, for example, typically involves teaming, although the reverse is not necessarily true, and dialogic teaching can be combined with adaptive instruction or inquiry.

Nevertheless, each approach represents a distinctive pattern of interaction among teachers, students, and instructional materials, and it is possible to study the effects of each on student learning. We look first at cooperative learning or teaming and project-based learning. For inquiry, dialogic teaching, and adaptive instruction, we examine research on what has been found to work in one or more of three key components of the high school curriculum: language arts and writing, mathematics, and science.

A highly effective instructional approach or "best practice" is one that results in measurable improvements in performance on examinations or standardized tests. In a broader review we would also consider outcomes such as student engagement, effort, persistence, and subsequent success in the subject and in academic work generally. In this short review we cannot consider all the evidence bearing on multiple outcomes, nor can we systematically review the findings from the thousands of studies, largely small in scale, examining the effectiveness of particular pedagogies. Instead we rely heavily on reviews prepared by others to determine whether there is compelling evidence to support the general hypothesis that the specific instructional approaches used by teachers matter and affect student achievement.

Group Learning
Popularly known as cooperative learning after one well-known variant of this approach, student groups or teams are used by many high school teachers. But although this instructional approach is familiar to many teachers and its use is not rare, it remains the exception in high school classrooms. And when it is used, it is often used carelessly, with too little regard to the composition of the groups, the appropriateness of the tasks they are

assigned, or the assessment of their work. Effective use of cooperative groups requires attention to these details and training for both the teachers and the students.[39]

Numerous research reviews have concluded that using various forms of group learning or teaming has improved pupil achievement, social attitudes such as tolerance and acceptance of differences, and classroom climates.[40] The studies examined in these reviews typically used experimental designs to look at the effects of structured classroom grouping on student learning, behavior, and attitudes. Researchers carrying out the experiments placed students randomly into grouped and non-grouped classrooms and collected observational and survey data to examine the effects of the grouping strategy on standardized measures of achievement. In one review, Peter Kutnik and several colleagues note some shortcomings of these meta-analyses—namely, that they do not attend sufficiently to differences in curriculum and tasks and to variations in effects across age groups.[41] Kutnik and his colleagues also point out that these grouping programs may not always fit well with classroom realities and therefore may be hard for some teachers to implement and sustain. They contend that researchers should give more attention to how both teachers and students are prepared for this kind of instruction and how class size, group composition, seating arrangements, group stability, the number of groups, and other factors influence the effectiveness of this approach. They also present a general theory of grouping that they believe provides teachers with more guidance and more flexibility than many of the current externally designed grouping programs.

Despite these caveats, the evidence shows that using structured student groups is a

promising instructional approach. Many independent reviews show that student teams improve student achievement. The effects are so large and so consistent across subjects that group learning would be normative in an evidence-based environment. We shall return to this theme.

> *Many independent reviews show that student teams improve student achievement. The effects are so large and so consistent across subjects that group learning would be normative in an evidence-based environment.*

Project-Based Learning

Project-based learning (PBL) organizes instruction around student-generated and -managed projects. It emerges from three older traditions of teaching: experiential and problem-based learning, which has been used successfully in higher education for decades; the Outward Bound wilderness expeditions; and the application of research on motivation, expertise, context, and technology to the design of instructional programs. Definitions of project-based learning vary widely, including the degree to which the approach must be student-centered.[42] The variations make it somewhat hard to do research on PBL and also hard to summarize research findings, as the latter task requires deciding both what the parameters of PBL should be (do packaged or scripted projects count?) and whether the differences observed in variations of

PBL matter and how they matter. There is general agreement, however, that the student projects should be central to the curriculum and focused on questions that direct students to encounter central concepts in a discipline. Most advocates believe the projects should not be teacher-selected or -scripted; rather, the students should have some choice and be expected to design and carry out the project themselves over an extended period of time. Significant portions of the work should be done independently, though the students often work in teams and the teacher may offer advice and guidance and feedback on partially completed or draft products. The projects should be realistic, not academic.[43]

PBL is often used in technology classes and is often supported by technology when used in other disciplines. The approach is used in many of the small schools funded by the Gates Foundation, such as those developed by Envision Schools and Big Picture Schools, in schools adopting the Expeditionary Learning and Co-nect school designs, and in many schools involved in technology projects. These schools all share a basic instructional approach, with considerable variation in the specifics.

The research on PBL consists largely of small-sample, non-experimental studies.[44] Most rely on observations and interviews of students and teachers. Some use surveys. Although the findings suggest that participating in PBL increases student motivation and engagement, reduces absenteeism, strengthens cooperative behavior and improves higher-order thinking skills, the methodologies employed typically do not support such causal inferences. A series of studies of the Expeditionary Learning/Outward Bound (ELOB) and Co-nect school designs reported modest but significant gains in academic

outcomes and changes in school climate.[45] A more recent analysis of the effectiveness of comprehensive school reform designs found the research evidence for ELOB to be promising while indicating the need for more research on Co-nect.[46] A review conducted in 2006 found only limited evidence that ELOB was effective and did not rate Co-nect.[47]

Although teaming, project-based learning, and interdisciplinary teaching are used in many subjects, the specifics of instruction usually are closely connected to curriculum content. That is, the pedagogies used in mathematics differ somewhat from those used in science or in language arts. Therefore, much of the research on instruction has been domain-specific, and evidence about instruction is typically examined domain by domain. We follow the pattern here and examine the evidence about instructional effectiveness in mathematics, science, and language arts below.

Mathematics

The effectiveness of various instructional approaches in mathematics has been heavily debated in recent years without much regard to empirical evidence about what works. Simply put, traditionalists, led by some respected mathematicians, and progressives have disagreed, among other things, over whether school mathematics should place more emphasis on algorithms (procedures for solving problems) or concepts, and whether discovery (constructivist methods) or direct instruction is more appropriate and effective and for whom. In 2005, representatives of the two groups issued a manifesto called "Reaching for Common Ground" to try to resolve some of their apparent differences over content and pedagogy.[48] In the manifesto, leaders from the two groups agreed on three fundamental premises: students need

proficiency with computational procedures, students must develop the ability to reason using mathematical language with precision, and students must be able to formulate and solve problems. They also agreed that automatic recall of certain basic procedures and algorithms was desirable, that calculators could be useful but should be used carefully in order not to impede fluency with basic procedures, that students should understand and be able to use basic whole-number algorithms and fractions fluently, that teachers should use methods appropriate to the goals, and that teachers should understand the mathematics they teach and how to make mathematics accessible to students.[49]

However, the debates continue, and evidence from a rich body of research on mathematics education does not resolve them. Most studies of mathematics teaching are small in scale, and many are observational, although some are small experimental and quasi-experimental studies. And most of the research has focused on the elementary and middle grades. Reviewing all this research would be beyond the scope of this article, but, fortunately, excellent reviews have been conducted in recent years.[50] The reviews tend to agree that the practice of American mathematics teachers is not in line with the vision of reformers who want to see more emphasis placed on conceptual understanding and more student-centered and hands-on pedagogy in mathematics classrooms. In spite of decades of professional development and introduction of more constructivist curricula, the IRE (initiation-response-evaluation) pattern of teacher-student interaction prevails. The reviewers also note the lack of well-developed pedagogical theory to guide research and methodological difficulties associated with linking specific practices to student learning. Nevertheless, the reviewers

see patterns in the research evidence suggesting the importance of teaching mathematical concepts explicitly, regular opportunities for student discussion, and collaborative work by students. Megan Franke, Elham Kazemi, and Daniel Battey point out that "simply using manipulatives, putting students in cooperative groups, or asking higher order questions does not lead to classrooms that support the development of mathematical understanding. How teachers and students engage with higher order questions, engage students in groups, or use manipulatives matters."[51]

These recent research reviews also emphasize the importance of discourse in mathematics classrooms. They cite many small studies that report that open discourse helps teachers understand their students' mathematical thinking and that when students have opportunities to express their ideas, they develop greater understanding. Franke and her colleagues describe four key strategies for effective discourse: revoicing, assigning worthwhile tasks, having students participate, and interrogating meaning. These strategies, of course, have been found to be components of most effective instructional approaches.[52] Again, most of this research has been conducted in elementary or middle schools, and its implications for high school teaching are not clear.

As James Hiebert and Douglas Grouws point out, the empirical links between particular patterns of discourse and student learning have not been established.[53] They note the primacy of two learning goals in mathematics—teaching skill efficiency or fluency and teaching conceptual understanding—and note there are no empirical studies that set out to examine which instructional approaches are associated with which of these outcomes. They argue that some features of

instruction emphasize one and some the other, but that they overlap. Reviewing the process-product research, they conclude that "teaching that facilitates skill efficiency is rapid-paced, includes teacher modeling with many teacher-directed product-type questions, and displays a smooth transition from demonstration to substantial amounts of error-free practice. Noteworthy in this set of features is the central role played by the teacher in organizing, pacing, and presenting information to meet well-defined learning goals."[54]

They then examine the research findings about conceptual development and conclude that the keys are: teachers and students attending explicitly to the concepts, and students struggling with important mathematics ideas. They conclude that features of teaching that are often associated with conceptual development—use of concrete materials or higher-order questioning—are too closely tied to particular classroom conditions to make general claims about their efficacy. They also note that in many of the studies showing conceptual development, students also gained greater skill efficiency.[55]

Perhaps the most compelling evidence regarding the link between specific instructional approaches in high school mathematics and student learning is found in the Best Evidence Encyclopedia (BEE). A meta-analysis of research on middle and high school math programs examined studies with randomized or matched control groups, a study duration of at least twelve weeks, and pretest data that were roughly equal for non-randomized studies. The programs evaluated fell into three main categories: mathematics curricula, which mainly consisted of standard and alternative textbooks; computer-assisted instruction, which includ-

ed programs that used technology, such as instruction or practice on computers; and instructional process programs that focused on the use of specific instructional approaches, including cooperative learning, individualized instruction, mastery learning, and comprehensive school reform. The latter does not seem to meet the usual definition of an instructional approach as comprehensive school reform models typically include structural, programmatic, and curricular changes as well as changes in instruction.

The programs associated with the most gains in student achievement, as measured by standardized tests, were those that focused on instructional processes, particularly cooperative learning, which had a median effect size of 0.3. Those linked with the smallest gains were the mathematics curricula programs, with a median effect size of 0.07.[56]

Science

The mantra of reformers in science education is inquiry, and the past two decades have witnessed significant efforts to introduce the inquiry approach into high school science classrooms. Inquiry is built into the national science standards and used to describe good practice in the state standards for science. Inquiry is often used in other subject areas, but, like project-based learning, which might be viewed as a special form of inquiry, definitions and practices vary widely across and within subjects.[57] There is, however, a common understanding of inquiry in science because it is central to the discipline. Although pure constructivists define inquiry as an activity in which students pursue answers to questions that they generate, more typically inquiry is viewed as the conduct of investigations selected by the teacher to help students understand key concepts in the discipline. Such "guided" inquiry is featured in many

of the instructional materials used in science and social studies classes and is the focus of much of the professional development provided for teachers. There is general agreement that inquiry involves active learning and should reflect what scientists actually do.

Many small studies report that open discourse helps teachers understand their students' mathematical thinking and that when students have opportunities to express their ideas, they develop greater understanding.

Researchers do not, however, agree about how effective inquiry instruction is, or which forms are most effective, or how much of it is needed. Should teachers be using pure inquiry or guided inquiry? Should they be using inquiry all of the time or only occasionally? Does inquiry work better for certain students or for certain content? And even more fundamentally, is inquiry more effective at helping students master scientific concepts and processes than more traditional forms of instruction are? With the support of the National Science Foundation, the Education Development Center undertook a rigorous review of research on the effectiveness of the inquiry approach.[58] The results of their analysis of more than 400 studies will be released in 2009, and the reader is advised to look for that report. In the interim, we must rely on other, less rigorous reviews conducted in the 1980s and 1990s that reported modest,

positive effects of inquiry on achievement, process skills, and attitudes toward science. These reviews are often cited in support of constructivist arguments that students need "hands-on" experiences in classrooms or that they need to "do" science rather than simply read textbooks, listen to lectures, or watch demonstrations. However, the development of virtual laboratories offers another, less expensive option, and raises questions about the conventional wisdom about inquiry and good science teaching. A study by David Klahr and several colleagues has found that virtual labs are a viable alternative for elementary and middle school students, although particular domains of science such as life science might require direct experience with physical objects.[59]

Reformers often connect inquiry to the use of student teams in the classroom, noting that scientists work in communities of inquiry. A review of research found that using cooperative learning in science classrooms was linked with improved student learning, as well as more positive attitudes, more engagement in tasks, and higher motivation.[60] These findings are consistent with the larger body of research on grouping or teaming discussed earlier. However, most of the science studies were small in scale; few had comparison groups, and most were in biology, so the evidence simply suggests that this approach is promising.

A study committee appointed by the National Research Council looked at the traditional laboratory activities found in high schools and concluded that labs are usually disconnected from the content of lectures. They argued for a more integrated curriculum that allows students to engage in the practices of science (for example, ask questions, make observations, analyze data, and construct

explanations) and to support and deepen their understanding of science principles and concepts.[61]

The bottom line is that the evidence in support of using the inquiry approach in science is modest at best and that researchers must do more rigorous work to answer the questions raised above. Furthermore, new applications of technology are altering the meaning of inquiry and changing the debate about the reform of science instruction.

Reading and Writing

Because so many students enter high school lacking basic skills in reading and writing, these two areas have received considerable attention from researchers. Writing, in particular, has been the subject of hundreds of studies, perhaps because poor writing skills among high school graduates have been a major complaint of college faculty for decades.

Arthur Applebee and Martin Nystrand developed conceptual frameworks defining high-quality instruction in reading and writing that have guided subsequent research in this area.[62] The frameworks define quality in terms of quantity, content, coherence, and student voice. Quantity denotes the time devoted to written and oral analysis of text, the content of which must be rich enough to support sustained discussion. Coherence denotes how well lessons relate to various parts of the curriculum. Student voice refers to the use of "dialogic" instruction, with students engaging in free-flowing discussions and expressing their own ideas and questions rather than merely responding to teacher monologues or questions.[63] Nystrand reports that an observational study of twenty-five high schools found that students receiving such dialogic instruction outperformed peers receiving monologic instruction on assess-

ments in which they were asked to critique literary passages.[64] Nystrand and Adam Gamoran report similar findings from an analysis of hundreds of language arts lessons.[65] In a subsequent study of forty-four classrooms in twenty-five schools, Judith Langer found that both high-performing and low-performing students who regularly engaged in dialogic discussions outperformed peers who did not.[66]

Researchers have also carried out some big-picture studies of instruction in the language arts. Gamoran and William Carbonaro, examining data from the 1990 National Education Longitudinal Survey, found that both students and teachers reported that most students were not receiving instruction in the language arts that met the expectations of reformers in terms of the amount of time allocated, the coherence or content of the curriculum, or the opportunities for students to express themselves.[67] They also found that students in honors classes were more likely than others to receive high-quality instruction. In a related analysis of national data

Searching for Demonstration Proofs

Clearly researchers have not found compelling evidence on the effectiveness of specific instructional and organizational reforms, with the exception of the use of structured student grouping and the possible exception of dialogic or student-centered classroom discourse. But we remain persuaded that the single most important reason that high school reform efforts have failed to meet expectations is that they have failed to change classroom instructional practice. So we undertook a search for demonstration proofs—schools or districts that had made sustained gains in achievement as a result of changing instructional regimes. Could we identify schools or, even better, school districts that have undertaken systematic, sustained, and successful efforts to improve performance by altering instruction? Here we share the results of that search.

We examined data on student achievement and district instructional reform efforts for a number of sites frequently mentioned in the school reform literature, including Union City, New Jersey; Charlotte-Mecklenburg, North Carolina; Duval County, Florida; and Montgomery County Public Schools, Maryland. We also examined evidence compiled for districts that had been awarded the Broad Prize for Urban Schools and schools implementing the Talent Development and First Things First school reform models. In general, we found no solid empirical data to support conclusions regarding the positive effect of district instructional reform initiatives on student achievement. The lack of evidence results in part from measurement complications associated with the many elements involved in district and school initiatives and from using state standardized assessments of varying quality to measure the impact of district-wide initiatives. But the paucity of evidence also suggests that even districts with vision and commitment face considerable difficulties in implementing and sustaining instructional reform initiatives, particularly at the high school level. For example, schools adopting the First Things First and Talent Development programs appeared to implement structural reforms with greater ease and fidelity than the instructional changes associated with these programs. Research from other sites suggests that even districts that initially raised student achievement, such as those recognized by the Broad Foundation, did so only in the elementary and middle grades and often found it hard to sustain the improvements over time.

from the National Adult Literacy Survey, Carbonaro and Gamoran found that student voice and the content of the curriculum were related to reading achievement but that quantity of assignments and coherence of instruction were not.[68]

Researchers at Johns Hopkins University recently conducted a systematic review of evidence on the effectiveness of various approaches to teaching reading to adolescents, as well as the effectiveness of instructional materials in reading and of computerized reading programs. The biggest gains in achievement were associated with instructional process programs involving cooperative learning (a median effect size of 0.28) and for mixed-method programs, such as Read 180 and Voyager Passport, that combined large-group and small-group instruction with computer activities. No studies of reading curricula or textbooks met the criteria for the analysis.[69]

Steve Graham and Dolores Perin conducted a rigorous meta-analysis of 123 studies of instruction in writing, all of which used experimental or quasi-experimental designs.[70] The authors categorized the instructional approaches into four groups: process writing, such as writers' workshops; explicit teaching of skills, processes, or knowledge; strategies for "scaffolding" students' writing, such as pre-writing, peer assistance, and feedback; and alternative modes of composing, such as using word processing. The largest effect size (0.82) was linked with instructional approaches that explicitly taught strategies for planning, revising, and editing writing.[71] Teaching students how to summarize reading material had a similarly large effect on writing quality. Using grouping arrangements that allowed students to work together to plan, draft, revise, and edit had an effect size of 0.75.[72]

Summary

It seems clear even from this unsystematic review of the evidence that the instructional approach teachers choose matters for student learning. And interesting commonalities in the evidence across disciplines suggest the power of well-designed grouping strategies, of classroom discourse that allows students to express their ideas and questions, and of offering students challenging tasks. Some evidence also suggests that inquiry approaches may add value. But although researchers look for routines in classroom practice that are linked to achievement, teachers, who have great discretion in their choice of instructional strategies, appear to pay little heed to the evidence that researchers amass. As a consequence, less than half of American high school students report working in groups. An even smaller share reports being engaged in any inquiry.[73]

The Instructional Reforms We Need

What guidance does research offer public high schools with a pressing need to improve instruction?[74] What should they do? What should researchers, educators, and policy makers be doing to help them? The policy environment for high schools is, to say the least, demanding. Standards-based reforms are asking high schools to do something they have never before been required to do—to succeed at some significant level with substantially all students. There is a growing public consensus both that schools should take on more responsibility for equalizing student outcomes and closing "gaps" and that the outcomes for all students should be more ambitious, more "world class," more rigorous. The nation's education policies have changed dramatically in recent decades, as have the economy and societal expectations, and it is clear that instruction—teaching and

learning—has to change as well. Yet human differences being what they are, exposing all students to the same content and practice for the same amount of time will inevitably result in widely differing outcomes. For student outcomes to be more equal or, perhaps more reasonably, for substantially all students to master the core knowledge and skills needed for further education, for success in the modern economy, and for responsible civic participation, educators will have to vary the amount and nature of instruction to take account of students' differences in motivation, dispositions and aptitudes, experience, and instructional needs. At the moment, however, as the review of evidence in this article demonstrates, neither researchers nor educators have an adequate idea of how to do that. Assertions that educators and policy makers know what to do, but lack the will to do it undermine the possibility of making the needed investments in research, program development, and teacher training. As we show in this article, the educational community has a lot to learn about how to meet the standards that policy rhetoric has set. It would do everyone involved a disservice to pretend otherwise.

The point is for schools to take responsibility for each student and to try continually to do better. Schools should promote the use of proven practices such as structured student groups and dialogic discourse. But they must also adopt instructional approaches in which teachers deliberately and systematically attend to how students vary in what they are learning, regularly adapting their instruction in response to students' progress and needs, in the process learning more about what variations in instruction respond most effectively to common variations in students' learning. This approach need not lead to tracking, as some fear, but rather to real-time

interventions in classrooms, regrouping within or across classrooms, or the provision of additional instruction through tutoring or supplemental experiences.

Schools should promote the use of proven practices…. But they must also adopt instructional approaches in which teachers deliberately and systematically attend to how students vary in what they are learning….

The process we are describing is sometimes known as personalization, but we prefer the term "adaptive instruction," which makes clear that the focus is instruction and not merely relationships. Adaptive instruction could incorporate the effective instructional approaches we have been reviewing, but add the power of real-time feedback and continuous improvement, for the student, for the teacher, and for the profession. Although little direct evidence supports the claim that adaptive instruction will help high schools meet the challenges of the new century, the considerable body of evidence showing that formative assessment improves student performance is relevant to our argument. Adaptive instruction is an analogue of, indeed the point of, formative assessment.[75] Teachers who use formative assessment are trying to enable their students to reach some learning goal, and they assess students regularly to see whether the students are on track to reach the goal. If the assessment indicates they are not, the teachers will use information gained

from the assessment to modify their instruction and try again to help students move toward the goal. They will then evaluate the results of their new effort and, once again, try something else if it has not been successful. This is adaptive instruction. To make sustained progress, the process must be coupled with provisions for capturing and evaluating the instructional responses to the formative feedback to build and manage knowledge about what might work in comparable situations in the future.

The evidence that formative assessment can have substantial effects on students' learning comes from studies that have focused on classroom uses in which teachers gather evidence of whether or not students are learning in the course of day-to-day, or even moment-to-moment, instruction and adapt their teaching on the basis of that evidence while the lesson or instructional unit is still in progress.[76] The evidence is often based on teachers' observations of student work, on student responses to teachers' questions, or on the use of techniques that allow students to give continual feedback about whether they understand the material. In some cases, researchers have used more formal assessment tools but in this short-term way. This work, and earlier studies of mastery learning, has its roots in evidence that one-on-one tutoring has large effects on learning—on the order of 2.0 (two standard deviations). Indeed, both formative assessment and adaptive instruction can be viewed as attempts to replicate at the classroom level the responsiveness of individual tutoring.[77] The studies cited in support of these approaches typically were small in scale, and as yet no studies have been conducted of similar interventions that try to use these classroom-level approaches at scale in whole school systems or that try to encourage the adaptation of instruction

based on evidence of students' performance and progress gathered during longer cycles of instruction, such as with the interim assessments that have become so popular.

It is important to recognize that what is being "adapted" in adaptive instruction is not the learning goals for students, but rather the instructional strategies and supports offered to help students reach the goals. This instructional approach is consistent with both standards-based education and outcomes-based accountability. It also goes to the heart of the difference between the earlier conceptions of opportunity to learn based on equity in exposure to content and the newer conceptions based on ensuring greater equity in outcomes. Achieving the latter will require appropriate adaptations in the interaction between teacher and student to ensure that learning progresses. This view of instruction in a standards-based environment stands in sharp contrast to some contemporary conceptions of content standards, particularly grade-by-grade content standards that all students are supposed to meet at the same time, supported by pacing guides and interim assessments. Instead, it recognizes and accepts that students may vary greatly in their rate of progress toward the standards and in the kinds of instructional support they need to meet them.

The wide variation in instructional practices within and across schools in systems has led some policy makers to seek more control over instruction to ensure that students experience a common curriculum. By adopting district-wide curricular materials, curricular road-maps, pacing guides, and similar tools, policy makers aim to provide greater quality control over teachers' practice and to make teaching more uniform across systems. But these management tools work at cross-purposes

with the use of adaptive instruction, which requires variations in instructional strategies and pacing and even in the micro-content of the curriculum. If policy makers want to encourage adaptive instruction, they must take a different approach to quality control and design a set of tools that focuses on teachers' use of formative assessment, selection of appropriate responses, and progress toward raising performance and closing gaps. Policy makers must make greater investments in building strong communities of practice, supervision, knowledge management, and coaching, and less in standardizing the instructional process.

Given the rather weak knowledge base on instruction and given today's policy environment, we believe that making such investments would put the nation's high schools on the path toward improving instruction and meeting the challenges they face. But we recognize that the evidence supporting our arguments is thin and that competing theories about how to improve instruction also deserve attention and testing.

We further recognize that persuading teachers to use adaptive instruction will be difficult and will require the development of easy-to-use instructional materials and assessment tools designed to support this approach. Monitoring individual progress and providing appropriate instructional responses will be more difficult in high schools than in elementary schools given the number of students the typical teacher works with each day and the complexity of the curriculum, but new applications of technology such as the hand-helds being used to track students in elementary classrooms and the cognitive tutors widely used to supplement classroom instruction in colleges might be adapted for use in high schools and make the work manageable.

Many teachers will want to hold on to the old norms of coverage and selection, but faced with growing pressures to serve all students and evidence that their peers are making progress toward this goal by embracing adaptive instruction (or other instructional approaches that prove to be robust), we believe they also will change their practice as most teachers want their students to succeed.

What Next?

Clearly, the instructional approach that teachers and their schools adopt matters for students' learning. The proven effectiveness of such instructional approaches as group learning makes one wonder why well-designed student groups in writing, science, and mathematics are not a major focus of teacher training, professional development, and teacher evaluation. Use of student teams or cooperative groups should be the norm rather than the exception in the classroom. Likewise, it should be the norm to use discussion strategies that allow student voices to be heard. Vigorously pursuing these and all other promising instructional strategies can contribute not only to student learning but also to increased collaboration and shared knowledge among teachers and to stronger norms of responsibility for learning and shared norms of good practice. Researchers are beginning to uncover some starting points for building evidence-based instructional practice, practice supported by new tools and materials that embed sound theory and make creative use of new technologies that have been tested and found effective.

But there are major gaps in the knowledge base, and the evidence for the effectiveness of instructional approaches is limited and uneven. The studies that identify classroom routines associated with increased student learning tend to be observational and quali-

tative, and the samples tend to be small. Although such studies can help build theories that inform practice, they do not have the kind of rigor that generates evidence with a warrant to prescribe practice. Conversely, studies that try to link teaching practices to outcomes often rely on teacher self-reports or crude measures of practice and narrow measures of student achievement such as standardized tests that do not begin to assess more complex cognitive goals. The evidence problem must be addressed. Better theories of instruction, better measures of practice, and more rigorous studies of the effects of particular instructional approaches or routines are essential. Once they are available, it will be possible to begin to build a body of knowledge about instruction that can compel the profession to attend to its implications for teaching.

Researchers must design experiments to test various instructional approaches being used in combination with the curriculum, materials, and assessment tools meant to be used with them. They must also devise technology that makes it easier for teachers to use labor-intensive approaches, like adaptive instruction or project learning, as well as tools to simplify, standardize, and increase the efficacy of these approaches. Finally, they must build a culture of evidence in education that supports the spread of instructional practices that produce large effects.

We believe that a research and development program that emphasizes adaptive instruction

is essential as it has the greatest potential for improving the efficacy of instruction in today's standards-based policy environment. New applications of technology are making adaptive instruction feasible even in situations where teachers have to deal with large numbers of students, and applications of cognitive science to the development of online learning opportunities such as Cognitive Tutor, Simcalc, Agile Mind, Mastering Physics, and other similar programs may redefine and enhance the power of adaptive instruction. Admittedly, the evidence supporting the effectiveness of adaptive instruction is weak at this point, but the theoretical argument is persuasive, and we believe adaptive instruction can be combined with student teaming, discussion methods, and even project-based learning to create more powerful pedagogies. Because the evidence is weak, however, other approaches should be developed and tested as well.

We end this essay on an optimistic note. The body of knowledge about what instructional practices work is growing. There are signs that an evidence-based culture is developing in the profession and in school districts. New technologies are being developed, and more importantly used, in classrooms. Many gaps remain in the profession's knowledge about teaching and learning, especially in high schools, but we see a bit of light at the end of the tunnel, and we think that a major national research and development effort can move the education community toward the light.

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College Readiness for All: The Challenge for Urban High Schools

Melissa Roderick, Jenny Nagaoka, and Vanessa Coca

Summary

Melissa Roderick, Jenny Nagaoka, and Vanessa Coca focus on the importance of improving college access and readiness for low-income and minority students in urban high schools. They stress the aspirations-attainment gap: although the college aspirations of all U.S. high school students, regardless of race, ethnicity, and family income, have increased dramatically over the past several decades, significant disparities remain in college readiness and enrollment.

The authors emphasize the need for researchers and policy makers to be explicit about precisely which sets of knowledge and skills shape college access and performance and about how best to measure those skills. They identify four essential sets of skills: content knowledge and basic skills; core academic skills; non-cognitive, or behavioral, skills; and "college knowledge," the ability to effectively search for and apply to college. High schools, they say, must stress all four.

The authors also examine different ways of assessing college readiness. The three most commonly recognized indicators used by colleges, they say, are coursework required for college admission, achievement test scores, and grade point averages. Student performance on all of these indicators of readiness reveals significant racial and ethnic disparities.

To turn college aspirations into college attainment, high schools and teachers need clear indicators of college readiness and clear performance standards for those indicators. These standards, say the authors, must be set at the performance level necessary for high school students to have a high probability of gaining access to four-year colleges. The standards must allow schools and districts to assess where their students currently stand and to measure their progress. The standards must also give clear guidance about what students need to do to improve.

College readiness indicators can be developed based on existing data and testing systems. But districts and states will require new data systems that provide information on the college outcomes of their graduates and link their performance during high school with their college outcomes.

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Melissa Roderick, Jenny Nagaoka, and Vanessa Coca

In 2006, the final report of the Commission on the Future of Higher Education made high school reform a central component in improving access to and success in college.[1] Secretary Margaret Spellings' Action Plan for Higher Education that same year committed the U.S. Department of Education to strengthening K–12 preparation and aligning high school standards with college expectations.[2] Both the commission's report and the secretary's action plan are a part of the growing consensus that high schools must begin to view the postsecondary performance of their graduates as a key measure of their own performance. This policy direction recognizes that the new economy demands higher skills and that high school graduates who have no postsecondary experience face declining economic prospects.[3] "All kids college-ready" and a host of other clarion calls are heralding a new era of high school reform focused on college readiness and access.[4]

But what exactly does college readiness entail? And how can high schools best promote it? In this article, we address those questions by examining different definitions of college readiness and laying out the challenges that a focus on college readiness presents to high school reform. We begin by addressing racial and ethnic and income disparities in college readiness and enrollment among the nation's high school students. Next we explore the different types of skills and knowledge that students need to do well in college, what indicators can be used to assess these skills, and how different benchmarks of college readiness shape the conception of what the policy problem is. Finally, we discuss what policy strategies may best promote a focus on college readiness in high schools.

Today, the most common policy prescriptions for helping high schools promote college readiness are to align high school curricula and graduation requirements with college readiness standards, move larger numbers of students into more rigorous coursework, and increase the rigor of state exit examinations to meet college entrance requirements.[5] Evaluating how well these policy prescriptions work requires indicators and data that link high school and postsecondary performance. At present, however, no state uses its existing high school assessment system, such as high school exit exams or performance on college entrance examinations, to benchmark college readiness, and only a few states have linked high school student indicators to actual college performance. School districts are just beginning to have the data to track their students into college. Thus for the present, researchers are primarily limited to data sets available from the Department of Education that provide descriptive data but do not allow a rigorous evaluation of the potential efficacy of different approaches to increasing college readiness. To meet the growing emphasis in district, state, and federal policy on building strong indicator and accountability systems around college readiness and enrollment, the Department of Education is now investing in building data sets that connect high school and postsecondary performance and has committed itself to developing college readiness indicators based on student performance on the National Assessment of Educational Progress (NAEP).

Over the past several decades, high school students' college aspirations have increased markedly, and gaps in educational aspirations across race and ethnicity and income have fallen dramatically. But significant, and in some cases widening, gaps remain in college readiness, access, and success across these

groups. For this reason, we focus in particular on the question of what it will take to improve college access and readiness for low-income and minority students in urban high schools.

## The Aspirations-Attainment Gap

In the final two decades of the twentieth century, a dramatic transformation occurred in high schools. Students' postsecondary aspirations changed, reflecting a new economic reality. Nationally, the share of tenth graders who stated that they hoped to earn a bachelor's degree or higher doubled, from 40 percent in 1980 to 80 percent in 2002.[6] These rising aspirations were shared across racial and ethnic groups, with low-income students registering the greatest increases.

Not surprisingly, the share of high school graduates making an immediate transition to college has also been rising among all racial and ethnic groups. Figure 1 shows trends in

the share of recent high school graduates who enroll in college in the fall, by family income and race and ethnicity. Although significant racial and ethnic and income gaps remain, all groups have seen dramatic increases in college enrollment after graduation. Recently, enrollment has grown more in four-year institutions than in two-year colleges. Between 2000 and 2005, enrollment in four-year institutions increased by 17.6 percentage points, while enrollment in two-year colleges grew 9 percentage points.[7] These trends are projected to continue; the National Center for Education Statistics estimates that four-year college enrollment will increase by approximately 16 percent by 2015.[8]

Rising college enrollment, however, has not translated into substantial increases in the share of African American and Latino students who earn four-year college degrees. Table 1 shows national trends in the share of

Figure 1. National Estimates of the Percentage of High School Graduates Who Immediately Enrolled in College, 1980–2004, by Income and Race and Ethnicity
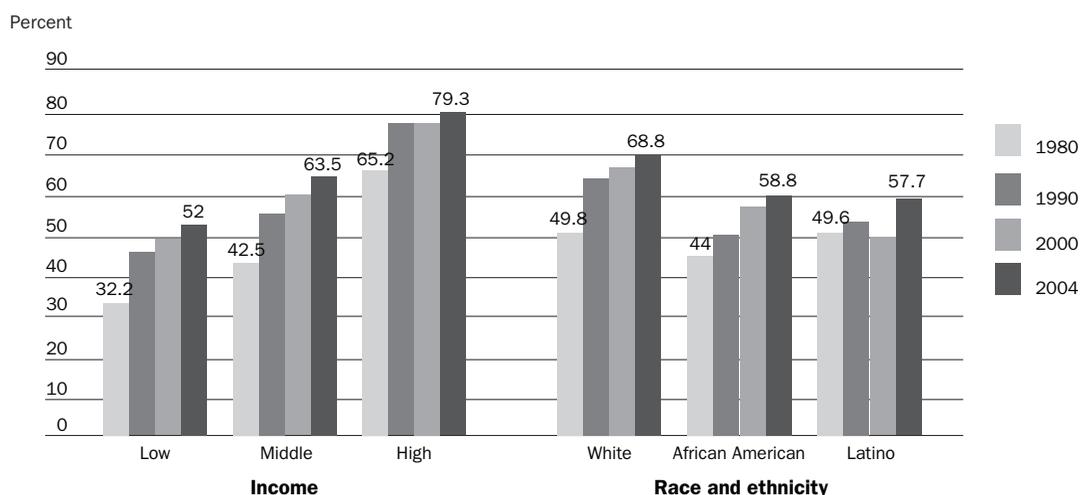
Source: Department of Education, National Center for Education Statistics, *The Condition of Education 2007* (Washington: Department of Education, 2007), table 25-1. Estimates for low-income, African American, and Latino students are based on three-year averages due to small sample sizes in the Current Population Survey.

Melissa Roderick, Jenny Nagaoka, and Vanessa Coca

young adults aged twenty-five to twenty-nine who report having attended some college and having completed a bachelor's degree or higher. We can estimate four-year college completion rates among students who enrolled in a college by dividing the proportion of students with a bachelor's degree by the proportion with some college.

From 1980 to 2005, the share of young adults who report having attended some college increased substantially among all racial and ethnic groups. For example, the share of African American young adults who attended some college increased 18 percentage points, from 32.2 percent to 50.3 percent. However, the very low four-year college completion rate among African Americans means that despite that upward trend in college attendance, the proportion who completed bachelor's degrees rose by less than 6 percentage points. In 2005, only 17.8 percent of African American young adults had earned a bachelor's degree. Latino students lag in both college attendance and completion. In 2005, less than one-third of Latino young adults had attended some college. This proportion will most likely improve given the increase in college enrollment among more recent Latino high school graduates (see figure 1). At the same time, only 10.5 percent of Latino young adults had completed a bachelor's degree or higher in 2005, a rate only slightly higher than that of fifteen years earlier.

The bottom line is that closing the aspirations-attainment gap requires more than increasing the number of students who enroll in college. It ultimately requires improving students' likelihood of completing degrees, and this will require improving college completion rates among students who enroll. As more students go to college, we might expect completion rates to decline on the assumption

that these newer college entrants are less academically prepared. College completion rates did fall somewhat during the 1990s, a decline that has been documented in John Bound, Michael Lovenheim, and Sarah Turner's rigorous analysis of Department of Education longitudinal data, which found that between the 1970s and mid-1990s, four-year college completion rates fell from 51.1 to 45.3 percent. The length of time it takes for students to complete a degree has also been rising.[9] But, since the 1990s, completion rates have risen. Is the recent rise in completion rates a trend that will continue, and what can we extrapolate about what will happen to more recent high school graduating classes, where we observe increases in the share of students attending four-year colleges? As shown in the bottom section of table 1, we have observed stable and in some cases widening racial gaps in college enrollment and completion despite dramatic reductions in the gaps in educational aspirations by race and ethnicity and income.

Addressing the gap between rising aspirations and college completion is one of the most vexing problems in education today. In our article we focus on the implications for high school reform. Many factors in addition to high school qualifications affect whether students attend college and their chances of persisting to graduation, including rising costs of college and the declining real value of financial aid.[10] But the central strategy to improve college access and performance must be to ensure that students leave high school with the academic skills, coursework, and qualifications they need.[11] Simply, high school students who graduate with higher test scores, better grades, and more rigorous coursework are more likely to enroll in and graduate from four-year colleges. And, as we will document, each of these areas of high

Table 1. Trends and Racial and Ethnic Gaps in Educational Attainment of Young Adults (Aged 25–29), by Race and Ethnicity, 1980–2005 (Three-year averages)

Percent

Educational attainment and race and ethnicity	1980	1985	1990	1995	2000	2005
	High school graduating class:					
	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
White						
Some college or more	47.9	46.3	48.3	59.6	64.3	65.1
Bachelor's degree or higher	24.7	24.6	26.5	29.1	33.5	34.3
Estimated college completion rate	51.6	53.1	54.8	48.9	52.2	52.7
African American						
Some college or more	32.2	34.5	35.7	45.0	51.5	50.3
Bachelor's degree or higher	11.9	11.7	12.3	14.5	16.9	17.8
Estimated college completion rate	36.9	33.9	34.6	32.3	32.7	35.4
Latino						
Some college or more	24.0	26.3	24.8	30.2	32.1	32.3
Bachelor's degree or higher	7.5	10.2	9.1	9.0	9.9	10.5
Estimated college completion rate	31.3	38.8	36.8	29.6	30.9	32.6
White-African American gap						
Some college or more	15.7	11.7	12.6	14.6	12.8	16.5
Bachelor's degree or higher	12.8	12.9	14.1	14.6	16.7	17.3
White-Latino gap						
Some college or more	23.9	20.0	23.5	29.4	32.2	32.8
Bachelor's degree or higher	17.2	14.3	17.3	20.2	23.6	23.8

Source: Department of Education, National Center for Education Statistics, *The Condition of Education 2008,* NCES 2008-031 (Washington: Department of Education, 2008), Indicator 25.

Notes: Data are from students' self-reports in the March Current Population Surveys. The estimated completion rate is the estimated proportion of students who had some college who ultimately completed a bachelor's degree or higher. Estimates use a three-year average to account for small sample sizes in the Current Population Survey. For example, the proportion of whites with some college in 1980 represents the three-year average for 1979, 1980, and 1981.

school qualifications is characterized by significant gaps by race and ethnicity and income. In the National Education Longitudinal Study of 1988, 62 percent of African Americans and 63 percent of Latinos who enrolled in college were placed into a developmental (that is, remedial) college course, compared with 36 percent of whites.[12] Differences by socioeconomic status were equally dramatic. Fully 63 percent of students in the lowest socioeconomic quartile took a developmental course in college compared with only 25 percent of students in the highest quartile. Such statistics have led many observers to conclude that high schools have sold their students short and that it is time for them to raise the bar to ensure that their graduates are "college-ready."

What Does It Mean to Be College-Ready?

This new emphasis on college readiness requires an understanding of what it means to be "college-ready" and where high school students currently stand on that score. Answering these questions must begin by being more explicit about precisely which sets of knowledge and skills shape college access and performance and how best to measure those skills. In this section, we draw on previous research, particularly David Conley's work on college readiness, to identify

four main areas of skill development that are critical in shaping college readiness: content knowledge and basic skills, core academic skills, non-cognitive skills and norms of performance, and "college knowledge."[13]

The first two types of skills are commonly recognized as being key components of high school instruction and are frequently used in definitions of what it means to be college-ready. Content knowledge and basic skills are foundational to the understanding of academic disciplines and are often specific to a given subject area, such as knowledge of different literary techniques in the field of English. Core academic skills, such as writing and analytic thinking, are not subject-specific, but rather allow students to engage in work in a range of disciplines. The distinction between core academic skills and content knowledge can be subtle. In the American Diploma Project's readiness benchmarks, for example, many of the English standards include core academic skills, such as writing, research skills, oral communication, and analytic thinking skills, which are not specific to English.[14] This distinction is important because high school courses, such as algebra, can teach content such as factoring equations by using rote memorization of algorithms rather than engaging students in solving problems that develop both deeper knowledge of the content and more general logic and analytic thinking skills. Core academic skills are highly valued by colleges and are most often cited by college professors and students as the weakest areas of preparation in high school.[15] Indeed, Conley argues that the largest differences in skill demands between high school and college classes are in these core academic skills—particularly in the amount and type of reading and writing required and the analytic and thinking skills emphasized.[16]

Although core academic skills and content knowledge are commonly recognized as college readiness skills, other skills also help shape readiness to do college-level work. Economists have characterized skills that determine educational achievement but are not measured readily by standardized tests or directly taught as content as "non-cognitive skills."[17] Non-cognitive skills include a range of behaviors that reflect greater student self-awareness, self-monitoring, and self-control—study skills, work habits, time management, help-seeking behavior, and social problem-solving skills. Meeting the developmental demands of college requires behavioral, problem-solving, and coping skills that allow students to successfully manage new environments and the new academic and social demands of college.[18]

The fourth area of college readiness that we have identified moves beyond academic and behavioral skills to acknowledge the role of social capital in college access and success. "College knowledge" includes the information and skills that allow students to successfully navigate the complex college admissions and financial aid processes, as well as develop an understanding of college norms and culture.[19] We focus on this area of college readiness in detail later.

Measuring College Readiness

Gaining access to and succeeding in college requires students to have high levels of content knowledge, core academic skills, and non-cognitive skills—skills that colleges traditionally assess by looking at students' high school coursework, their performance on achievement exams, and their relative class rank and grade point average (GPA). Colleges use students' coursework to identify whether applicants have been exposed to content that prepares them for introductory

college courses. They use achievement tests primarily as standardized indicators of students' cognitive ability, basic skills, content knowledge, and core academic skills. They use course grades to measure whether students have mastered the material in their classes and have developed core academic skills and content knowledge. Grades also measure the third area of college readiness, non-cognitive skills, particularly whether students have demonstrated the work effort and study skills needed to meet the demands of a college environment. Thus, colleges tend to use multiple indicators to assess college readiness.

Over the past decade, however, state and district policy strategies have largely focused on two of these indicators—coursework and test scores. First, many states and districts have raised high school graduation requirements, expanded access to engage more students in college preparatory coursework such as Advanced Placement (AP), and aligned state curricular standards to college expectations.[20] Second, many states have adopted minimum competency testing and accountability linked to performance on standardized tests to ensure that students who graduate from high school meet minimum standards of performance. We examine the picture that emerges in both the status and trends for high school graduates in each of these areas—coursework, college admissions exams, and state and national achievement tests. We then ask whether indicators of college readiness should also include student performance in coursework as measured by their GPA—a central indicator used by colleges in admission decisions, but one that has had limited emphasis in the policy discussion around high school reform. The choice of indicators may be particularly important, as different indicators suggest very different strategies

for attacking the problem and very different prospects for more recent high school graduates.

The question of how to measure college readiness depends on what indicators we use and also on what outcome we want to measure— access to any college, access to a minimally selective four-year college, or access to and success in credit-bearing courses. The least useful goal would be to define college readiness as the ability to enroll in any college. In a world of open-admissions, defining college readiness by whether a student can "walk through the door" of a college does not raise the bar for high schools since by that definition graduating from high school makes students "college-ready." A second approach is to set the goal that students should have the ability to enroll in a four-year college that has minimal admissions standards or higher. Yet a third approach focuses on whether students have a strong likelihood of success in college (for example, placement in credit-bearing courses, freshman year GPA, degree attainment). In summation, measures of college readiness will vary depending on the choice of indicators and what outcome is assessed. Different measures of college readiness, as we discuss in the next section, come to similar conclusions: there are significant racial and ethnic gaps in college readiness.

College Readiness Defined by Minimum Four-Year College Admissions Requirements

Some researchers and policy makers define students as college-ready if they meet the minimum entrance requirements for a four-year college with some admission criteria—meaning that they have taken the necessary courses and have demonstrated basic proficiency skills. Jay Greene and Greg Forster of the Manhattan Institute drew on

Table 2. Trends in College Access Indicators of Graduating High School Seniors,
by Race and Ethnicity, 1990–2005

Indicator and year	White	African American	Latino	Asian	White-African American gap	White-Latino gap
Percentage of students completing mid-level curricula						
1990	32%	26%	23%	44%	6%	9%
1994	41%	30%	32%	47%	11%	10%
1998	45%	38%	30%	53%	7%	15%
2000	47%	46%	38%	54%	1%	9%
2005	52%	51%	44%	63%	1%	7%
NAEP reading scale scores (seventeen-year-olds)						
1990	297	267	275		29%	22%
1994	296	266	263		30%	33%
1999	295	264	271		31%	24%
2004	293	264	264		29%	29%
NAEP mathematics scale scores (seventeen-year-olds)						
1990	309	289	284		21%	26%
1994	312	286	291		27%	22%
1999	315	283	293		31%	22%
2004	313	285	289		28%	24%
Cumulative GPA						
1990	2.73	2.42	2.61	2.88	.31	.13
1994	2.84	2.47	2.71	3.00	.37	.13
1998	2.96	2.61	2.75	3.04	.36	.21
2000	3.01	2.63	2.80	3.20	.38	.21
2005	3.05	2.69	2.82	3.16	.36	.23
Percentage of students taking advanced mathematics (above Algebra II)						
2004	54%	42%	34%	69%	8%	20%
Percentage of students taking advanced science (chemistry, physics, or above)						
2004	71%	63%	60%	84%	8%	11%
Percentage of students earning any credit in an AP or IB class						
2004	33%	16%	25%	53%	17%	8%

Source: Results from the NAEP and NAEP high school transcript studies of graduating seniors.

transcripts and test scores from the NAEP to estimate the proportion of high school graduates from the classes of 1991 to 2002 who could be deemed "college-ready" by this standard.[21] The authors specified college readiness as meaning that students possessed "basic literacy skills" (scoring at or above basic level on the NAEP twelfth-grade reading assessment), had graduated from high school, and had taken and passed the minimum coursework requirements of four-year colleges with at least some admissions criteria.[22] Using this definition of college readiness (a combination of course-taking and measured achievement), they found that only about one-third of 2002 graduates met minimum college readiness criteria. Less than one-quarter (23 percent) of African American and only 20 percent of Latino graduates would be deemed college-ready, compared with 40 percent of whites.

Measures of college readiness such as that developed by Greene and Forster are useful because they combine different indicators, in this case, course-taking and measured achievement. An assessment of what to do about these low levels of college readiness, however, will differ depending on whether one focuses on course-taking, where the national trend is positive, or measured achievement, where the national trend is flat. First, course-taking is most easily influenced by policy and is an area where American students have already begun to show substantial progress. Across the nation, students are taking more advanced coursework in high school, and over the past decade many states have increased graduation requirements.[23] Stephen Planty and his colleagues' recent analysis of Department of Education data documented that in 2004 the average American senior was taking approximately a year more each of mathematics, science, and foreign language than seniors in 1982 and more than one year more of mathematics above the level of Algebra I.[24] Similar trends are observed in transcript data from NAEP. The NAEP defines a mid-level high school curriculum as four years of English, three years each of social studies, mathematics, and science, and one year of foreign language. As seen in table 2, increasing shares of high school graduates have taken this core curriculum, which is often deemed the minimal requirement for four-year college admissions. Thus, if we define college readiness on the basis of minimum course-taking alone, we would conclude that over time, more students are meeting college readiness standards.

There remain, however, significant gaps in the shares of minority and white students and in the shares of students at different socioeconomic levels who take advanced mathematics and science courses, particularly college preparatory courses such as AP. In 2003–04, high school graduates of high socioeconomic status were more than three times more likely (50.9 percent versus 16.3 percent) to have taken an AP course than students of low socioeconomic status.[25] As shown in table 2, only 16 percent of African American and one-quarter of Latino graduates had taken an AP course, compared with 33 percent of white graduates.

Looking at the other part of Greene and Forster's college readiness measure, NAEP scores, the picture is not promising. As seen in table 2, trends over time in NAEP scores show relatively flat achievement performance among seventeen-year-olds and significant and consistent gaps across race and ethnicity.

College Readiness Defined by Performance on Achievement Exams

Given these persistent gaps in course-taking and NAEP scores, a second approach to assessing college readiness would be to use scores on achievement exams to identify the skills students need to gain admission into a four-year college and relate those scores to college performance. ACT, for example, has developed "benchmarks of college readiness" by comparing students' scores on subject-matter ACT tests with their grades in introductory college classes.[26] The ACT benchmarks indicate the minimum ACT score students would need to have a 50 percent likelihood of getting a B or better in an introductory college class and a 75 percent likelihood of getting a C or better.[27] Sixty-nine percent of all test-takers meet ACT benchmarks in English, but only 43 percent do so in mathematics. The gap by race and ethnicity is striking. In mathematics, half (49 percent) of whites but only one-quarter of Latinos and 12 percent of African Americans meet the benchmarks.

Massachusetts Comprehensive Assessment System (MCAS), the state exit examinations. Less than one-third of students who passed the MCAS with the lowest passing score of "needing improvement" in mathematics enrolled in four-year colleges, compared with two-thirds of graduates who scored "proficient" and fully 87 percent of graduates who scored "advanced."[35] Moreover, in their first year of college, half of MCAS test takers who were identified as "needing improvement" in mathematics were enrolled in developmental mathematics, compared with 20 percent who scored at "proficient" and 4 percent deemed "advanced." These findings suggest that if college readiness is defined as having a high likelihood of being able to enroll in credit-bearing courses at a four-year college, "proficient" would be a better standard for minimal college readiness in Massachusetts than simply passing. Using this standard, white high school students in Massachusetts were more than twice as likely as African Americans and Latinos to graduate from high school ready to enroll in credit-bearing coursework at a four-year college. Only 23 percent of African Americans and 21 percent of Latinos scored "proficient" or above in mathematics compared with 57 percent of whites.[36] Similar gaps are observed in English Language Arts.[37]

Clearly, as many researchers and policy advocates have pointed out, merely passing a high school exit exam does not ensure that students are college-ready. Does this mean that states should raise their standards, or does it mean that states need to develop better indicators that delineate the differences between the standards for graduation and "readiness for college"? The possibility that raising standards to align with college expectations could increase the number of high school dropouts poses a problem. One solution would be to make it clear that meeting exit requirements may be sufficient for graduation, but not for college readiness, by establishing different benchmarks for each. A variation of this approach, one that has not been rigorously studied, has been used in New York where students can receive a Local Diploma, a Regents Diploma, or a Regents Diploma with Advanced Designation.[38]

Readiness Defined by GPA

One limitation of test scores from high school exit and college entrance exams is that they do not measure the non-cognitive skills that may be critical for meeting the academic and developmental demands of college environments. GPA, which is already used by colleges in making admission decisions, may be an important indicator to assess college readiness. If GPA is a non-cognitive measure of a student's ability to work hard in college courses and meet the academic and developmental demands of college, then we would expect to see that high school GPA is an important predictor of college performance. Generally, research finds that achievement test scores and GPA are independently associated with college performance, but that high school GPA, even self-reported GPA, is at least as predictive of college grades as college entrance examination scores.[39] In the recent College Board validation study of the SAT, for example, self-reported high school GPA explained 54 percent of the variation in freshman-year college GPA in four-year institutions compared with 53 percent for the SAT writing, critical reading, and mathematics sections combined.[40] Self-reported GPAs in the SAT study were substantially higher than those observed in national studies that used transcript analysis. The College Board reports that studies have found that there is a strong relation between self-reported and actual GPA, usually about a 0.8 correlation.

In a more rigorous study, Saul Geiser and Veronica Santelices of the University of California–Berkeley analyzed the college performance of 80,000 students who attended one of eight University of California campuses from 1996 to 1999.[41] They predicted college GPA and likelihood of graduation on the basis of high school grades, SAT scores, class rank, family background, and a measure of the average test scores of students' high schools using a nested model to adjust for college effects. High school grades emerged as the strongest predictor of college GPA and college graduation. For example, a one standard deviation increase in high school GPA was associated with a 0.34 standard deviation increase in cumulative four-year college GPA, compared with a 0.19 standard deviation for the SAT II writing test, the SAT component that has the strongest association with grades in college.

These findings are quite consistent with our own analysis of the relationship between high school performance and college enrollment and graduation among graduates from the Chicago Public Schools, a predominantly minority system.[42] We used National Student Clearinghouse data to determine four-year college enrollment and six-year college graduation and estimated enrollment and graduation rates among students who enrolled in a four-year college immediately after graduation on the basis of unweighted high school GPA, the number of honors and AP courses the students took, and eleventh-grade achievement test scores. A one standard deviation increase in GPA, controlling for test scores and participation in advanced coursework, was associated with a 15 percentage point increase in the chances of four-year college graduation, while a one standard deviation increase in achievement test scores was linked with only a 7 percentage point

increase in those chances. The study identified an unweighted GPA of 3.0 as a key benchmark for college readiness—a cutoff that gave students a 50 percent or greater likelihood of graduating from a four-year college within six years.

The Chicago study, moreover, found that low GPAs among African American and Latino graduates, particularly among male graduates, created significant barriers to college access as well as college graduation. GPA was a better predictor than ACT scores of whether students would enroll in a four-year college, particularly a more selective college. Most important, few Chicago graduates left high school able to signal to colleges through their GPA that they had worked hard in high school. Only 25 percent of all Chicago graduates, and even fewer minority male graduates, had a GPA of at least 3.0. Only 8 percent of African American and 13 percent of Latino male graduates had a GPA of 3.0 or higher, as compared with 18 percent of African American female and 25 percent of Latino female graduates. These gender gaps were not observed in students' ACT scores.

These racial and ethnic gaps in GPA are also reflected in national data, which show stable and, in the case of Latinos, widening gaps in college readiness (see table 2). Given the significance of GPA for college outcomes, the national upward trend in high school GPAs is promising. However, as seen in table 2, one of the most significant trends in college readiness is the widening of the racial and ethnic gap in the GPAs of graduating seniors. From 1990 to 2005, the average GPAs of white graduates increased from 2.73 to 3.05. The GPAs of African American and Latino graduates also increased, although not at the same rate, leading to the widening gap in coursework performance. Indeed, the average

GPAs for Latino and African American graduates remain lower than the 3.0 benchmark that the research in Chicago found to be critical for giving students a high probability of attaining a four-year college degree.

GPA was a better predictor than ACT scores of whether students would enroll in a four-year college.... Most important, few Chicago graduates left high school able to signal to colleges through their GPA that they had worked hard in high school.

What is driving the increases in GPA? One theory is that the trend reflects grade inflation. At the same time, national trends show that more students are participating in rigorous coursework, such as AP, and are working harder in their courses. Student self-reports suggest that American high school students are spending more time on homework.[43] From 1980 to 2002, the proportion of sophomores who report completing ten or more hours of homework a week increased from 6.9 percent to 36 percent. Students are also more likely to report being in a college preparatory track versus a general track, with the largest increases occurring among minority and low-income students.[44] These statistics are correlational but do suggest that students are working harder in high school, and this increased effort might be reflected in higher grades.

Should college readiness indicators include GPA? Educators and policy makers often discount grades because they believe that grades are not valid measures of student performance and that they are not comparable across high schools. But if grades were not comparable across high schools and were not reliable indicators of performance, they would not be so strongly associated with performance in college. Not including coursework performance, moreover, means that college readiness indicators may not be adequately capturing the non-cognitive skills students need to gain access to and do well in college. In addition, focusing on GPAs does not, like focusing on exit examinations, create a trade-off between high school graduation and college access, because high GPAs are also a central predictor of whether students will graduate from high school. Using only freshman-year GPA, Elaine Allensworth from the Consortium on Chicago School Research at the University of Chicago was able to correctly predict 80 percent of on-time high school graduates. By contrast, eighth-grade test scores and measures of student risk (prior school mobility, being over-age for grade, race and ethnicity, gender, and measures of the socioeconomic status of a student's census block) together predict only 65 percent of graduates.[45]

Readiness Defined by College Knowledge
So far we have examined college readiness as defined by three commonly recognized academic indicators used by colleges to determine access: coursework required for college admission, achievement test scores, and GPA. Sociological researchers emphasize that in addition to measured qualifications, a student's college readiness will be shaped by whether he or she has the information, resources, and skills necessary to effectively navigate the college admission process—what

we are calling "college knowledge." While college knowledge has not traditionally been discussed as part of college readiness, it may contribute to significant disparities in college readiness by income and race and ethnicity and is an area of particular relevance for high school reform. Even among students who have similar academic qualifications, low-income and minority students are more likely than high-income and white students to attend a two-year institution and less likely to enroll in a selective four-year college.[46] Such findings suggest that low-income and minority students face barriers to college access beyond their qualifications and point to the importance of understanding the college application process, the financial aid system, and the range of choices within the postsecondary system, as well as being able to navigate these complex processes and systems. Successfully enrolling in college requires such knowledge, which high schools can support by providing norms, information, and guidance about college-going to their students.

Urban students with high postsecondary aspirations often lack information about the college application process and often have difficulty taking the concrete steps needed to apply to and enroll in four-year colleges.[47] For example, economists Christopher Avery and Thomas Kane found that high school seniors with similar college aspirations in Boston Public Schools and suburban high schools near Boston differed dramatically in the extent to which they took the steps necessary to apply to college.[48] Among students who planned to attend a four-year college, only slightly more than half of the Boston sample, compared with 91 percent of the suburban sample, had obtained an application from the college they were interested in attending by the fall of their senior year. Only 18 percent of the Boston sample versus 41 percent of the suburban sample had applied to a four-year college by that fall.

Our own recent study in Chicago, *From High School to the Future: Potholes on the Road to College,* provided a more comprehensive look at this problem.[49] We found that only 41 percent of Chicago seniors who stated that they aspired to complete a four-year degree actually applied to and enrolled in a four-year college.[50] We identified three critical points where even highly qualified students encountered obstacles on the road to college. First, many students with aspirations to attain a four-year degree instead planned to attend a two-year or vocational school or to delay enrollment. Second, many did not apply to a four-year college by the spring of their senior year. Only 60 percent of seniors who aspired to complete a four-year degree reported that they had applied to a four-year college. Fewer than half of Latino students who aspired to attain a four-year degree applied to at least one four-year college. And, finally, even among students who were accepted at a four-year college, some ultimately did not enroll. Not surprisingly, students with the lowest qualifications were the least likely to plan to attend a four-year college, apply, and enroll. But students with higher qualifications were also at risk of not completing these benchmarks.

Successfully applying to college, particularly for low-income students, also requires applying for financial aid. There is a growing recognition that the complexity of the federal financial aid application creates barriers for students.[51] The American Council on Education estimates that approximately one in five low-income students who are enrolled in college and would likely be eligible for federal Pell Grants never filed a Free Application for Federal Student Aid (FAFSA).[52] Low-income

students who file a FAFSA, moreover, are more likely than middle-income students to file late, after April 1, which reduces their eligibility for state and institutional aid. In our recent study in Chicago, completing an application for federal financial aid was an important predictor of whether students who had been accepted at a four-year college ultimately enrolled. Even after controlling for differences in students' qualifications, family background, neighborhood characteristics, and reports of support from their parents, teachers, and counselors, we found that students who had been accepted into a four-year college and had completed a federal financial aid application were almost 50 percent more likely to enroll than students who had been accepted but had not completed that application. Although the study adjusts for an array of student characteristics, the estimates may overstate the importance of a student having filled out a financial aid application for college enrollment because students who complete a FAFSA may be more motivated or otherwise differ from those that do not.

Another important strand of research on college access suggests that low-income and first-generation college students do not engage effectively in a college search. They have difficulty identifying the kinds of colleges they might like to attend, as well as the range of options that are available to them and how much they will be expected to pay for college.[53] Because of these difficulties, many urban students, who are likely to be first-generation college students, focus their entire college search within the enclave colleges of the traditional feeder patterns—largely public, two-year, or non- and somewhat selective four-year colleges.[54] For example, economists Amanda Pallais and Sarah Turner, using data from the SAT,

demonstrate that low-income students are much less likely than other students with similar test scores to send those scores to top-tier public and private institutions.[55] Similarly, a recent study of Harvard University's new Financial Aid Initiative found that the guarantee of free tuition for families with lower incomes led to significant increases in the representation of students with eligible family income ($60,000 or less) in the application pool and an increase in the proportion of the entering class with eligible family incomes from 14.9 to 16.5 percent.[56] However, the study found that many low-income academically qualified students still did not apply and these students were concentrated in high schools where few students apply to selective private colleges. These findings suggest that many first-generation college students, particularly in schools without a strong college-going tradition, conduct a constrained college search that often leads them to enroll in colleges that are less selective than they are actually eligible to attend.

Why would college choice matter in defining college readiness? Most important, it may well shape students' likelihood of college graduation. There is evidence that low-income and urban minority students often enroll in colleges, such as two-year colleges and less selective four-year colleges, that provide significantly lower probabilities of completing a four-year degree.[57] Using multiple data sets and multiple methodologies to address student selection into different colleges, sociologists Sigal Alon and Marta Tienda found that minority students' likelihood of graduating increased as the selectivity of the college increased.[58] Although Alon and Tienda found a strong association between college graduation rates and college selectivity, they could not offer further

evidence on why more selective institutions produced better outcomes.

Researchers exploring the area of college choice have also found that minority and low-income students are especially dependent on their teachers and other non-familial adults in making educational plans and decisions and that high schools can play a central role in shaping students' college enrollment.[59] Using data from the National Education Longitudinal Study of 1988, Stephen Plank and Will J. Jordan explored how student support in high school shaped differences in college enrollment and the decision to enroll in a two- versus four-year institution.[60] Using a multivariate analysis that controlled for student background, test scores, and high school characteristics, Plank and Jordan found that low socioeconomic status students were less likely to enroll in four-year colleges, partly because these students were much less likely to report that they had received support in preparing for college entrance examinations and support in college planning in their schools.

In our work in Chicago, the single most consistent predictor of whether students took steps toward college enrollment (planning to attend a four-year college, applying, being accepted, and enrolling in a four-year college), as well as whether they enrolled in a college that matched their qualifications, was whether their high schools had strong college-going climates measured either by the percentage of prior graduates attending four-year colleges or by teachers' reports of whether they focused their work and curriculum on preparing and planning for college.[61] After controlling for students' ACT scores, GPAs, and demographic and socioeconomic characteristics, we found that a one standard deviation increase in a school's college-going climate

was associated with a 7 to 9 percent increase in the likelihood that a student who aspired to a four-year college degree would take each step in the college enrollment process and a 30 percent increase in the probability that a student would enroll in a college with a selectivity level that matched or exceeded his or her qualifications.

If educators are to use college readiness as a strategy for accomplishing the goal of college access and success, they must couple academic preparedness with the knowledge and skills students need to navigate the college-going process.

College knowledge has not commonly been seen as a part of college readiness or even necessarily as something that high schools are responsible for providing. However, if educators are to use college readiness as a strategy for accomplishing the goal of college access and success, they must couple academic preparedness with the knowledge and skills students need to navigate the college-going process.

Conclusion

The focus of recent high school reforms on college readiness reflects the recognition that most high school students now aspire to attain a four-year degree and will ultimately participate in some form of postsecondary education. These reform efforts also suggest

that high schools should be held accountable for their students' academic performance after high school graduation. The challenge for high schools is how to increase the college readiness of their students.

At present, the K–16 alignment strategy embraces two sets of policy recommendations to improve college readiness. The first is to raise standards. The second is to develop integrated data systems. Raising standards includes making high school graduation requirements more demanding, increasing the rigor of high school exit exams, and aligning state curricular standards to college-level work. These policies, however, have three significant limitations. First, they provide no means of measuring how they affect college readiness; rather, they are based on the assumption that once they are implemented, college readiness will follow. As Valerie Lee and Douglas Ready argue in their article in this volume, however, the benefits of raising high school graduation requirements may have been significantly overstated. Although the aim of more rigorous graduation requirements is to help more students reach minimum college entrance requirements, there is limited evidence that the tougher requirements have delivered on their promise to improve student achievement. Second, any standards-raising approach that is tied to high school graduation may have trade-offs in the form of increased dropout rates. Third, raising standards involves external policy changes that do not build the capacity of schools to teach the skills and knowledge students need to access and succeed in college.

The second policy recommendation—creating data systems to track student progress across educational levels and institutions—holds more promise. In this article, we have demonstrated that making high schools

accountable for their graduates' college performance requires developing clear indicators of college readiness and creating clear standards for those indicators. These college readiness standards must be based on validated measures of the performance level necessary for high school students to have a high probability of gaining access to four-year colleges and credit-bearing courses. The standards must provide schools and districts with a clear assessment of where their students currently stand and allow schools and districts to measure their students' progress. And, finally, the standards must provide educators and students with clear guidance about what students need to do to improve.

Unfortunately, few districts and states now have such a capacity. As noted, no state uses existing measures to benchmark college readiness, and few have linked student indicators to actual college performance. As we have shown, college readiness indicators can be developed based on existing data and testing systems. But districts and states will require new feedback systems that both provide schools information on the college outcomes of their graduates and link their performance during high school with their college outcomes. We simply cannot ask high schools to focus on the college readiness and postsecondary outcomes of their graduates if they do not know what happens to their students after they graduate and do not have measurable indicators of what determines college access and performance.

In this article, we have looked at three approaches to defining college readiness: minimum college admissions criteria, achievement test performance, and GPA. Each of these is a valid approach and comes to similar conclusions—no matter where we

set the bar, there are significant gaps in college readiness for high school graduates, particularly for low-income and minority students. The good news is that students are taking more courses and their GPAs have risen; the bad news is that despite these gains, large gaps by race and ethnicity and income on all college readiness indicators remain, particularly on measures of mathematics achievement. Using the various college readiness indicators we have discussed, about half of white graduates meet college readiness benchmarks, compared with less than one-quarter of Latino and African American graduates. Still, increasing qualifications may not be sufficient; even among students who meet college readiness standards, minority students are less likely to enroll in four-year colleges.

College readiness indicators help focus high schools' attention on postsecondary readiness, but they do not build the capacity of schools to improve. The remaining question is: what policy approaches can lead high schools to bring a singular focus to learning and engagement in coursework while building their capacity to support this focus? High schools will have to do more than raise graduation requirements and align standards. They will have to build instructional environments where students are learning content knowledge and core academic skills, as well as developing the non-cognitive skills that traditionally have not been the domain of most high schools. They will also have to take responsibility for teaching college knowledge and providing support for students in the college-going process. They will have to make a fundamental shift from strategies that focus on credit accumulation, such as increasing graduation requirements, to strategies that focus on preparing students for college.

Policy Strategies for Increasing College Readiness

Our prescriptions for increasing college readiness in urban high schools can be frustrating for a policy audience. State policy makers have a limited number of simple policy levers that can affect college readiness, and these are of limited efficacy. Although this new focus for high schools is not something that can easily be mandated, we next identify four sets of strategies that states and districts can pursue. Although we describe these strategies as distinct, the programs that have been found to be effective often incorporate multiple strategies.

Strategy 1: Develop Valid Indicators of College Readiness and Build Accountability

We have seen that high schools cannot focus on college readiness if they do not know where they stand. A first step in increasing college readiness is for districts and states to hold themselves accountable for students' postsecondary performance, which, as noted, requires building a strong data system and validated indicators of college readiness. Several states have begun to link high school and college data sets together for tracking purposes, but few states and localities have made postsecondary outcomes a core component of their accountability and data reporting systems.

Strategy 2: Help High School Educators Meet the Instructional Challenge

Accountability and data systems may help to focus high schools on postsecondary readiness and performance, but they do not in and of themselves build the capacity of schools and teachers to respond. Increasing college readiness is fundamentally an instructional challenge that will require developing classroom environments that deeply engage

students in acquiring the skills and knowledge they will need to gain access to and succeed in college. Supporting this shift within the classroom will require a serious investment to increase the capacity of high schools by providing teachers the development opportunities to enhance their instructional practice to meet this challenge. (See the article by Tom Corcoran and Megan Silander in this volume.)

Strategy 3: Bridge the Information and Social Capital Gap

A third strategy for increasing college readiness seeks to provide schools with another type of capacity: the resources and supports necessary to help low-income and minority students effectively manage the college application and financial aid processes. This approach focuses on strengthening schools' capacity by providing the resources, strategies, and know-how to counselors and teachers so that they are appropriately equipped to provide support to students throughout the college planning process.

Strategy 4: Use Incentives and Strong Signals for Students

A final strategy is for states and districts to adopt policies that reinforce these efforts by sending clear messages directly to students about what they must do to prepare for college and, in turn, by providing students with incentives for strong performance. Parents and students are both more likely to respond strongly to programs if they receive a clear signal about expectations and if performance is connected to real payoffs, particularly college attainment. Incentives and strong signals can also provide greater focus to the efforts of teachers and school administrators on improving college readiness and supporting the college planning process of their students.

Needed: A Comprehensive Effort

These four strategies provide guidelines for how states and school districts can focus their efforts to increase college readiness. The goal of college readiness, however, will not be attained by simply adopting a promising program or policy in isolation. The evidence is strongest for programs and policies that use multiple strategies for increasing college readiness, particularly if they are a part of an integrated strategy around college access.[62] Districts and schools must combine the resources and support to increase capacity within schools with the signals and incentives that reinforce both student and teacher behaviors that build college readiness.

The Texas Advanced Placement Incentive Program is one example of such a program that has strong evidence for its efficacy. It combines enhanced professional development and support for teachers in implementing pre-AP and AP curricula with monetary incentives for teachers and students for passing exams. A recent evaluation by C. Kirabo Jackson compared changes in student performance in schools that adopted the program with changes in schools that had not, adjusting for the general demographic characteristics of schools and school effects. Over several cohorts, Jackson found that participating schools saw substantial increases, over and above comparison schools, in the percentage of students scoring high on the ACT (higher than 24) and SAT (higher than 1100) and in the proportion of students who attend college in Texas.[63] Jackson's qualitative data suggest that the AP incentive program may have led to improvements in counseling, both in recruiting students for AP and in supporting students in the college search process. What programs such as this one in Texas make clear is that increasing college readiness is not something that happens with

one strategy or one program; it requires a comprehensive effort to build capacity within schools and to give students and teachers clear signals about what it will take to turn college aspirations into college attainment.

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Expanding Policy Options for
Educating Teenagers

David Stern

Summary

David Stern argues that some basic features of the American high school must be modified if it is to serve all students successfully. He notes, for example, that only three-quarters of U.S. high school students graduate four years after beginning ninth grade and that the National Assessment of Educational Progress found no improvement in reading or mathematics for seventeen-year-olds between 1971 and 2004. The nation's system for educating teenagers, says Stern, seems to be stuck, despite the constant efforts of teachers and repeated waves of reform.

Citing two widely accepted public purposes of educating teenagers—preparation for civic participation and for economic self-sufficiency—Stern proposes four new strategies to achieve those goals. He draws on empirical evidence suggesting that these are promising directions for research and policy, but acknowledges that existing studies provide only limited guidance.

First, he says, schools should continue the current trend toward integrating educational options to provide young people with skills and experiences that pave the way to *both* college and careers. Second, states and districts should tie education funding not simply to the number of students attending school, but also to what young people learn, whether they graduate, and whether they find jobs or enroll in postsecondary education. Such a move, he argues, would encourage teaching and learning formats that use students' time more effectively. Third, more adults in addition to classroom teachers should be involved in educating teenagers. Other adults acting as academic advisers, learning coaches, student advocates, internship supervisors, mentors, and college counselors could help guide the education of teenagers inside and outside of school and provide some relief for the chronic shortage of teachers. Fourth, schools should expand the options for educating teenagers outside of geographically fixed schools. Combining improved Internet-based curriculum with internships and civic engagement projects, for example, may produce better results for many young people and also may promote academic achievement for teenagers who do not thrive in conventional classrooms and for those who face academic and social challenges when they move from one place to another. Stern argues that the limited success of today's high schools makes such new initiatives well worth trying and evaluating.

David Stern is a professor at the Graduate School of Education, University of California–Berkeley. The author thanks authors of the other papers in this volume, and especially the issue editors, for helpful feedback on earlier drafts. He also acknowledges Lisa Arrastia, Bob Lenz, and Page Tompkins, whose dedication to improving education for teenagers has inspired this essay.

David Stern

The basic structure of the American high school that emerged in the twentieth century has never served all students successfully. Although graduation rates rose steadily from about 1900 to 1970, the share of public high school students who graduate with regular diplomas four years after starting ninth grade has remained at about 75 percent since then.[1] The National Assessment of Educational Progress found no improvement in reading or mathematics for seventeen-year-olds between 1971 and 2004.[2] Although larger numbers of high school graduates are going directly to college, the number completing college degrees has risen much more slowly.[3] The system seems to be stuck, despite the constant efforts of teachers and repeated waves of reform. A *Future of Children* issue on American high schools is a good place to consider possible new directions for policy and research.

I begin by reviewing two of the widely accepted public purposes of education for teenagers: to produce informed citizens and to prepare students for economic self-sufficiency. In examining how well high schools are fulfilling those two goals, I find much room for improvement. I then analyze some of the structural limitations of the conventional high school model that may hamper fulfillment of those goals and suggest possible ways to overcome them. To the extent possible, I draw on empirical studies, but I acknowledge at the outset that the evidence is insufficient to prove that all the prescriptions I propose are correct. My purpose is to recommend some new directions for policy and research that offer promise for guiding the evolution of American high schools over the coming decades.

Even conservative economists who favor private over public provision of many services have endorsed the idea that tax-supported public education is justified by the goal of preparing citizens.

Public Purposes of Education for Teenagers

In considering how to improve education for teenagers,[4] it is important to recall why education is compulsory for teenagers and why taxpayers are required to pay for it. Most Americans agree that the public purposes of a high school education include enabling students to become informed citizens, and preparing them for economic self-sufficiency. A key pathway to economic self-sufficiency is through higher education. But because the question of how high schools are succeeding in preparing students for postsecondary education is discussed in depth elsewhere in this volume (see the articles by Melissa Roderick, Jenny Nagaoka, and Vanessa Coca, and by Valerie Lee and Douglas Ready), I focus much of this discussion on preparing students for economic self-sufficiency through career-technical education in high school.

Citizenship First

In response to a recent California court decision on homeschooling, the state's Secretary of Education reportedly declared, "'As a society, we recognize that a well-educated citizenry is our goal.' The purpose of compulsory education is 'to help ensure that.'"[5] The

U.S. Supreme Court has repeatedly invoked the ideal of good citizenship in making decisions about education. In the 2003 *Grutter v. Bollinger* ruling that it is permissible for universities to consider race in selecting students for admission, for example, the Supreme Court quoted the 1954 *Brown v. Board of Education* decision that "education … is the very foundation of good citizenship."

A 2000 Gallup Poll on public attitudes toward education asked respondents to rate the importance of seven different "purposes that have been offered to explain why America needs a system of public schools." The purpose that earned the highest average rating from respondents was "to prepare people to become responsible citizens."[6]

Even conservative economists who favor private over public provision of many services have endorsed the idea that tax-supported public education is justified by the goal of preparing citizens. For example, in his famous 1955 essay on "The Role of Government in Education," Milton Friedman explains the public benefits of general education for citizenship as follows:

> A stable and democratic society is impossible without widespread acceptance of some common set of values and without a minimum degree of literacy and knowledge on the part of most citizens. Education contributes to both. In consequence, the gain from the education of a child accrues not only to the child or to his parents but to other members of the society; the education of my child contributes to other people's welfare by promoting a stable and democratic society. Yet it is not feasible to identify the particular individuals (or families) benefited or the money value of the benefit and so to charge for the services rendered.[7]

Friedman's view harks back to Adam Smith, who described with brutal honesty in the *Wealth of Nations*, what he saw as the devastating effects on workers of repetitive and mindless work. As a prime remedy for these ills, Smith proposed public schools. Public support for schools, he argued, is warranted and necessary to avoid the "dreadful disorders" that arise among unschooled people. "Instructed and intelligent people," by contrast, are less susceptible to "the delusions of enthusiasm and superstition" or the claims of "faction and sedition." For Adam Smith, public order was the public benefit that justified providing schooling at public expense.[8] Others among Smith's contemporaries, notably including Thomas Jefferson and James Madison, also viewed education for citizenship as a governmental responsibility.[9]

Economic Self-Sufficiency
The educational purpose that respondents in the 2000 Gallup Poll ranked a close second to that of preparing citizens was helping students become economically self-sufficient.[10] During most of the twentieth century, high schools fulfilled this second goal in two ways: through academic courses leading to college and through vocational education, defined as preparation for occupations that did not require a college degree. In recent decades, traditional forms of vocational education have gradually given way to what is now called career-technical education (CTE), a broader notion of preparation for economic self-sufficiency that includes readiness for postsecondary education as well as for entering the workforce directly. As I will show, the trend away from a sharp separation of preparation for college and preparation for careers is one example of how limitations of the twentieth-century high school model may be successfully overcome.

How Well Do High Schools Achieve the Public Goals of Education?

Available evidence indicates much room for improvement in preparing high school students for civic responsibilities. In preparing students for work, the results are somewhat ambiguous: traditional vocational classes have led to higher earnings among high school graduates who do not attend college, but students who take more vocational classes also have been less likely to attend college and thereby gain access to high-paying jobs that require college degrees.

Preparation for Civic Life

Are high schools preparing teenagers to take on the civic responsibilities of adults? Civic competence has three key components, including the analytical skills necessary to reason about public issues, familiarity with governmental institutions, and participation in community affairs. A brief review of the research indicates considerable room for improvement on all three components.

Analytical skills are essential to fulfilling some of the basic roles of citizens, including serving on juries and voting on ballot propositions routinely placed before voters in many states. Just as one example, voters in California between 2000 and 2004 considered thirty-seven statewide ballot propositions, as well as hundreds more local propositions. The statewide ballot matters involved complex and contentious issues such as limiting campaign contributions, enabling Indian tribes to open more gambling casinos, and regulating chiropractors. Other issues included whether public agencies should be allowed to collect data on race or ethnicity, penalties for first-time convictions on illegal drug charges, and dedication of state revenues for rebuilding infrastructure. Since California first started putting propositions before the voters in 1901, many have had powerful and lasting effects on government and society.

To help voters make informed choices about ballot propositions, California mails each registered voter a booklet, sometimes up to 200 pages of dense type, that gives the full text of each proposition, provides an analysis by a state agency that is intended to be impartial, and also presents arguments by proponents and opponents, along with rebuttals. Using the information from the booklet to make a reasoned decision about how to vote requires "making a critical judgment about a detailed document," a reading skill rated at the "proficient" level by the National Assessment of Educational Progress (NAEP).[11] But as of 2005, only 35 percent of twelfth graders scored proficient or better in reading, suggesting that most high school seniors would not be able to read and reason well enough to use the booklet successfully.

In 1998 and 2006, NAEP specifically assessed "students' understanding of the democratic institutions and ideals necessary to become informed citizens." Only 27 percent of twelfth graders scored proficient or better in 2006, with no significant improvement since 1998. For example, only 5 percent of twelfth graders correctly explained three ways in which the power of the president can be checked by the legislative or judicial branch. Similarly, Mark Hugo Lopez and several colleagues report results from a 2006 national survey of fifteen- to twenty-five-year-olds, in which 54 percent believed that the U.S. government spent more on foreign aid than on Social Security, and only 30 percent could correctly name at least one member of the president's cabinet. Evidently, high school graduates lack important knowledge about the institutions of government.

Civic competence has three key components, including the analytical skills necessary to reason about public issues, familiarity with governmental institutions, and participation in community affairs.

The third component of civic competence, participation in civic or community affairs, includes voting and various kinds of volunteering, among other things. Young people who have graduated from high school but have not attended college are less likely to vote or volunteer than their peers who attend college. According to Lopez and his colleagues, voter turnout rates among eighteen- to twenty-four-year-old citizens who have not attended college are, and have been consistently since the 1970s, only about half the rates among college attendees.[12] Similarly, Karlo Barrios Marcelo analyzed 2006 Current Population Survey data on volunteering among nineteen- to twenty-five-year-olds and found that 8 percent of high school graduates who did not attend college reported some kind of volunteer activity, compared with 31 percent of college graduates, 26 percent of current college students, and 23 percent of young people who had some college experience but were not currently enrolled.[13] These differences are partly attributable to socioeconomic and personal variables that affect both college attendance and civic participation. Nevertheless, it is evident that high school by itself does not produce graduates who have high rates of voting or volunteering.

Given these data, it would be difficult to claim that high schools are fulfilling the first public purpose of education for teenagers: enabling them to become informed and responsible citizens.

Preparation for Economic Self-Sufficiency
Today, more than 95 percent of students graduating from high school have taken at least one course in what used to be called vocational education and is now called career-technical education (CTE). Between 1982 and 2000, a steady share of about 45 percent of these graduating seniors took at least three year-long courses in CTE. The share taking at least three courses in a single occupational area (for example, business or health careers) declined from about 33 percent to 24 percent during that period.[14] The mean number of CTE credits earned by graduating seniors declined from 4.4 in 1982 to 3.8 in 2000, while the number of credits earned in academic subjects rose from 14.5 to 19.1.[15] Nationwide, CTE programs are provided in about 9,500 comprehensive high schools, in about 1,000 vocational high schools whose students enroll full-time and also take academic subjects, and in about 800 area or regional vocational schools that offer only CTE courses and whose students attend part-time, taking their academic coursework at their "home" high schools.[16]

A key question is the extent to which high school CTE accomplishes the purpose of preparing students to earn a living. There is some evidence that high school CTE has been successful in this realm, although the research is not completely convincing. This research finds that graduates who take more CTE courses in high school obtain higher earnings.[17] For example, Ferran Mane used three national longitudinal surveys to analyze labor market outcomes for high school graduates in

1972, 1980, and 1992. He examined how the total number of CTE courses and the total number of academic courses of students were each related to the number of months they were employed in the year following graduation, their hourly wage, and their annual earnings. Significantly, the number of vocational courses was more positively related to these labor market outcomes than the number of academic courses. The difference was generally greater for graduates in 1980 and 1992 than in 1972.[18]

Correlational studies such as Mane's suggest that the labor market outcomes of students who took CTE improved as a result of having taken the classes. Such studies, however, are limited because of what social scientists call "selection bias." Some students may "self-select" into high school CTE classes because they are interested in the kind of work for which such classes prepare them. Providing CTE for students who are not interested would not necessarily produce equally positive results. Selection bias is inherent in correlational studies and can lead to either overstating or understating the effect being measured.

Students who take many CTE classes in high school are less likely than their peers who take few such classes to participate in postsecondary education or to complete a degree, further complicating estimates of the effects of high school CTE on subsequent success in the labor market. Mane's study was limited to high school graduates who had not participated in full-time postsecondary education for more than six months in the first twenty-one months after high school. But the higher earnings associated with more CTE for these students are offset by the higher probability of going to college for students who take fewer CTE classes. The 2003 National

Assessment of Vocational Education, for example, compared the postsecondary educational experiences of vocational "concentrators"—defined as students who had taken at least three CTE classes in the same occupational area—with those of non-concentrators. Among the concentrators, 19 percent had completed a bachelor's or higher degree within eight years after high school; among the non-concentrators, the share was 46 percent.[19] Students who take more CTE in high school are thus less likely to gain access to the more highly paid jobs that require a bachelor's or advanced degree.

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Summary

Americans agree widely that two important collective purposes of education include preparing for civic responsibilities and equipping students to earn a living. Research evidence indicates much room for improvement in achieving the first goal, but possibly some success in achieving the second. One way to address the goal of equipping students to earn a living has been through what used to be called vocational education and is now called career-technical education. Among students who do not enroll in postsecondary education, there is some evidence that taking more career-technical courses in high school can lead to higher earnings. This finding, however, comes from correlational studies

that may overstate (or understate) the true effects of these courses. Furthermore, students who take more career-technical courses in high school also have been less likely to participate in postsecondary education.

Limitations in the Twentieth-Century High School Model

In this section I describe four standard features of the twentieth-century American high school that arguably have made it more difficult to educate teenagers effectively for civic participation and economic self-sufficiency. The first such feature is the traditional separation of academic and vocational curricula. That separation has until recently been cast as a mutually exclusive choice that students must make or that is made for them, so that students who take more vocational classes in high school have less access to college. The three other features are attendance-based school funding, the multi-period school day, and the geographically fixed nature of high schools. Altering these features may make it possible to educate teenagers more effectively.

Separating Academic and Career-Technical Curricula

Whether preparation for work and preparation for college should be two separate tracks in the American high school curriculum has long been a subject of debate. Social scientists from John Dewey a hundred years ago to George Counts in the 1930s to Jeannie Oakes and others more recently have criticized such tracking, arguing that it disproportionately places low-income and minority students in vocational classes that do not challenge them academically or prepare them for college.[20] During the 1980s, influential spokesmen for employers, traditionally strong advocates for vocational education, began to question its efficacy in preparing students for a changing

economy. Congress responded in 1990 by approving federal support to "integrate academic and vocational education."[21] In 2006, language limiting CTE to preparing students for occupations that do not require a bachelor's or advanced degree was eliminated from federal law.

The American debate about whether to establish separate high school curricula for college-bound and work-bound students began in the late nineteenth century. A very influential 1894 report by the Committee of Ten, headed by Harvard President Charles W. Eliot and composed mainly of university professors, argued unambiguously that all students should take the same rigorous academic curriculum, whether or not they intend to go to college.[22] However, that policy did not prevail. In 1918, the National Education Association produced another landmark report, the *Cardinal Principles of Secondary Education*, in which a group composed mainly of authorities in educational administration argued, among other things, that high school curriculum should be differentiated according to students' vocational interests.[23]

Significantly, in 1918, Congress passed the Smith-Hughes Act, which for the first time provided federal money for states to support vocational education in high schools. By explicitly defining vocational education as preparation for occupations that did not require a bachelor's or advanced degree, the Smith-Hughes Act affirmed that vocational education was not intended to prepare high school students for college. The *Cardinal Principles* report and the Smith-Hughes Act were major victories for those like Charles A. Prosser, who saw differentiated curriculum as a means to achieve social efficiency, and a defeat for John Dewey and others who wanted to achieve democratic equality by

offering the same rigorous academic curriculum to all students.[24]

The early debate about differentiated curriculum occurred at a time when high school enrollment growth was beginning to accelerate as a result of the shift from a rural agricultural society to an urban industrial economy. Relative to the population of fourteen- to seventeen-year-olds, the share of students enrolled in grades nine through twelve grew from 6 percent in 1889–90 to 14 percent in 1909–10, then to 31 percent in 1919–20, and 51 percent in 1929–30.[25] Vocational education was a logical program for the mass of new students, most of whom would not attend college.

At the time of the Smith-Hughes Act, college was still for the few. In 1920, only 3 percent of the population aged twenty-five and older had bachelor's degrees. As the twentieth century progressed, college enrollments steadily grew. The share of the population aged twenty-five and older with bachelor's degrees reached 20 percent in 1987 and 29 percent in 2007.[26] The rise in the share of college graduates was in part a response to growing demand, which has kept the average earnings of college graduates consistently well above those of high school graduates.[27]

When few high school students expected to attend college, the fact that vocational education did not lead to college was less problematic than it is now, when most high school students expect to attain at least a bachelor's degree. The nationally representative 2002 Education Longitudinal Study found that 72 percent of high school sophomores expected to earn at least a bachelor's degree, and 10 percent did not have definite expectations, so only 18 percent definitely did not expect to earn a bachelor's degree.[28]

National surveys indicate that high school students' expectations of college attendance have grown significantly since the 1980s. Between 1981–82 and 2003–04, the share of high school seniors who expected to attain at least a bachelor's degree rose from 35 to 69 percent.[29] Because a large majority of high school students have come to expect that they will earn bachelor's degrees or more, the fact that traditional vocational education has not been a path to college has made it less attractive to many students and their parents.

Employers provided important political backing for vocational education during most of the twentieth century. However, as America was becoming alarmed about serious international economic competition during the 1980s, key business spokesmen began to question whether traditional vocational education provided a sufficiently solid academic foundation for employees to continue to learn and adapt to new technologies during their working lives.[30]

The 1983 report titled *A Nation at Risk* tied the perceived decline in national economic competitiveness to a lack of academic rigor in the nation's schools.[31] The report spurred state legislatures to increase the number of courses in mathematics, science, English, and social studies required for high school graduation. Business groups also supported the increased requirements, which have reduced the amount of time available in students' schedules to take vocational classes.

The continued viability of separating academic and vocational education in high school, which was a standard feature of the twentieth-century American high school, has been called into doubt by growth in the share of high school students expecting to attend college, by the softening of political support

from employers, and by the increased academic course requirements for high school graduation. Later in this article I will describe how high school career-technical education has changed since the 1980s, to become more compatible with preparation for college.

In effect, states pay districts simply to keep teenagers in custody. For funding purposes, all that matters is that they be physically present at a school, not what they learn there.

Attendance-Based School Funding
A second standard feature of high schools (and of K–12 schools generally) has been that funding depends on student enrollment or attendance, without regard to how well students themselves fare. Here I describe how current funding formulas may lead to unproductive use of students' time.

Subventions from states have become the main source of school district revenues, with various formulas being used to distribute money.[32] Most states provide basic or "foundation" funding, along with various "categorical" grants for particular activities or categories of students. However varied the funding formulas may be, one feature is constant: the amount of money depends on the number of students, without regard to student outcomes.[33] The amount may depend on the number of students enrolled, or the number in attendance, and it may depend on grade

level or other student characteristics. But it does not depend on what students learn or whether they graduate.

In effect, states pay districts simply to keep teenagers in custody. The law requires teens to attend school, and districts get money simply for keeping them there. For funding purposes, all that matters is that they be physically present at a school, not what they learn there.[34]

This arrangement seems almost guaranteed to waste students' time. During the school day, schools do not have to consider the opportunity cost of students' time because their time has no alternative use. Students' options are limited to what the school offers and allows. The extent to which high schools use students' time productively varies from school to school, classroom to classroom, and student to student, but research finds that much time is, indeed, wasted.

Studies of high schools over the years have documented widespread disengagement among students.[35] The 2006 High School Survey of Student Engagement asked a national sample of students, "Why are you in school?" Reflecting an awareness of compulsory school attendance, 58 percent replied, "Because it's the law." Only 39 percent replied, "Because of what I learn in classes."[36]

The same survey asked students, "Have you ever been bored in class in high school?" Two out of three students indicated they are bored in class in high school at least some of the time every day; 17 percent said they are bored in every class. Only 2 percent said they were never bored in class. Students were then asked, "If you have been bored in class, why?" Seventy-five percent of them replied that the class material was not interesting;

39 percent, that the material was not relevant to them; 32 percent, that the work was not challenging enough; 31 percent, that there was no interaction with a teacher; and 27 percent, that the work was too difficult.[37]

The similarity in the shares of students who said the work is too hard or not hard enough is consistent with theories of engagement proposed by Mihaly Csikszentmihalyi. Maximum engagement, or "flow," occurs in situations that challenge valued skills. Situations involving no skill or challenge produce apathy; those where skills are used but not challenged create "relaxation"; and situations where challenge exceeds skills cause anxiety. None of those situations is optimally productive. David Shernoff, Csikszentmihalyi, and Barbara Schneider applied this theory to high school students, using data obtained by paging students at eight random times a day and asking them to answer questions about what they were doing at that moment and how they felt about it. They found that the students spent a lot of time in activities that were less engaging, like listening to teachers talk or doing homework in class. Students spent less time in more engaging activities like group projects.[38]

Other evidence of wasted time comes from the National Education Longitudinal Survey (NELS). Jennifer King Rice analyzed the NELS data reported by teachers to see whether use of time was associated with class size in high school math and science. She compared time devoted to instruction and time committed to non-instructional activities. Relationships with class size were mixed, but the overall average responses imply that both math and science teachers reported spending about 10 percent of class time on administrative tasks and about another 10 percent on maintaining order—a total of 20 percent on non-instructional activities.[39]

The most egregious waste of students' time may occur in settings where misbehaving students are sent—for example, detention, in-school suspension, or alternative schools for disruptive students. Districts are paid for students in these settings, but the students may learn very little. In-school suspensions keep students on the school premises, but apart from regular classrooms, while they are serving their suspension time. According to Troy Adams, this practice increased during the 1980s and 1990s in response to the 1975 U.S. Supreme Court decision in *Goss v. Lopez,* which made it more difficult to suspend students from school without due process.[40]

The "bell schedule" that divides the school day into instructional periods is another standard feature of high schools that may sometimes interfere with effective education.

Programs provided in some of these settings for misbehaving students are not likely to achieve the goals of compulsory education, as Regina M. Foley and Lan-Sze Pang found in a survey of principals of alternative schools for disruptive students in Illinois. The schools, operated by school districts, special education cooperatives, or regional offices of education, served students both with and without disabilities. The survey found that most students in the schools were referred, suspended, or expelled from regular high schools. Programs typically were housed in

"hand-me-down" buildings and offered limited access to libraries or science facilities. The curriculum was characterized mainly as general or vocational, with little or no college-preparatory coursework.[41]

The alternative schools surveyed by Foley and Pang are sometimes called "last-chance" programs to distinguish them from other alternative schools created for more positive reasons, such as to give students more choice, usually in a smaller setting where students can receive more personal attention. Cheryl Lange and Sandra Sletten have described the varied offerings grouped under the "alternative" umbrella, but the point here is that within this broad category some alternative settings serve mainly to detain teenagers, providing only low-quality education while the districts or other operating agencies collect money for this service.[42]

If regular high schools find some students difficult to deal with, they can send them to alternative schools, and the district continues to receive funding for them. Some of these students choose to enroll in charter schools, which are not operated by school districts but do receive public funding for each student. It is thus not surprising that when Susan Rotermund compared annual dropout rates among different categories of schools in California she found that alternative schools account for 8 percent of enrollments in grades nine through twelve but 33 percent of dropouts. She also found that charter schools enroll 4 percent of high school students but account for 16 percent of the dropouts.

Alternative and charter schools with very high dropout rates are presumably taking large shares of students who have some kind of trouble in regular high schools. In recent years, state and federal accountability policies

that depend on test scores have given regular high schools yet more reason to get these students off their books and let them go to alternative or charter schools. A 2007 study by the California Legislative Analyst criticized the practice, and the legislature responded by passing a law requiring that test scores of students sent to alternative schools be attributed to the original school for accountability purposes.[43] But districts or charter operators will still be paid to enroll these students, whether or not they are effectively educating them.

The Multi-Period School Day and the Teacher Quality-Quantity Quandary

The "bell schedule" that divides the school day into instructional periods is another standard feature of high schools that may sometimes interfere with effective education. To receive a high school diploma, a student must satisfactorily complete certain numbers of "units" in particular subjects, as required by the state and the local school district. Each unit requires at least a minimum number of instructional hours. The only feasible way to keep track of the number of instructional hours a student receives in each subject is to divide the school day into periods, so that every student can be counted as taking a particular subject during each period.

Breaking up the educational process into rigid time periods increases the difficulty of keeping students interested. A period of math, followed by a period of English, then science, then history—in whatever order—confronts students with a series of disjointed assignments. If a student does become involved in a class, the experience nevertheless must stop when the bell rings. Field trips or projects that take extended periods of time are difficult to fit into the schedule. Many high schools have recently tried to group

students and teachers into small learning communities (SLCs), with a given set of students taking several classes together so that teachers can create some connections among their separate subjects. But this strategy turns out to be difficult to implement, because the school's master schedule often includes only one or two sections in certain subjects, and scheduling students for that section or sections conflicts with keeping them together with their SLC.[44]

The multi-period school day also increases the challenge of teaching. With many teenagers feeling that they are in school only because they have to be, it takes a great deal of talent, energy, commitment, and resourcefulness for a high school teacher to keep classes lively, engaging, and worthwhile for students. Chopping up the curriculum into uniform chunks makes the experience more artificial and regimented for students and adds to the challenge of teaching them.

The multi-period day also means that each teacher must interact with many individual students every day. A typical high school teacher meets four to six classes each day, depending on the length of class periods. With 20–30 or even more students in each class, a teacher interacts with 100–150 different students, or more, every day. As Richard Elmore has pointed out, the standard structures of mass schooling militate against effective teaching.[45] How to connect with, understand, instruct, support, and stimulate each student appropriately is a huge challenge—even if the students want to be there. Because many students are less than willing participants in the classroom, motivating and disciplining them also can become a major part of teachers' work. Theodore Sizer's influential study, *Horace's Compromise,* poignantly depicted teachers'

difficulties trying to engage a series of teenage groups over the course of the multi-period school day.[46]

No wonder so many new teachers quit. Richard Ingersoll has analyzed four waves of the national Teacher Follow-up Survey, and found that "after just five years, between 40 and 50 percent of all beginning teachers have left teaching altogether."[47] Some return to teaching later, but most do not. Among teachers who indicated they left because of some dissatisfaction, 61 percent cited poor salary; 32 percent, poor administrative support; 24 percent, student discipline problems; and 18 percent, poor student motivation.[48]

Various policies have been proposed to reduce turnover and remedy the chronic shortage of good teachers, as summarized by Richard Murnane and Jennifer Steele in a recent issue of this journal focused on teachers.[49] Because teachers' salaries are low, and getting lower compared with those of other college graduates, one possible solution would be to raise teachers' salaries across the board to reduce turnover and attract more people into teaching. However, Murnane and Steele, along with Erik Hanushek and Steven Rivkin, conclude that higher salaries would not necessarily improve teacher quality because districts cannot accurately identify in advance which new teachers will be effective and because it is difficult to discharge tenured teachers who turn out to be ineffective.[50] Nor is it likely that taxpayers would suddenly be willing to support a substantial hike in teachers' pay. Instead, researchers have proposed experimenting with targeted salary increases for teachers in certain kinds of schools or in certain hard-to-staff disciplines.[51] Some argue that tying teachers' pay to their performance would attract more high-performing teachers.[52]

If teachers' salaries cannot be increased enough to alleviate shortages, policy makers are caught in what could be called a quality-quantity quandary. Some proposals would reduce barriers to entry into teaching by easing credential requirements to let in recent bachelor's degree graduates who want to try teaching but do not want to take time to earn a teaching credential. The Teach for America program, for example, has claimed success in recruiting bright young teachers who have just completed undergraduate studies but have not undergone formal teacher training. Opponents of this approach argue that it reduces teacher quality and demeans the teaching profession. Conversely, requiring new teachers to pass examinations as a condition for earning a teaching credential is seen as a way to ensure quality, but opponents point out that testing requirements reduce the number of people available to teach. How best to balance the quality and quantity of teachers, given available salary levels and the challenges of custodial classrooms, is a question that fuels protracted debate.

Immobile Schools and Mobile Students
Another structural limitation of the traditional high school model is the mismatch between the large number of students who move from place to place and the fixed geographic location of schools.

Although schools are rooted in place, many students are not. According to Russell Rumberger, who has studied this issue extensively, a majority of students during their K–12 career change schools at least once for reasons other than promotion from one level to the next. The 2000 Census found one out of six school-age children had changed residences in the previous year. Changing residences is the most common

reason for changing schools; about one-third of school changes occur for other reasons.[53]

Mobility is a challenge for students and for schools. Because control over schools in the United States is decentralized, schools differ from one another in many ways: curriculum, textbooks, bell schedules, classroom norms, and rules. Students who move must adapt to all these differences. They also must learn to fit in with a new group of peers. These academic and social challenges are reflected in the lower levels of academic achievement and higher drop-out rates of unusually mobile students. According to Rumberger, statistical studies find the negative associations between mobility and school success are attenuated and sometimes eliminated by controlling for prior achievement and socioeconomic background. Students who move may already be having difficulties in school. But changing schools tends not to help.

Emerging Possibilities
How could high schools prepare teenagers more effectively for civic responsibilities and earning a living? Four directions for policy and research that seem promising are integrating academic and career-technical education to promote both work readiness and college access, incorporating measures of educational outcomes into funding formulas, easing the teacher quality-quantity quandary by involving other adults in educating teenagers, and allowing more education for teenagers to take place outside of schools.

Creating Multiple Pathways to Work and College
Over the past two decades, in recognition of the limitations built into the strong separation between academic and career preparation, explicit efforts to prepare high school students for both college and careers have become

more widespread. The share of high school graduates who have completed both an academic and a CTE concentration increased dramatically, from 9 percent in 1982 to 21 percent in 2000. During that period, the share that completed a CTE concentration but did not take a full set of academic courses fell from 23 percent to 3 percent.[54] Almost all CTE concentrators are now also completing the academic core curriculum. Contemporary CTE recognizes that preparing students to be economically self-sufficient increasingly requires that they have the option of attending postsecondary education.

What is the evidence on the effects of the recent trend toward combining CTE with a core academic curriculum? Since the 1980s, researchers have analyzed data from long-term surveys such as High School and Beyond (HSB) and the National Education Longitudinal Survey (NELS) to determine whether course-taking patterns are correlated with subsequent success in postsecondary education or work. Not surprisingly, students who combine a sufficient number of courses to qualify for college with a sequence of career-technical courses have more success in postsecondary education and work than students who complete neither the college-prep nor the career-tech sequence.[55] But studies differ in whether students who took this combined curriculum were found to do better than, the same as, or worse than students who took the college-prep but not the career-tech courses. However, as noted, it is not possible to infer from the correlational studies whether enrolling students in additional college-prep or career-tech courses actually makes any difference. Students may self-select, or be directed by teachers or counselors, into certain sets of courses because of unmeasured characteristics such as ambition, energy, drive, self-discipline, or

awareness of what it takes to do well in the world. These qualities might enable them to succeed just as well without a combined academic and career-technical curriculum.

One of the most important efforts to promote a combined academic and career-technical curriculum is High Schools That Work (HSTW), led by Gene Bottoms. The Southern Regional Education Board (SREB) and a group of state partners launched this effort in 1987, "to prepare students for careers and further education by improving curriculum and instruction in high schools."[56] According to the website, "More than 1,200 HSTW sites in 32 states are using the framework of HSTW Goals and Key Practices to raise student achievement." One of those ten key practices is: "Teach more students the essential concepts of the college-preparatory curriculum by encouraging them to apply academic content and skills to real-world problems and projects." A second is: "Provide more students access to intellectually challenging career-technical studies in high-demand fields that emphasize the higher-level mathematics, science, literacy and problem-solving skills needed in the workplace and in further education."[57]

From its inception, HSTW has stressed the importance of using data to monitor its work in schools. The core of its continuous improvement system is the HSTW Assessment, a set of achievement tests, based on the National Assessment of Educational Progress, in the subjects of reading, mathematics, and science.[58] All HSTW sites are required to administer the tests in even-numbered years. Initially, the HSTW achievement tests were administered only to "vocational completers," seniors who had completed a sequence of four or more units in a particular career-technical specialty. In the late 1990s, HSTW

began offering schools the option of testing all seniors or a random sample of all seniors.

Contemporary CTE recognizes that preparing students to be economically self-sufficient increasingly requires that they have the option of attending postsecondary education.

This sampling strategy, however, makes it difficult to draw conclusions about the effects of HSTW on student achievement. If the average test scores of a school's career-technical completers are higher this year than they were two years ago, the explanation could be that this year's career-technical completers were a higher-achieving group to begin with. Upgrading career-technical courses may simply be keeping out lower-achieving students. Limiting the assessment to career-technical completers, or over-sampling this group, makes it impossible to determine whether scores increased simply because career-technical courses enrolled more students who were already achieving at higher levels.

Another difficulty is the lack of comparison groups. Even if the HSTW Assessment sample consisted of all seniors, or a random sample of all seniors, a school may show improvement over time for reasons unrelated to the HSTW program. Given increased state and federal pressure to raise test scores, some states have reported rising trends. To determine how much HSTW contributed, it would

be necessary to compare HSTW schools with similar non-HSTW schools in the same states.

For these reasons, the jury is still out on whether HSTW actually causes gains in student achievement. This is ironic, given HSTW's genuine commitment to using data for continuous improvement. HSTW has published hundreds of reports, case studies, and research briefs offering data on its results. Many include results from the HSTW Assessment. But two separate meta-analyses of the HSTW evidence have both concluded that the data are simply insufficient to make a judgment. Geoffrey Borman and associates included HSTW in their review of twenty-nine different comprehensive school reform models. Based on the meta-analysis, they classified models into groups according to whether the evidence of effectiveness was strong, highly promising, or promising. They placed HSTW in the category of those with greatest need for additional research.[59] A review by the Comprehensive School Reform Quality Center similarly concluded that none of the available studies of HSTW met the center's standards for rigor of research design.[60]

Two studies of programs that combine CTE with a core academic curriculum have randomly assigned students to the program or a control group by lottery to avoid selection bias. In the first study, Robert Crain and several colleagues examined academic career magnet programs in New York City.[61] These programs were organized either as schools-within-schools in comprehensive high schools or as completely separate schools called total academic career magnets, of which there were eight. Career themes included pre-law, business, and computer science.

Crain and his colleagues found mixed effects of career magnet programs on educational attainment. After the fourth year of high school, 14 percent of the randomly selected career magnet students had dropped out of high school, compared with 11 percent of the students in comprehensive high schools. Career magnet students also had slightly lower math test scores than their counterparts in comprehensive high schools, and there were no significant differences in reading test scores, absenteeism, or the proportion taking advanced (New York State Regents') graduation tests. On the other hand, the Crain study discovered that, in the first year or two after graduating from high school, career academy students completed more postsecondary credits and were more likely to have declared a college major than students who had graduated from comprehensive high schools, even though the two groups spent about the same amount of time working.

Analysis of a small subsample of high school graduates in the Crain study found positive results on labor market outcomes. Gail Zellman and Denise Quigley, two of Crain's co-authors, compared fifty-one career academy graduates and fifty-nine students who graduated from comprehensive high schools. The two samples were matched on their first choice of career magnet, on age, and on school performance in grades seven and eight. Zellman and Quigley found career magnet graduates reported average hourly wages of $8.00, compared with $7.01 for the non-magnet graduates.

Career academies that combine CTE with an academic curriculum have also been evaluated with a random-assignment design. These academies began in Philadelphia in 1969 and spread to California and New York City

during the 1980s.[62] The original impetus for this strategy was to motivate more students to complete high school, by creating a small school-within-a-school (what would now be called a "small learning community"), in which a team of teachers worked with the same group of students during grades ten through twelve or nine through twelve. Students at each grade level were scheduled as a cohort to take a core set of academic classes and a technical class related to the theme of the academy—for example, business, electronics, or health. Internships, mentorships, field trips, and other experiences linked the school curriculum to the world of adult work. The initial focus on dropout reduction was expanded during the 1980s to include completion of coursework that would qualify graduates for admission to bachelor's degree programs. The academy model is therefore a clear example of the "college and career" approach for high schools.

During the 1980s and 1990s, several different research teams conducted quantitative evaluations of career academies.[63] Some studies were quasi-experimental, comparing students in career academies with matched groups of similar students at the same high schools. Other studies used regression to estimate differences in outcomes between academy and all non-academy students at the same schools, controlling for individual students' demographic characteristics and prior achievement. Measured outcomes included indicators of success in high school such as attendance, credits, grades, and dropping out. Some studies also measured postsecondary outcomes including college attendance, bachelor's degree completion, employment, and earnings. No study found that academy students performed better on all these measures, but every study found academy students did better on some of

them, and none of the evaluations found academy students did worse.

Prompted by these results, the MDRC research organization began a random-assignment evaluation of nine career academies. Because each was the only academy in its host high school, the contrast between academy and non-academy students was clear. For the evaluation, each academy recruited more applicants than it could accommodate.[64] Surveys of students during the high school years found significant differences. In particular, students assigned to academies were more likely to combine academic and career-technical coursework and had substantially more exposure to career development activities, including work experiences connected with school.[65] These results confirmed that the academies did, in fact, provide a curriculum that combined academic with career-technical preparation.

A follow-up survey four years after students' scheduled high school graduation found that academy students reported significantly higher earnings than the control group ($1,358 a month on average, compared with $1,225 a month).[66] A subsequent follow-up, eight years after scheduled graduation, showed the difference persisted: students assigned to academies had average monthly earnings of $2,112, compared with $1,896 for the control group.[67] Separated by gender, the difference in both follow-up surveys was significant among males but not among females. The greater earnings are plausibly attributed to academy students' having more career-technical courses, work experience, and other career development activities while they were in high school.

The follow-up data revealed no difference between the academy and non-academy

groups in the share who had received high school diplomas or in postsecondary educational attainment. In short, career academies evidently improved students' preparation for work, while neither improving nor diminishing postsecondary education outcomes.[68]

Incorporating Performance Measures into Funding Formulas

States' educational funding arrangements obviously should not ignore the number of students in a school district, but these arrangements can and should take into account other information. States could, for example, reward districts or other education providers for accomplishing certain outcomes. The point would be to focus the attention of education providers on achieving those outcomes, not just on keeping students in attendance. Outcomes for which funding might be allocated include progress toward mastering academic skills and concepts, attaining a high school diploma, demonstrating civic competence (such as by understanding a voter information booklet or oral arguments in a jury trial), and gainful employment or enrollment in postsecondary education (or both) at ages eighteen to twenty.

Tying funding to student outcomes poses some obvious challenges. First, the numbers of teenagers achieving desired outcomes depend on many factors that education providers cannot control, including students' socioeconomic background and local labor market conditions. The problem, however, is not insoluble. Researchers have developed reasonably good statistical models for measuring "value added" by education.[69] These models can take into account each student's circumstances and past level of performance, so that education providers could be rewarded for student achievement beyond what would be predicted by past

performance and other factors. Some states are now using such models as part of accountability under No Child Left Behind.[70] Statistical methods for measuring value added are also being developed in the context of new experiments with performance-based pay for teachers.[71]

Developing valid outcome measures poses another challenge. Current accountability policies focus mainly on test scores, which are presumed to reflect some of the academic skills and concepts necessary for economic self-sufficiency and responsible citizenship.[72] Other measures would also be needed to determine whether the collective goals of education are being met. Earning a high school diploma, for example, is associated with economic self-sufficiency, because individuals without such diplomas are at an ever-increasing disadvantage in the labor market and have very little access to higher education.[73] Most states now require that students pass examinations before graduating from high school to ensure that the diploma represents a certain level of academic proficiency. Further evidence of economic self-sufficiency would require collecting employment data after high school, as some states already do, though not all have yet developed the capability. Enrollment in postsecondary education could be ascertained in part through the National Student Clearinghouse,[74] but the coverage would have to be expanded. Linking students' records over time requires privacy safeguards. Finally, direct evidence of civic competence would require developing new measures, such as understanding voter information guides or arguments in a jury trial.

Another challenge with any incentive scheme is determining the appropriate locus of responsibility. In a large school district, the incentive provided by performance measures applied to the entire district would become too diluted to affect behavior in individual schools and classrooms. But if the units held accountable are too small, they have an incentive to push problems, such as disruptive or low-performing students, onto other units. Some balance between school and district responsibility would be appropriate.

These challenges are not insuperable. The benefit of attaching some funding to student outcomes would be to give districts and other education providers a direct incentive to use students' time more productively.

Easing the Teacher Quality-Quantity Quandary by Involving More Adults
Funding education based in part on outcomes may also provide relief for the teacher quality-quantity conundrum by allowing more adults to become involved in educating teens.

The benefit of attaching some funding to student outcomes would be to give districts and other education providers a direct incentive to use students' time more productively.

Adults in workplaces are one educational resource for teenagers. Career-technical education (CTE) often has included structured work experience, called cooperative education, or "co-op."[75] The co-op supervisor in the work setting collaborates with the CTE teacher in defining a student's learning objectives, making sure the student has the

opportunity to learn what is intended and evaluating the student's performance at the end. Unlike employers in regular jobs that most high school students find outside of school, co-op employers take explicit responsibility for supporting students' learning. Accordingly, although jobs outside of school sometimes conflict with schoolwork, this conflict is attenuated in co-op jobs.[76]

"The Met" is an example of a school where adult "mentors" in workplaces become an integral part of a young person's education.[77] Under the banner "One Student at a Time," The Met schools assign each student an adviser to help develop an individual learning plan intended to achieve academic objectives such as reading, writing, public speaking or facilitation, problem solving, data collection and analysis, scientific reasoning, computer science, civics, and conflict resolution. The learning plan maps out which goals will be pursued in various settings, including classes at The Met or at local colleges, and extended internships and internship projects. As in traditional co-op, the workplace mentors collaborate with students' advisers to plan, support, and document students' learning. The Met has not yet been rigorously evaluated, but it does illustrate the possibility of involving adults outside schools in teenagers' education.

Homeschooling could also help to ease the shortage of classroom teachers by involving parents or guardians in a bigger part of their students' education. The number of home-schooled students is still small but appears to be growing fast.[78] Acceptance of the idea by the American public also seems to be growing: between 1985 and 2001, the share of families who approved of homeschooling rose from to 16 percent to 41 percent.[79] Further development of Web-based

curriculum may accelerate yet more the growth of homeschooling.

Involving adults other than teachers in educating teenagers raises important questions. One is how to ensure that these other adults are qualified to guide teenagers learning mathematics, English composition, science, languages other than English, and other subjects at the level expected in high school. Another is how to combine workplace mentors, parents, and specialized subject teachers in a team that supports student learning. Programs like The Met provide starting points in the search for more effective educational solutions for teenagers. In the next section I discuss two other such programs—Check & Connect and the Quantum Opportunities Project.

Educating Teenagers outside the School Building

Allowing more education to take place outside of schools may contribute directly to preparation for citizenship by expanding service-learning and civic engagement projects, which involve teenagers as volunteers providing various kinds of service to the community.[80] And internships in workplaces may contribute directly to preparation for economic self-sufficiency. Providing for more learning to take place outside the school building may promote academic achievement for some teenagers who do not thrive in conventional classrooms and for students who face academic and social challenges when they move from one school to another. Further development of education outside of schools can build on existing models of mentoring and increased use of the Internet.

Mentors can maintain a personal connection with a teenager even if the student moves to a different school, drops out, or leaves the state—thereby addressing the problem of

student mobility. Mentoring of some kind has become a common feature of many high school improvement models, including some like First Things First and career academies that offer good evidence of positive impact on students. Some programs have taken this a step further by keeping mentors in contact with students even if the students leave. For example, researchers at the University of Minnesota developed a program called Check & Connect, which "is implemented by a person referred to as a monitor or mentor. The person is a cross between a mentor, an advocate, and a service coordinator whose primary goal is to keep education a salient issue for disengaged students and their teachers and family members. The monitor-mentor works with a caseload of students and families over time (at least two years) and follows the caseload from program to program and school to school."[81]

Mary Sinclair and several colleagues have reported findings of two random-assignment evaluations of Check & Connect.[82] A 1998 study of ninth graders found 9 percent of students assigned to the program dropped out of school by the end of the year, compared with 30 percent of the control group. A 2005 study reported dropout rates of 39 percent over four years of high school for students assigned to Check & Connect, compared with 58 percent for the control group.

Another program that includes mentoring for students who drop out or move from school to school is the Quantum Opportunities Project (QOP, pronounced "quop"). QOP combines educational, developmental, and community service activities to support high school completion by entering ninth graders who appear to be at risk. Each participant has an adult counselor who acts as case manager and advocate. In theory, and often in practice,

counselors are accessible to students by telephone twenty-four hours a day, seven days a week. Participants remain in the program whether they change schools, drop out, become incarcerated, or move out of state. The program's motto is, "once in QOP, always in QOP."

QOP has been the subject of two separate, multi-site, long-term evaluations in which students were randomly assigned to treatment and control groups. Andrew Hahn and associates at Brandeis evaluated the Ford-funded QOP pilot program in five cities from 1989 to 1993 and found a significant positive impact of QOP on high school completion.[83] Allen Schirm and colleagues at Mathematica evaluated a second QOP demonstration funded by Ford in two cities and the U.S. Department of Labor in five cities from 1995 to 2001. The Mathematica evaluation also found positive short-term effects, though the effects were smaller than those in the Brandeis study.[84] Mathematica's final report, based on findings when study participants were twenty-two to twenty-five years old, found no overall effect on high school completion, engagement in postsecondary education or training, or employment. But for the two-thirds of the sample who were age fourteen or younger when entering ninth grade, QOP did increase the likelihood that a student received a high school diploma or GED. It also increased postsecondary educational attainment and success in vocational or technical school and the military.[85]

The evaluations were not designed to detect which elements in QOP had the most impact. Still, QOP and other programs illustrate that mentoring for students who leave school or move from one school to another can help the students overcome the limitations of place-based schools.

Better use of the Internet also can make it possible to move education outside of the high school building, by providing access to the same curriculum from any place with Internet access. Many high school courses, and complete programs, are now offered online. According to the *New York Times,* the largest Internet public high school in the country is the Florida Virtual School (FLVS).[86] Founded in 1997, FLVS offers more than ninety courses for grades six to twelve.[87] Other providers of high school courses online include Brigham Young University, Apex Learning, Plato Learning, and Cyber High.[88]

Internet-based curricula are already being used in regular schools. Growing numbers of high schools are turning to the Internet for help with "credit recovery," allowing students to meet graduation requirements by taking online courses to make up for courses they missed or failed.[89] NCES commissioned a survey in 2002–03 to estimate the prevalence of various forms of distance learning in K–12 schools, including courses via Internet. More than one-third of public school districts, and 39 percent of public high schools, reported having students enrolled in distance education. High schools accounted for an estimated 76 percent of the students enrolled in distance education. Most of the courses were in standard academic subjects, including some at the Advanced Placement or college level. The most common technology reported was two-way interactive video (55 percent). Internet courses using asynchronous computer-based instruction (47 percent) were more common than those using synchronous computer-based instruction (21 percent). Entities providing distance education included districts themselves, cyber high schools within the districts, regular schools, and online providers outside the districts.[90]

A 2005 report by Learning Point Associates found that twenty-one states had established online programs, primarily at the high school level. All relied on the school or district to provide support for students, and all were reporting rapid growth. Policies regarding funding, quality assurance, and student assessment were still under development in most of these states.[91]

I was unable to find any random-assignment evaluations comparing online learning and classroom instruction at the high school level, but a review of existing studies using non-random comparison groups concluded that online education is at least as effective as classroom instruction.[92] And online education will become more powerful as it incorporates features such as simulation, visualization, interaction with data, and collaborative learning.[93]

Summary and Conclusion

Attending high school and spending the school day in a series of classes fulfilling Carnegie unit requirements will probably continue to be the predominant educational experience for most teenagers for the next several decades at least. This model works quite well for many students, but not for all. I have proposed four ways in which policy and research should seek to better achieve the goals of preparing all teenagers for civic participation, economic self-sufficiency, and further education. The first is to continue the trend toward integrating educational options that combine academic rigor with work-related relevance and provide young people with skills and experiences that pave the way to both college and careers. The second is to tie education funding to student outcomes to encourage teaching and learning formats that use students' time more effectively and are less daunting for teachers. The

third is to involve other adults, in addition to teachers, to help guide the education of teenagers inside and outside of school and provide some relief for the chronic shortage of teachers. And the fourth is to expand the options for educating teenagers outside of geographically fixed schools, both to provide more direct preparation for civic engagement and work, including work after completing college, and to better accommodate students who do not thrive in classrooms or who are geographically mobile.

If teenagers spent more time outside of school, where and how would they spend it? Growing numbers of teenagers already spend time in homeschooling, independent study centers, internships, and other settings that are quite different from the standard high school with its multi-period day.[94] Other options could include various kinds of service-learning that engage teenagers in civic activities or productive projects for community and public benefit. To minimize the risk that teenagers would waste time in such settings—as they now do in some alternative educational arrangements and in many conventional school classrooms—it is important to find ways to attach funding to results. Adults who are paid to educate teenagers, whether in conventional high schools or elsewhere, should have an incentive to focus students' time on achieving the collective goals of education.

Who would be responsible for teenagers in these expanded educational settings? Making education effective outside the place called school will require new kinds of paid professionals, in addition to parents or workplace mentors who volunteer to contribute time without pay. Unlike teachers in high school classrooms, these new professionals will not necessarily be subject specialists. Instead, they will act as academic advisers, learning coaches, student advocates, mentors, and college counselors. They will have to combine some of the skills of teachers, counselors, and social workers. One of these professionals might be responsible for about fifteen teenagers at a time, organizing for each student a combination of individual and group experiences that could include homeschooling or instruction in other non-school settings, online learning, internships, service-learning, and participation in conventional classes at high school, college, or other educational institutions. Funding for this kind of education would cover the salary of the adviser-counselor-mentor-coach, in addition to access to various specialized instructional services. If students move away, the adviser-counselor-mentor-coach could continue to work with them for a short time to help manage the transition, or for a longer time.

A challenge for policy and research will be how to prepare these new professionals. Programs like Check & Connect, The Met, and QOP provide some experience on which to build. In addition to proper preparation, these new professionals should also be guided by proper financial incentives, as I have already noted.

It is not possible to know in advance whether educational arrangements of this kind would be more effective than the current high school model in accomplishing the collective goals of education for teenagers. Given the limited success of today's model, however, some new initiatives along these lines seem well worth trying.

Endnotes

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4. This section does not discuss the many private purposes for which individuals may choose to be educated, including gaining a better understanding of themselves and the world.

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76. David Stern and others, "What Difference Does It Make if School and Work Are Connected? Evidence on Co-operative Education in the United States," *Economics of Education Review* 16, no. 3 (1997): 213–26.

77. (www.metcenter.org/Site/Real_World.html).

78. Daniel Princiotta and Stacey Bielick, *Homeschooling in the United States: 2003,* NCES 2006-042 (Washington: U.S. Department of Education, National Center for Education Statistics, 2005).

79. Patrick Basham, John Merrifield, and Claudia R. Hepburn, *Home Schooling: From the Extreme to the Mainstream,* 2nd edition (Vancouver, British Columbia: The Fraser Institute, Oct. 2007), p. 5.

80. Examples and research evidence are available from The Center for Information and Research on Civic Learning and Engagement, at www.civicyouth.org. See also *What Kids Can Do,* at www.whatkidscando.org, and the National Service-Learning Partnership at www.service-learningpartnership.org. An introduction to the literature on service-learning is Shelley H. Billig and Andrew Furco, eds., *Service-Learning through a Multidisciplinary Lens* (Greenwich, Conn.: Information Age Publishing, 2002).

81. (http://ici.umn.edu/checkandconnect [March 16, 2008]).

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84. Allen Schirm and others, *The Quantum Opportunity Program Demonstration: Short-Term Impacts,* MPR Reference No. 8279-093 (Washington: Mathematica Policy Research, Inc., August 2003), tables V.1, V.3.

85. Allen Schirm, Elizabeth Stuart, and Allison McKie, *The Quantum Opportunity Program: Final Impacts.* MPR Reference No.: 8279-932 (Washington: Mathematica Policy Research, Inc., July 2006).

86. Sam Dillon, "Online Schooling Grows, Setting Off a Debate," *New York Times,* February 1, 2008.

87. (www.flvs.net/educators/fact_sheet.php. [March 16, 2008]).

88. (http://ce.byu.edu/is/site/courses/select.cfm?type=hs), (www.apexlearning.com), (www.plato.com/Secondary-Solutions.aspx), (www.cyberhigh.org).

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92. See Rosina Smith, Tom Clark, and Robert L. Blomeyer, *A Synthesis of New Research on K–12 Online Learning* (Naperville, Ill.: Learning Point Associates, 2005).

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94. A rough estimate is that 20 or 30 percent of teenagers are now participating in such settings. For homeschooling, see Princiotta and Bielick, *Homeschooling in the United States* (see note 78). For public alternative schools, see Brian Kleiner, Rebecca Porch, and Elizabeth Farris, *Public Alternative Schools and Programs for Students at Risk of Educational Failure: 2000–01,* NCES 2002–04 (Washington: U.S. Department of Education, National Center for Education Statistics, 2002). For charter schools, see Alison Consoletti and Jeanne Allen, *Annual Survey of America's Charter Schools* (Washington: Center for Education Reform, April 2007). For a description of how dividing large high schools into smaller units alters instructional formats, see Lee and Ready, *Schools within Schools* (see note 44).

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