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ABSTRACT

This report examines trends in student learning. Using data from the National Assessment of Educational Progress, the first section reports on current trends in reading and mathematics test scores, highlighting arithmetic and noting that student's computation skills have stagnated or declined in recent years. The second section revisits the previous year's study of high school culture. It replicates the 2001 survey of foreign exchange students with American students who have studied in high schools abroad, asking them to compare U.S. high schools to high schools in thirty-five countries. The American students reaffirmed key impressions of students from abroad, especially on the question of academic rigor; more than half of American students said their regular classes were easier than the classes they attended in foreign countries. By compelling margins, U.S. and foreign students agree that success at sports means much more to U.S. teens than to teens in other countries. However, a study of high schools that are sports powerhouses finds that there is no evidence that schools suffer academically when they excel in athletics. The third section discusses charter schools, examining the test scores of charters from 1999 to 2001 in 10 states. Charter schools performed about one-quarter standard deviation below comparable regular public schools on these 3 years of state tests. The study did not indicate why they performed at this level. The report offers suggestions on how achievement in charters can be evaluated as fairly and accurately as possible. (Contains 37 endnotes.) (SM)

The 2002 Brown Center Report on American Education:

HOW WELL ARE AMERICAN STUDENTS LEARNING?

With sections on arithmetic, high school culture, and charter schools

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September 2002
Volume I, Number 3

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THE 2002 BROWN CENTER REPORT ON AMERICAN EDUCATION

As in the past, the report is divided into three independent sections. The first section reports on current trends in test scores in reading and mathematics. Arithmetic receives special consideration. A troubling body of evidence is presented that suggests students' computation skills have stagnated or even declined in recent years. Remarkably, the National Assessment of Educational Progress (NAEP), the nation's report card, does not report how well elementary grade students are performing in arithmetic.

The second section of the report revisits last year's study of high school culture. First, we replicate the 2001 survey of foreign exchange students with American students who have studied in high schools abroad, asking them also to compare U.S. high schools to high schools around the world. By compelling margins, American and foreign students agree that success at sports means much more to U.S. teenagers than to teens in other countries. Is this cause for concern? Does it interfere with the nation's efforts to raise academic achievement?

If holding athletic accomplishments in high esteem creates problems, one would expect them to surface in high schools with highly successful athletic teams. We present a study of high schools that are sports powerhouses, schools that in recent years have been the best in the nation in football, baseball, and basketball. It is clear that these schools are excellent at sports. What about academics? Is dominance in team sports attained at a cost to excellence in reading and mathematics? After analyzing test score data from dozens of states, Brown Center researchers are confident that the answer is no, excellence is not zero sum when it comes to sports and academics. There is no evidence that schools suffer academically when they excel in athletics. On state tests, the sports powerhouses score about as one would expect, no better or worse than non-powerhouse schools serving similar populations. And there is evidence, though only suggestive, that some schools are capable of making excellence at sports and excellence at academics mutually reinforcing.

The third section of the report looks at charter schools. Charters have proliferated across the country since the first few opened in Minnesota nearly a decade ago. There are now about 2,400 charters serving 250,000 students. Very little is known about academic achievement in charter schools, so we examined the test scores of charters from 1999 to 2001 in ten states. In a nutshell, charter schools performed about one-quarter standard deviation below comparable regular public schools on these three years of state tests. We do not know why charters performed at this level. They may have attracted students who were already low achieving, which explains why parents sought an alternative to the local public school. Thus, readers are cautioned that these test scores may or may not reflect the quality of education students have received and are receiving at charters. And we offer a few suggestions on how achievement in charters can be evaluated as fairly and accurately as possible in the future, especially with state accountability systems beginning to take hold.

Part I THE NATION'S ACHIEVEMENT

THE BROWN CENTER REPORT ANNUALLY EXAMINES trends in reading and math test scores. One source of data is the federal government's National Assessment of Educational Progress (NAEP), also known as "the nation's report card." No new NAEP scores were released in reading and math during the past year.

Data are also collected from state assessments. We obtained 2001 test scores for four different grades in forty-five states and analyzed whether scores had gone up, down, or remained the same from the previous school year. We then compared these year-to-year results to the year-to-year results of previous years.

The percentage of states reporting annual gains in reading from 1999 to 2001 is displayed in Figure 1. Compared to 2000, a few more states reported positive results for 2001 in eighth grade. But scores fell in grades 4, 5, and 10, extending declines already in place. In the past three years, the overall trend in reading is down. In all grades, fewer states reported higher reading scores in 2001 than in 1999. As mentioned in last year's report, a plateau effect is quite common in scores after a particular test is given for a while. Typically, strong gains are recorded in the early years of a test's use, then achievement flattens out or declines. Many states began annual testing of students in the late 1990s, and their assessment programs have reached maturity. Nevertheless, the states are indicating that reading achievement may have stagnated.[1]

A similar pattern is evident in math (see Figure 2). In 2000, state tests gave encouraging signals about math achievement in grades 8 and 10, but the gains dissipated in 2001. In grades 4 and 5, about 50% of states reported improved math scores in 2001. This is down from 60% in 2000 and about 80% in 1999. The eighth grade experienced the biggest decline in 2001, with fewer than 40% of states reporting gains. The trends in grades 4 through 8 warrant national attention and concern. The elementary grades are crucial for learning arithmetic and, in particular, computation skills.

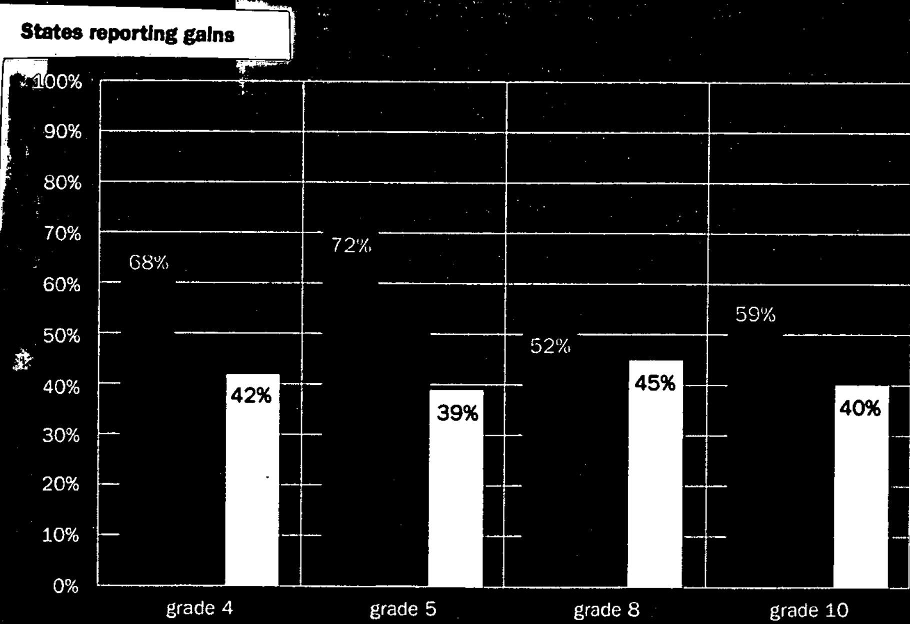
Turning our backs on arithmetic

Dictionaries define arithmetic as the most elementary branch of mathematics. As such, it is the foundation on which the field of mathematics rests and a universal starting point for learning math. For young children, arithmetic is to mathematics as phonics is to reading or as learning about the colonies and the Civil War is to learning our nation's history. Students who do not learn arithmetic are not prepared to learn algebra or calculus.

Reading gains continue to slow.

1

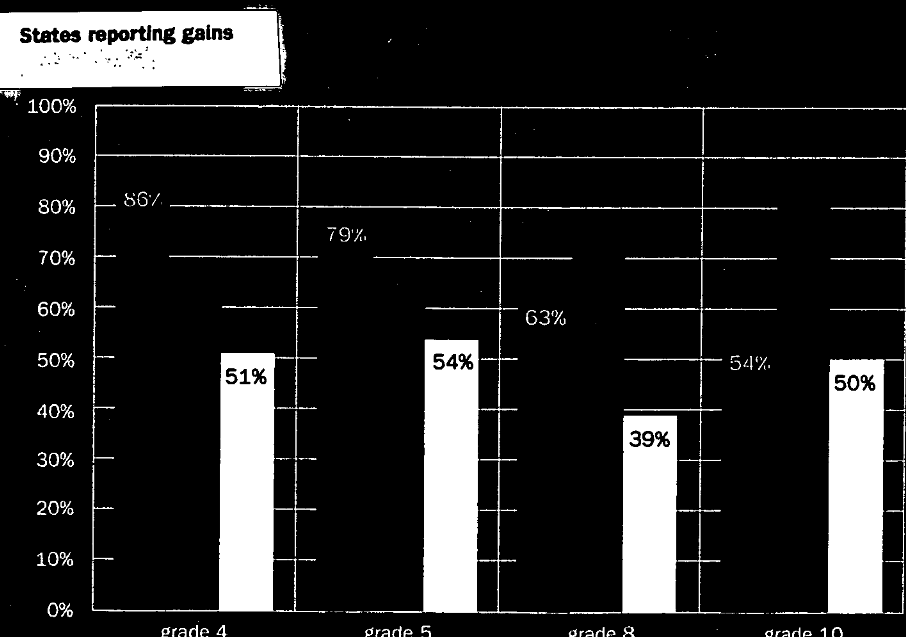
Only in grade 8 did more states report higher scores in 2001 than in 2000.



Math gains also continue to slow.

2

In all four grades, fewer states reported gains in 2001 than in 2000.



Why is it that the NAEP, the federal government's primary tool for evaluating American education, cannot tell whether fourth graders know how to compute accurately?

Introduction to NAEP

They are less likely to attend college. When they enter the workforce, their chances of landing middle class jobs are severely diminished.[2]

Computation skills are central to arithmetic. The term "computation skills" refers to the ability to add, subtract, multiply, and divide whole numbers and to perform these same operations using fractions, decimals, and percentages. Their importance makes the following fact truly alarming: the NAEP test does not report student progress in computation. Not even at fourth grade. The NAEP reporting categories for fourth grade are Number Properties and Operations, Geometry, Data Analysis, Algebra and Functions, and Measurement. Computation skills are subsumed under the category Number Properties and Operations, not reported separately. And that category comprises only 40% of the fourth grade math test. Beginning in 2005, the category will shrink from the current 25% to 20% of the eighth grade test. Granted, items requiring computation are scattered across other categories of the NAEP—a geometry item may require students to compute the area of a triangle, for example—but they are never linked together to gauge computational proficiency.

Here is what the 2005 NAEP Mathematics Framework says:

> "It is important to note that there are certain aspects of mathematics that occur in all the content areas. The best example of this is computation. Computation is the skill of performing operations on numbers. It should not be confused with the content area of NAEP called Number Properties and Operations, which encompasses a wide range of concepts about our numeration system....Certainly the area of Number Properties and Operations includes a variety of computational skills, ranging from operations with whole numbers to work with decimals and fractions and finally real numbers. But computation is also critical in Measurement and Geometry, such as in calculating the perimeter of a rectangle, estimating the height of a building,

"... no single instrument of youthful education has such mighty power, both as regards domestic economy and politics, and in the arts, as the study of arithmetic. Above all, arithmetic stirs up him who is by nature sleepy and dull, and makes him quick to learn, retentive, shrewd, and aided by art divine he makes progress quite beyond his natural powers." Plato, *Laws*, Book V (360 B.C.)

or finding the hypotenuse of a right triangle. Data analysis often involves computation, such as calculating a mean or the range of a set of data. Probability often entails work with rational numbers. Solving algebraic equations usually involves numerical computation as well. Computation, therefore, is a foundational skill in every content area. While the main NAEP assessment is not designed to report a separate score for computation, results from the long-term NAEP assessment can provide insight into students' computational abilities."[3]

As applied to elementary mathematics, the term "Number Properties and Operations" is classic educational jargon. It sounds sophisticated but is ambiguous. It is also of marginal importance. Most people, including parents, are justifiably concerned that children learn how to add, subtract, multiply, and divide whole numbers and accurately use fractions, decimals, and percentages. Number Properties and Operations? What parent is worried about that? Why is it that the NAEP, the federal government's primary tool for evaluating American education, cannot tell whether fourth graders know how to compute accurately?

How did this happen?

In 1989, the National Council of Teachers of Mathematics (NCTM) released the *Curriculum and Evaluation Standards for School Mathematics*. The standards proposed that the K–12 math curriculum be organized into five strands. Federal officials at the National Assessment Governing Board (NAGB), the group in charge of the NAEP, agreed. The NAEP reporting categories listed above are the NCTM's five strands. Arithmetic was relegated to a subcategory of number because the NCTM standards argued that "shopkeeper arithmetic" commanded too much time in elementary classrooms. For most of the twentieth century, arithmetic had dominated the K–8 math curriculum, especially the teaching of computation skills. The NCTM felt it was time for a change. Calculators would free students from the drudgery of memorizing multiplication tables and practicing long division. Rather than learning standard algorithms through direct instruction, arithmetic could be learned while solving "real world" problems that piqued children's interest. The federal government—from NAGB to the National Science Foundation to the Department of Education—enthusiastically embraced this position. Unfortunately, official support preceded any practical experience with the NCTM standards or independent research on their effects. Potential consequences were unknown. So we arrived where we are today: a federally endorsed state of ignorance on the computation skills of American students.

Are computation skills improving or declining?

In order to assess student progress in computation, evidence must be pulled together from several disparate sources, including the NAEP. As noted in the quotation from the NAEP math framework, the long term trend NAEP can help. Indeed, as pointed out in previous editions of *The Brown Center Report*, the two NAEP tests have been signaling a potential problem for some time (see Figures 3 and 4). Scores on the main NAEP, a test reflecting the NCTM's views, skyrocketed during the 1990s. Astonishingly, the gains reflected in Figure 3 are the equivalent of more than a full school year's worth of learning. Scores on the trend NAEP, on the other hand, have bogged down. Granted, the divergence of the two tests could be due to a number of reasons. The main NAEP allows students to use calculators on one-third of the test and asks questions in which partial credit may be granted. One of the most plausible explanations, however, is the prominence of computation items on the trend test and their subordinate role on the main test.

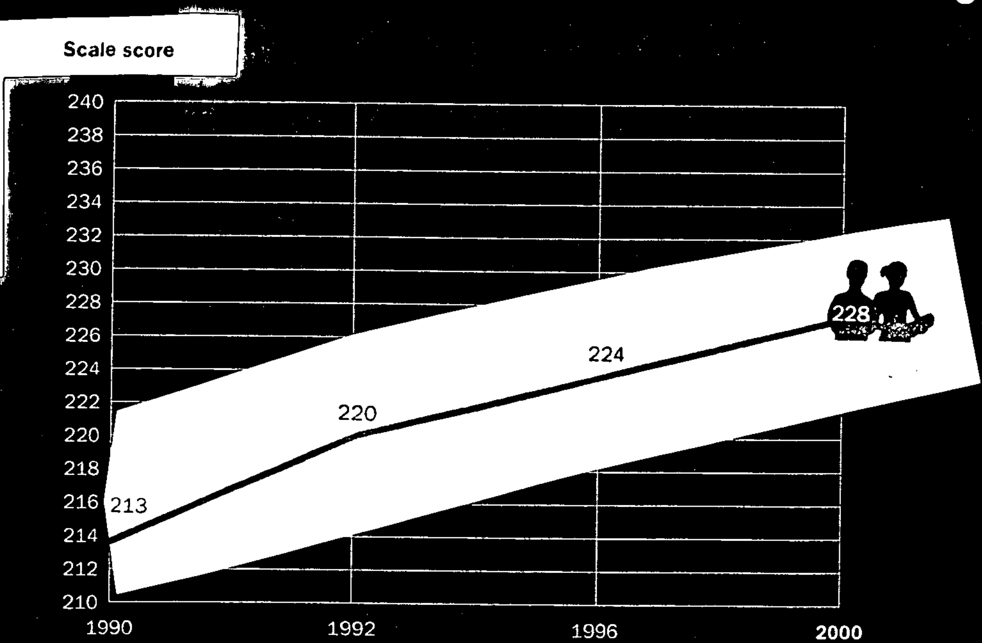
NAEP officials release performance on individual items of the trend test. Examining the scores since 1982 on arithmetic items is quite revealing (see Figure 5). Bear in mind when studying Figure 5 that the performance of different age groups cannot be compared. Figure 5 is *not* suggesting that thirteen year olds scored higher than seventeen year olds. The different age groups take different tests, but for each group, test questions have remained essentially the same over time. The data are plotted on the same graph to identify points in time when achievement changed direction. Solid gains were registered in the 1980s for all three age groups. Then something happened around 1990. Scores were flat for nine and thirteen year olds after 1990, and they declined sharply for seventeen year olds. In 1999, a smaller proportion of seventeen year olds had mastered basic arithmetic than a decade earlier. The headline story here is that scores were up before 1990 and flat or down afterwards.[4]

The decline of seventeen year olds' performance is largely attributable to sharply falling scores on items involving fractions

The main NAEP shows dramatic gains in math.

3

From 1990 to 2000, fourth grade math scores increased fifteen points—equivalent to about 1.2 years of learning.



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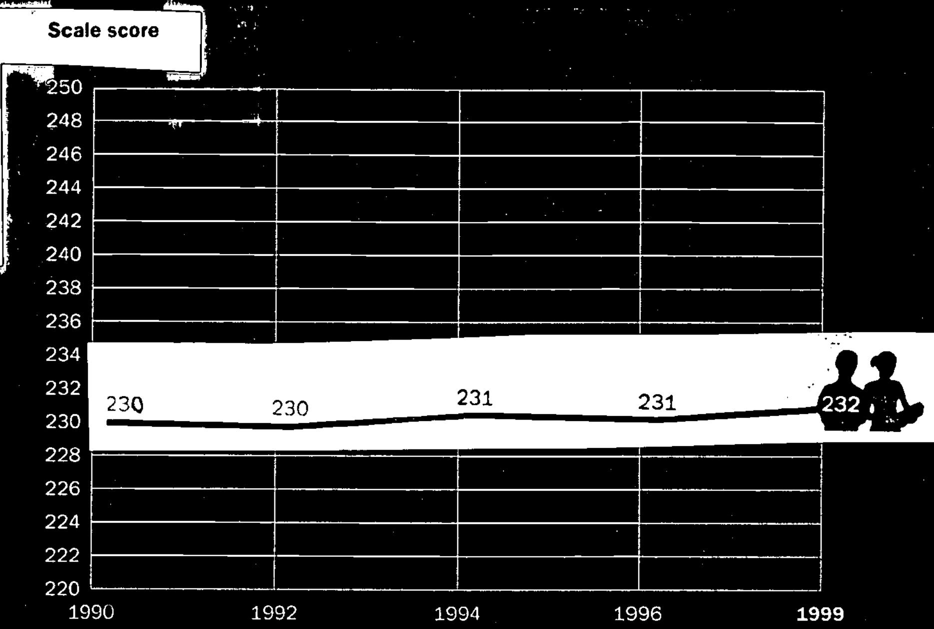
The trend NAEP is essentially flat.

4

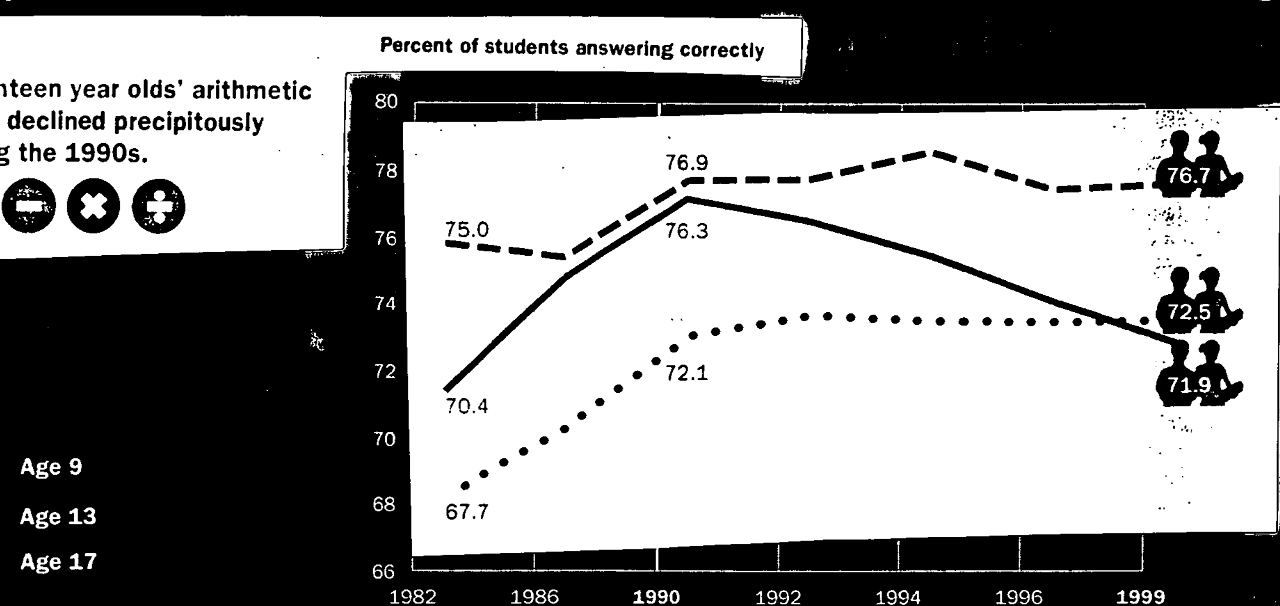
From 1990 to 1999, nine year olds gained two points—equal to about one-fifth of a year of learning.



Progress in arithmetic stopped in 1990.

5

Seventeen year olds' arithmetic skills declined precipitously during the 1990s.



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14

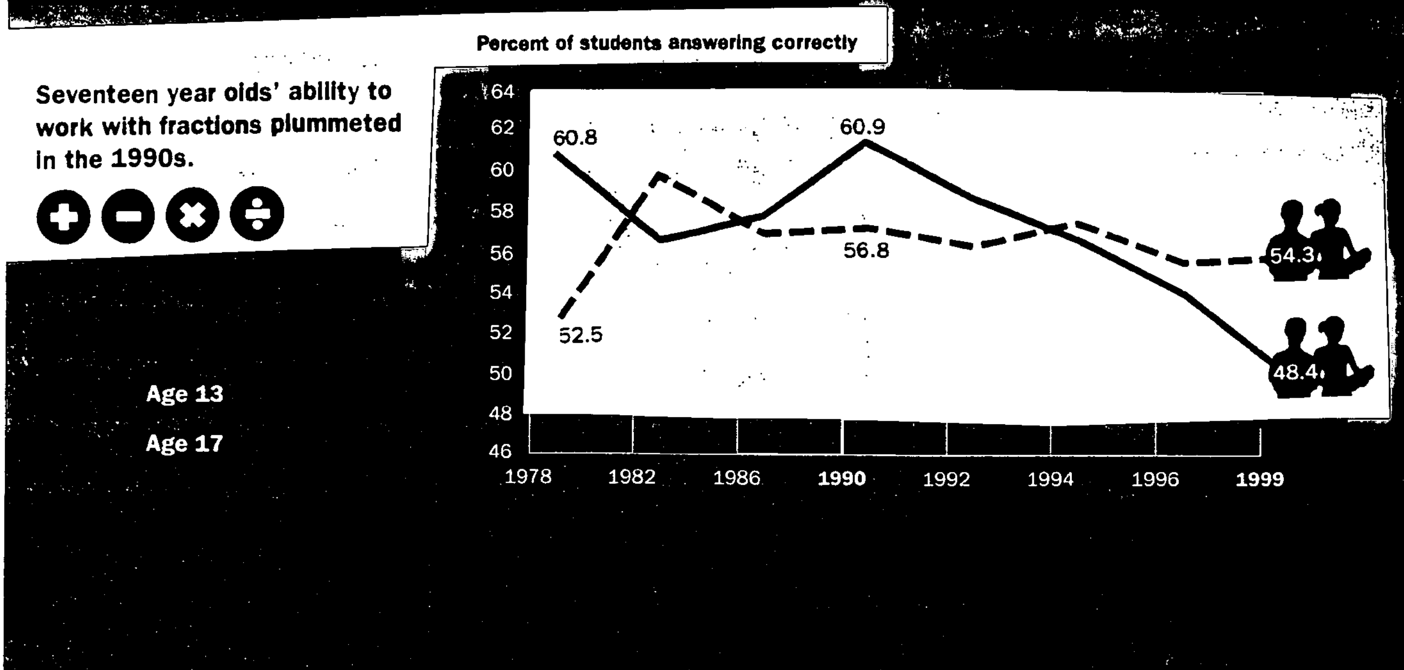
When it comes to computation skills, Iowa may be the canary in the coal mine, warning the nation that there are consequences to de-emphasizing computation skills in the elementary grades.

(see Figure 6). Thirteen year olds' scores also slipped in the 1990s, but not by as much as the older group. Nine year olds are not tested on fractions. Only five items make up the fractions cluster at age seventeen and four items at age thirteen so not too much should be made of the patterns detected here. But they do warrant concern. As Figure 6 displays, the percentage of seventeen year olds correctly answering items with fractions fell steadily—61% in 1990, 58% in 1992, 56% in 1994, 53% in 1996, 48% in 1999. Statistical tests confirm that the decline in seventeen year olds' performance—displayed in both Figures 5 and 6—was significant from 1990 to 1999.[5]

School districts in the state of Iowa have been giving the same achievement test for several decades—the Iowa Test of Basic Skills (ITBS). No other state has collected comparable achievement data over such an extended period of time. The math portion of the ITBS contains a computation subtest, allowing for separate scrutiny of the paper and pencil skills that came under attack by math reformers in the late 1980s. Figure 7 displays test scores for Iowa's eighth graders from 1978 to 2001. Eighth grade is crucial in any discussion of arithmetic, for it is when most students begin the transition from arithmetic to algebra.[6]

Iowa's scores on computation and non-computation subtests rose together in the 1980s, increasing by about one-half grade level. Computation flattened out from 1988 to 1991, while non-computation scores continued rising. Then in 1992, computation scores went into a swan dive for several years, losing more than one-half grade level by 2001. All of the 1980s gains were erased, and computation skills hit low levels not seen in more than two decades. Although it is true that Iowa's

Proficiency in fractions fell. 6



The nation must not remain in the dark on whether students are learning arithmetic.

schools experienced demographic changes in the 1990s, there is no reason to think that these changes would affect computation skills differently than other math skills.[7] When it comes to computation skills, Iowa may be the canary in the coal mine, warning the nation that there are consequences to de-emphasizing computation skills in the elementary grades.[8]

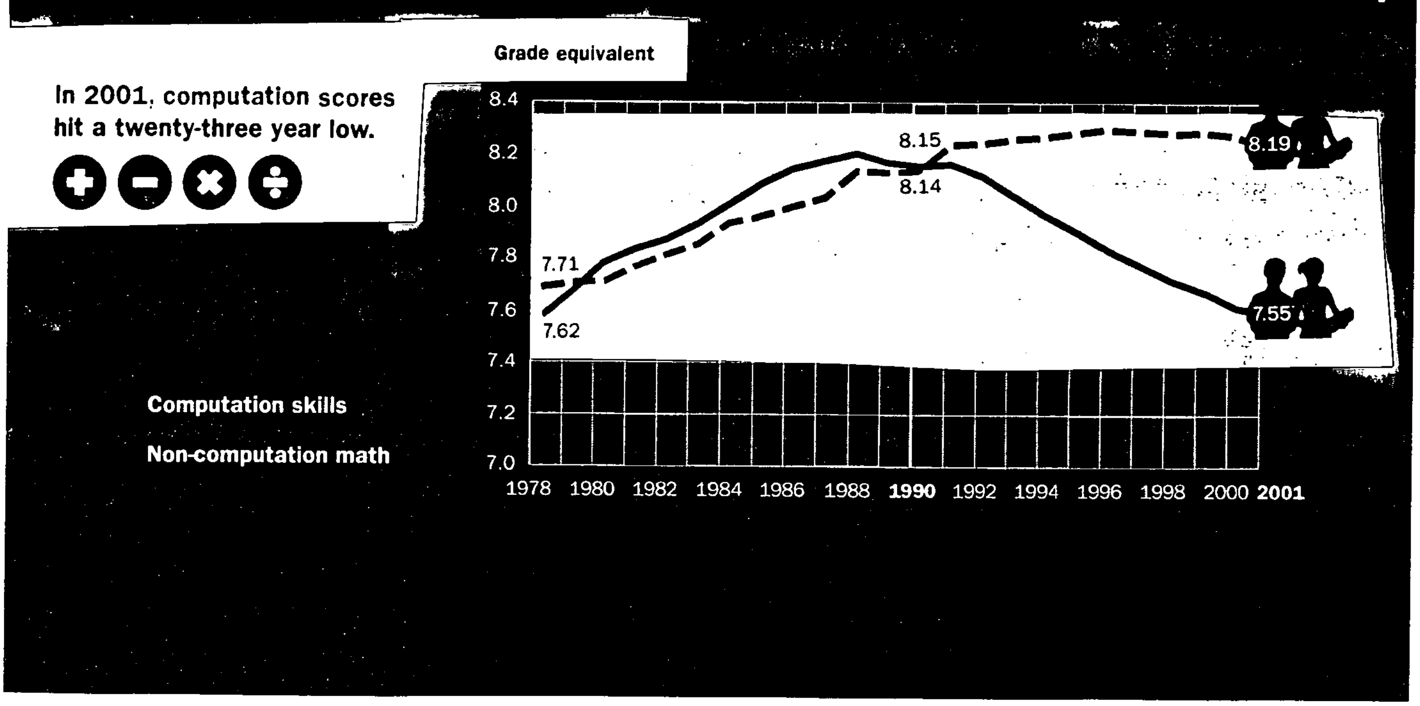
Conclusion

Let's put the computation issue in perspective. The widespread math reforms of the 1990s may have forced a trade-off. Since 1990, U.S. students have registered gains in several math areas, especially problem solving, geometry, and data analysis. These gains have been documented in previous Brown Center reports.[9] But computation skills have been flat at best, and there is some evidence that they have declined. In 1999 on the trend NAEP, a smaller percentage of thirteen and seventeen year olds answered items with fractions correctly than a decade earlier. Seventeen year olds' scores on arithmetic items fell significantly from 1990 to 1999. In 2001, eighth grade computation scores on the ITBS hit twenty-three year lows in the state of Iowa.

This evidence is not conclusive, but it does suggest that continuing to ignore computation would be a mistake. Three policy recommendations flow from the analysis.

- The nation must not remain in the dark on whether students are learning arithmetic. It is especially important that arithmetic is assessed on the NAEP at the fourth and eighth grades. This score should be reported separately from other categories and should not include items on which calculators are used. If math reform involves a trade-off in students'

Iowa's eighth grade math scores pose a national warning. Math scores taken from the Iowa Test for Basic Skills (ITBS). 1978-2001. **7**



math skills, we must carefully measure what is being lost and gained. Only then can the wisdom of current practices be determined.

- The NAEP is only valuable to parents and teachers if it reports student progress on skills that are important to them. Subcomponents of arithmetic should be assessed and reported separately, including operations with whole numbers at the fourth grade and operations with fractions, decimals, and percentages at the eighth grade.

- The NAEP test should establish independence from the NCTM's reform agenda in order to objectively gather the evidence on which NCTM's reforms will be judged. The current framework and the framework going into effect in 2005 are based on NCTM doctrine.

- Arithmetic deserves the same attention that reading has received in federal education policy. The rising math scores on the main NAEP may have lulled the nation into thinking all is well in young people's math skills. A national campaign emphasizing arithmetic and computation skills would help prepare all students for advanced math courses in high school.

"Mathematics is the queen of the sciences and arithmetic the queen of mathematics. She often condescends to render service to astronomy and other natural sciences, but in all relations she is entitled to the first rank."

Friedrich Gauss, quoted by R.E. Moritz, *Memorabilia Mathematica* (1914)

Part II HIGH SCHOOL CULTURE

—*Perceptions of U.S. Students Who Study Abroad*

—*The Impact of Team Sports*

INTERNATIONAL COMPARISONS OF LEARNING IN the elementary grades cast U.S. schools in a favorable light. In the fourth grade, American students rank among the top one-third of nations in mathematics. In reading, the U.S. performs even better, one of three or four countries with the highest test scores. High school comparisons, on the other hand, are a national embarrassment. In math and science, U.S. students score well below average.

Why do older students do so poorly? Last year's Brown Center Report featured a survey of foreign exchange students who had recently attended U.S. high schools. We asked them to compare high schools in their home countries with American schools on several dimensions, including rigor of curriculum, frequency of homework, what motivates teens to attend school, and the value students place on success at sports and mathematics. The purpose was to see what teenagers from other countries think about important aspects of U.S. high schools and American teen culture.

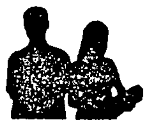
In the summer and fall of 2001, we replicated the survey with what seems to be a natural comparison group, American students who have attended high schools abroad in the same exchange program. Surveys were mailed to the 562 students who had participated in the AFS Intercultural Exchange Program during the 2000–2001 academic year.[10] We received responses from 328 students (58%) who had attended high schools in thirty-five host countries. Some of the results are discussed here, and responses to all of the survey's questions can be found on our website (www.brookings/browncenter)[11]. Readers are cautioned that foreign exchange students—from the U.S. or any other country—are certainly not representative of all students in a particular country. The findings can only be generalized to students in the AFS program. Despite this limitation, the study is valuable in offering a glimpse into the life of high schools and the values of teen culture from the perspective of teens from all over the world. Rarely are Americans allowed to view their institutions through the eyes of others. Rarer still are cross-national comparisons of high schools by the students who attend them.

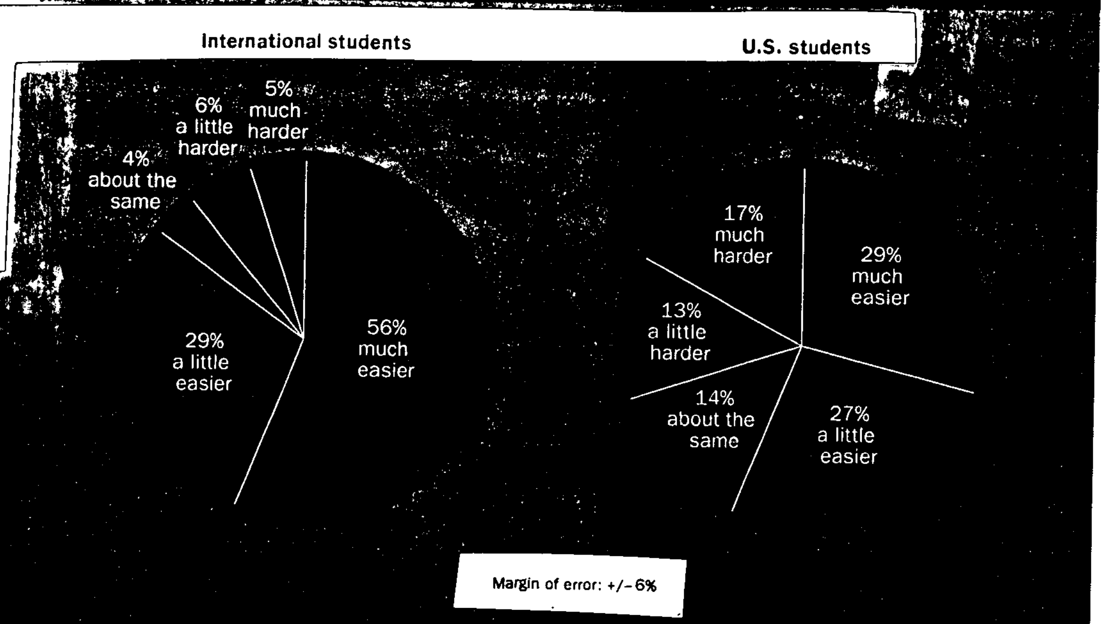
The American students reaffirm the key impressions of students from abroad,

Students from abroad say American classes are easier.

8

U.S. students agree, but less emphatically.

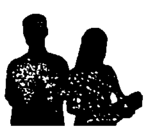


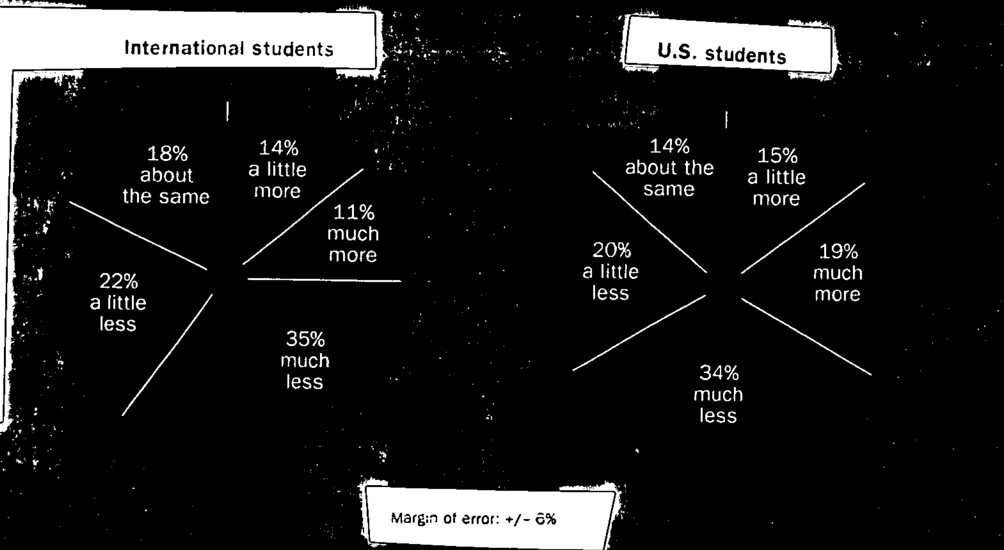


Both groups say that U.S. students spend less time on schoolwork.

9

International and U.S. students were asked: Do you think U.S. students spend more, less, or about the same amount of time on schoolwork as students in other countries?





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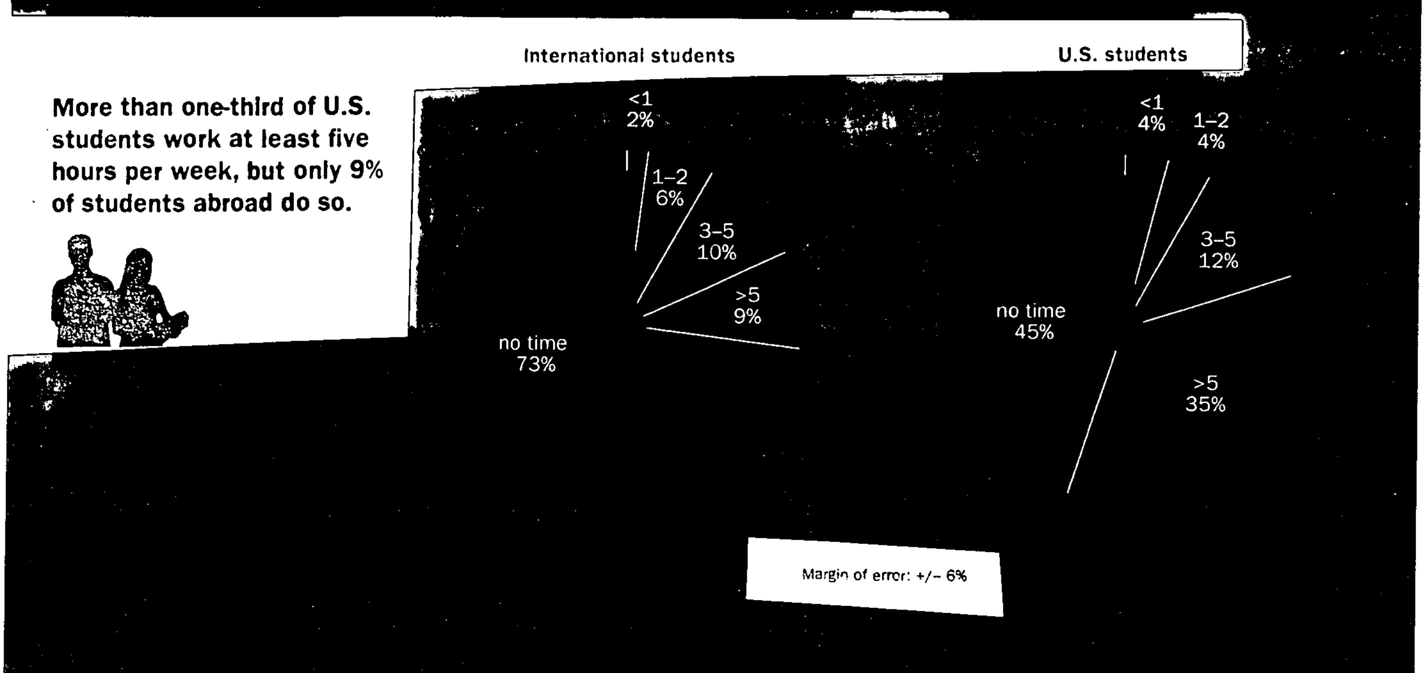
American students encounter two distractions in high school that other nations minimize, part-time work and sports.

especially on the question of academic rigor (see Figure 8, page 17). U.S. high schools are not very demanding. For example, 85% of students from abroad found classes in American high schools easier than classes at home (56% much easier, 29% a little easier). American students agree, although not as emphatically. More than half, 56%, say their regular classes in the U.S. are much easier or a little easier than the classes they attended in foreign countries. About 30% say U.S. classes are harder, almost three times the percentage of foreign students that felt that way.

American students also agree that students in the U.S. spend less time on schoolwork than students in other nations (see Figure 9, page 17). Students from other countries were divided about two to one on this question, with 57% stating that American students spend less time on schoolwork and 25% saying more time. Among U.S. students, 54% feel that American students spend less time on their studies and 34% say more time. American high schools are seen as less focused on academic learning than high schools of other nations, and this perception is shared by both American and foreign students.

American students encounter two distractions in high school that other nations minimize, part-time work and sports. The U.S is unique in the world when it comes to employment during high school. Most countries discourage it. For American students, holding part-time jobs is the norm. In our survey, more than half of U.S. students were employed during the school year, but only about one-fourth of students from other countries (see Figure 10). About one-third of American students (35%) reported that they worked more than five hours per week, compared to only 9% of students from foreign countries. The survey question specifically

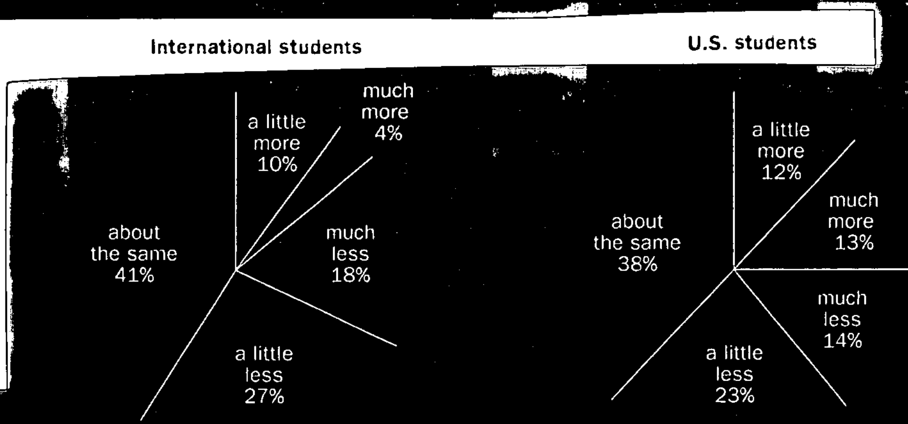
U.S. students are more likely to work at part-time jobs during a typical school week. 10



Both groups agree that math is valued less by U.S. students.

11

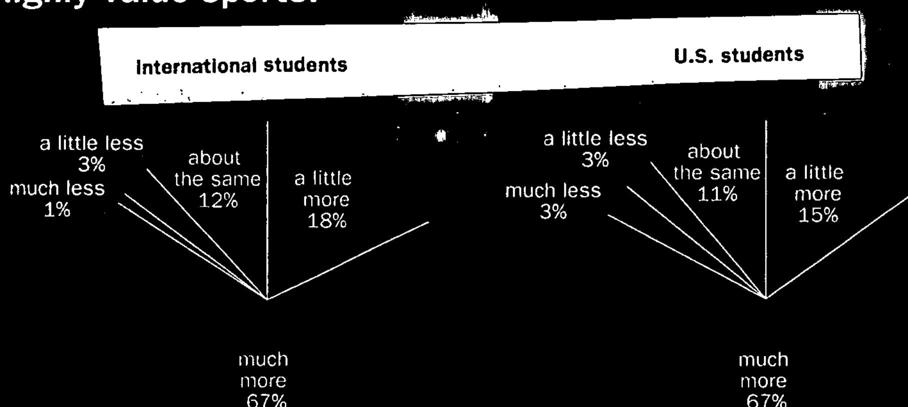
International and U.S. students were asked: Compared to students in other countries, how important is it to your American friends to do well in math?



Margin of error: +/− 6%

Both groups resoundingly agree that the U.S. students highly value sports.

12



Margin of error: +/− 6%

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The U.S. permits sports a place in the life of high schools that other countries avoid.

asked for the number of hours spent working before and after school. It appears that even on school days a significant portion of U.S. students' out-of-school time is devoted to employment.

Part-time work may capture students' time. Sports captures their hearts. One of the most striking results of last year's survey was the contrast foreign exchange students perceived between how much American high school students value success at sports compared to success at mathematics. American students see a similar contrast. We asked the American exchange students to compare pursuits in which U.S. students and students abroad want to do well. Mathematics was the first topic. About 37% said American students value success at math much less or a little less than teens in other countries, 38% said about the same, and 25% said much more or a little more (see Figure 11, page 19). According to the U.S. students, mathematical prowess is slightly more esteemed abroad, but not by much.

Sports is quite a different story. With both samples, the survey responses were overwhelming (see Figure 12, page 19). Two-thirds of both groups say that American students care much more about athletic accomplishments than students in other countries, swamping the 4% to 6% who say they matter more abroad. On first blush, this is not terribly surprising. For some time, sports have commanded a prominent place in American popular culture. From Babe Ruth to Muhammad Ali to Michael Jordan, America's most beloved national heroes have included athletes. But the U.S. is not unique in that regard. Soccer is practically a national religion in some countries. Baseball is revered in Japan. And teens around the world are just as sports crazy as teens in the U.S.

A significant difference is that the U.S. permits sports a place in the life of high schools that other countries avoid. Team sports abroad are often organized by clubs outside the school. Community pride in its local team may be just as great, but teams represent the communities themselves, not local high schools. Primarily American phenomena are the massive, costly high school stadiums and arenas in which sports are played, extensive press coverage of interscholastic competition, school wide rallies during the school day, extensive travel by student athletes, and high school coaches signing big dollar shoe contracts. Sports have a unique role in U.S. schools. What do we know about the effect of sports on American education?

IN THE 1950s, THE EMINENT SOCIOLOGIST JAMES COLEMAN described the unparalleled position student athletes command in the social status of high schools. Athletes are revered. Good students, on the other hand, are frequently the outcasts of teenage society. Coleman argued that unless adults pay close attention to the values of teens—and do not shrink from guiding them—sports may adversely affect school culture by undermining the pursuit of academic goals.

In the extreme, teens are capable of transforming personal qualities that adults admire into character weaknesses, cruelly so when detected in peers. Respect for authority, working hard, and intellectual brilliance are the defining characteristics of "suck-ups," "grinds," and "brains." Not much has changed in this regard since the 1950s. Cornell economist John Bishop has documented the same phenomena in recent studies of high school "nerds."[12] The cautionary advice of these studies deserves attention. Schools function like mini-societies. A high school's culture represents the shared values of the institution, and it shapes student behaviors as much as it reflects them.

What about the athletes themselves? Do sports help or hinder their learning? In general, the research is strongly positive on participating in high school sports. Herbert W. Marsh analyzed survey data collected from a large random sample of high school students in the 1980s. He found participating in sports has a positive influence on fourteen of twenty-two student outcomes, including enrollment in academic coursework, homework, and reduced absenteeism.[13] Other well-designed studies show benefits too. Studies of high school students in the early 1990s found a positive effect of participating in athletics on both grades and test scores.[14] Studies also document the positive impact of sports on several aspects of students' psychological and social development, such as boosting students' self-concepts, reducing delinquency and discipline problems, and diminishing the chances of teen pregnancy in female athletes.[15]

High school athletes appear to reap benefits after graduation. Students who participate in sports hold higher educational aspirations while in high school, and, subsequently, they are more likely to attend college. Economists have shown that high school athletes have an earnings advantage over

Kids who go out for a team sport may be intrinsically different than others—more ambitious, harder working, more confident in themselves.

non-athletes ten to fifteen years after graduation.[16] In particular, the adult wages of black males are higher if they participate in sports.[17] Bradley T. Ewing estimates that African American adults who participated in high school sports earn 8% to 11% more than those who did not.[18]

There are several theories as to how and why the positive effects of sports occur. Some explanations focus on the development of what is known as "human capital." For a moment, think of young people as small business firms. New businesses need capital investments to grow and mature—labor, financing, equipment. Children need the knowledge, habits, and skills that allow them to become productive adults. Start-up companies acquire capital from investors. Children acquire human capital from schools, but also through education in the broadest sense of the term: in the home, from peers, and in the community. From the human capital perspective, high school sports enhance an individual's stock of productive resources. Athletes may learn self-discipline, how to follow directions, perseverance, and how to set goals, a valuable set of skills for success in college and the workplace.

Another explanation focuses on social capital. High school sports promote strong ties between athletes and schools, bring parents of athletes into close contact, and create dense social networks around youngsters. A social network is a fancy term for something simple. Small towns possess dense social networks. The adults in an adolescent's life know each other. If an athlete decides to do something stupid, it is likely that an adult will hear about it and have a chance to intervene. Non-athletes, especially at high schools with two or three thousand students, often pass through schools anonymously. Another facet of social capital relates to establishing valuable social connections. Athletes learn teamwork, and by being around other motivated students, may make solid friendships that last long into adulthood.

A third explanation involves signaling. Teachers, colleges, and employers believe that successful athletes possess attributes that are also common to good students and good employees. Kids who go out for a team sport may be intrinsically different than others—more ambitious, harder working, more confident in themselves. Signaled of the likelihood that a person possesses these traits, educators and employers reward athletes with good grades, admission to college, good jobs, and high wages. Notice the difference between the human capital and social capital explanations, on the one hand, and the signaling explanation, on the other. The human and social capital stories are that athletes benefit from participation in sports because playing sports adds value, producing better students and better employees. The signaling story is that educators and employers believe anyone who self-selects into sports—whether the participation adds value or not—probably possesses valuable characteristics.

There are apparent limits to the pay-off from sports. In a large study of high schools, Laurence Steinberg discovered that students who devote more than twenty hours per week to extracurricular activities, including sports, suffer academic losses. Spending an inordinate amount of time on sports or allowing athletics to circumvent studying can turn the benefit of athletic participation into a loss. In addition, the positive effects of high school sports may not be uniform for all sports or all students. A recent study, for example, found that participation in basketball or football had a negative effect on tests scores, but was neutral on grades. Other sports, primarily, baseball and track, had a positive effect on white students' grades, but a negative effect on the grades of African Americans.[19] Race differences have also been discovered in how participation in high school sports is related to adult earnings. A 2001 study uncovered a positive impact on blacks' earnings, but a negative impact on whites.[20] Only recently have researchers accessed databases large enough to dig down to analysis at this level, so more research is needed to reach any substantive conclusions.

Returning to Coleman's work highlights an additional limitation. Most of the research cited above focuses on student athletes. What about other students? What about school culture as a whole? The starting five basketball players in a school with 1,500 students constitute only one-third of one percent of all students at the school. The literature is fairly convincing that they derive benefits from being athletes. But if a focus on excellence in sports has an adverse effect on school culture, then many more students might be negatively affected. Does this happen? A recent study in Massachusetts found that districts spending more on sports tend to score lower on the state's achievement test.[21] But there is sparse research on the question, and the notion that sports can undermine a school's academic performance remains largely theoretical.

Standouts and powerhouses in high school sports

How seriously do sports distract American high schools from their academic mission? We looked for an answer to this question by focusing on a sparsely researched segment of U.S. schools—high schools that are nationally recognized as top schools in major sports, so-called "standout" or "powerhouse" schools. If sports impede academic success, it should be noticeable in these schools. Identifying standouts took some work. We used *Parade Magazine's* All-America Teams and *USA Today's* national and regional rankings to identify the top high schools in three team sports—football, baseball, and basketball. Rankings at the end of each sport's season since the 1997–98 school year were collected and coded. In football, we were able to gather data back to the 1990–1991 academic year.

Bear in mind that this is only the first cut at identifying dominant schools. Indeed, the *Parade* list of all-star players is probably not an appropriate tool to screen for team dominance. The intention here, however, was first to conduct a sweep of high schools that were good enough to be noticed by national press, even if they had only one star player. So although the standout pool includes some schools that are not powerhouses, the approach identifies a large enough sample, so that national patterns of athletic excellence might be revealed.

Where are the standout high schools located? Table 1 shows the top ten states in the three sports. The top ten states are defined by "over-representation" of standouts, that is, the amount that a state's portion of standouts exceeds the amount one would expect, which is simply the state's portion of the U.S. population. In other words, values in the last column of Table 1 were found by computing the difference between the two previous columns (with a few discrepancies due to rounding). In football, for example, Texas has forty-eight standout high schools, representing 10.9% of the national total. Given that Texas holds about 7.5% of the nation's population, its percentage of standout schools is 3.4% points more than expected.[22]

The most notable aspect of Table 1 is the geographical distribution of schools in the three sports. Indeed, regional stereotypes from popular books and films are reinforced. Football is dominated by southern states. The top eight states are located in the South. This is not at all surprising if one reads *Friday*

Top Ten States in Three Sports
(States ordered by percent of over-representation of "standouts")

Table 1

Football (N=442)

State	No. of Standouts	% of Standouts	% of U.S. Population	% Over
Texas	48	10.9	7.5	3.4
Florida	37	8.4	5.7	2.6
Mississippi	13	2.9	1.0	1.9
Alabama	15	3.4	1.6	1.8
South Carolina	14	3.2	1.4	1.7
Georgia	19	4.3	2.9	1.4
Louisiana	11	2.5	1.6	0.9
Virginia	14	3.2	2.5	0.6
Montana	4	0.9	0.3	0.6
Oklahoma	7	1.6	1.2	0.3

Basketball (N=291)

State	No. of Standouts	% of Standouts	% of U.S. Population	% Over
Illinois	19	6.5	4.5	2.1
Michigan	16	5.5	3.6	1.9
Maryland	11	3.8	1.9	1.9
Indiana	11	3.8	2.2	1.6
North Carolina	13	4.5	2.9	1.6
Tennessee	9	3.1	2.0	1.0
Oklahoma	6	2.1	1.2	0.8
Louisiana	7	2.4	1.6	0.8
Iowa	5	1.7	1.1	0.7
Washington	8	2.7	2.1	0.6

Baseball (N=171)

State	No. of Standouts	% of Standouts	% of U.S. Population	% Over
Florida	19	11.0	5.7	5.2
California	28	16.2	12.2	4.0
Arizona	7	4.0	1.8	2.2
New Jersey	9	5.2	3.0	2.2
Washington	6	3.5	2.1	1.3
Indiana	6	3.5	2.2	1.3
Georgia	7	4.0	2.9	1.1
Connecticut	4	2.3	1.2	1.1
Louisiana	4	2.3	1.6	0.7
West Virginia	2	1.2	0.7	0.5

"Standouts" were named in the top 25 national rankings or top 10 regional rankings in *USA Today* or had a player named to the *Parade* All-American team.

Night Lights, the compelling story of the west Texas town of Odessa and its 1988 championship football team from Permian High School. In basketball, three out of the top five states are in the Midwest. The passion for basketball in the Midwest, most notably Indiana, is movingly documented in William Gildea's *Where the Game Matters Most*. The basketball standouts also seem to be states with notable state universities. In the top five states, the universities of Illinois, Michigan, Maryland, Indiana, and North Carolina possess legendary basketball programs. The correlation is not perfect—Kentucky and Kansas are noticeably absent from the top states—but it's certainly plausible that strong college sports programs influence the quality of high school athletics. Baseball has no clear pattern. The top three states—California, Florida, and Arizona—have obvious climate advantages for baseball, but New Jersey also makes the list. Excellence in baseball is less dispersed than the other two sports. California and Florida produce more than one-quarter of the nation's standout schools in the sport.[23]

Another interesting aspect to the standout schools is not shown in the table: the large percentage of private schools. Approximately 19% of the standouts are private schools, much larger than the share of high schools nationally (about 11%). This could be tied to recruiting. Private schools are not constrained by residential boundaries and can recruit talented athletes to attend their schools. The award winning documentary *Hoop Dreams* told the story of two star basketball players growing up in central Chicago. One of the young men was heavily recruited to attend a suburban Catholic school, where he eventually enrolled. Private schools are sensitive to the charge that they aggressively recruit star athletes, so it is important to emphasize that the current study

How Big Are Powerhouse High Schools?
(N=141)

Table **2**

	< 1000 Students	1000–1499 Students	1500–1999 Students	> 2000 Students	Median
U.S. High Schools	60%	19%	12%	10%	791
Powerhouse High Schools	10%	19%	25%	46%	1,920
Football	10%	20%	20%	50%	2,012
Basketball	15%	23%	26%	36%	1,744
Baseball	2%	14%	26%	57%	2,134

Enrollment data from U.S. Department of Education, National Center for Education Statistics, *Common Core of Data*, "Public Elementary/Secondary School Universe Survey," 1999–2000.

"Powerhouses" were named in the top 25 national rankings of *USA Today*.

In What Kinds of Communities Are Powerhouse High Schools Located?
(N=141)

Table **3**

	Urban	Suburban	Rural
U.S. High Schools	19%	31%	50%
Powerhouse High Schools	36%	54%	10%
Football	22%	68%	10%
Basketball	59%	36%	6%
Baseball	26%	60%	14%

Data on communities from U.S. Department of Education, National Center for Education Statistics, *Common Core of Data*, "Public Elementary/Secondary School Universe Survey," 1999–2000.

cannot determine whether recruiting is taking place. Gifted athletes may be attracted to private high schools for a variety of reasons. We only observe that private high schools produce more standouts in team sports than the proportion of private high schools overall. Among the standouts, 30% of basketball schools are private schools.[24]

Powerhouses: The best of the best

In the second cut of the data, we identified 163 powerhouses, schools ranked in the top twenty-five nationally in *USA Today's* end-of-season rankings since 1997. These are America's dominant high schools in team sports. We limited the analysis to public schools because of the spotty data available on private schools, especially the lack of test scores. We were able to collect the following data on 141 schools (88% of powerhouses): enrollment, community (urban, suburban, rural), racial composition, and poverty (percentage of students eligible for free lunch).[25] The powerhouses are located in twenty-four states. They have several characteristics that make them different from the average high school.

Powerhouse schools are huge.

The median powerhouse serves 1,920 students, more than twice as many students as the median high school in the U.S. Only 10% of American high schools serve more than 2,000 students, compared to 46% of the powerhouses (see Table 2). Large schools have a deep pool of talent from which to assemble athletic teams. Competition in baseball and football is strongly influenced by school size, as over half of the dominant high schools in these two sports are populated by at least 2,000 students. Perhaps because of its smaller squads, basketball is not as driven by school size, but even it favors large schools. Small schools are at a marked disadvantage in team sports. In the U.S., 60% of high schools are attended by 1,000 students or less. These schools have little chance of rising to prominence in team sports. Only 10% of the powerhouse high schools are that small.

Different sports flourish in different kinds of communities.

Basketball is an urban sport (see Table 3). More than half of the nation's dominant basketball teams hail from urban high schools. Football and baseball are dominated by suburban schools. The availability of open space for the large playing fields of baseball and football is probably one reason for the discrepancy. But the relative wealth of suburbs also might be a factor. Rural schools constitute about one-half of the nation's high schools, but only 10% of the powerhouse schools in the three sports. Basketball's appeal seems to diminish as it gets farther from the city. Dominance in basketball is exceedingly rare for a rural high school, with only 6% of the powerhouses in that sport coming from rural areas.

The South is the dominant region in high school sports.

We used the categories of the National Assessment of Educational Progress to sort the powerhouses by geographical region (see Table 4). The South is extraordinary in high school sports. The region holds 43% of the powerhouse schools, more than double its 21% share of U.S. high schools. The South is especially strong in football and baseball. The Northeast is the most underrepresented region, with 11% of the powerhouses. The Midwest's strongest sport is basketball. The West's strongest sport is baseball, and as noted above, dominance in baseball is greatest in the sunbelt states of the South and West.

Powerhouse schools are attended by a large African American population.

Student enrollment in the average high school in the U.S. is 72% white, 13% African American, 10% Hispanic, and 3% Asian. The powerhouse high schools are attended by 28% of African American students, about twice the percentage of the average high school (see Table 5). Dominant schools in basketball and football serve substantial black populations. The dominant basketball schools are 42% African American and 40% white, and in football, 64% white and 26% African American. Baseball powerhouses are similar to national averages, with 73% white enrollment. The figures square with racial patterns in data collected from high school sophomores in 1990. African American males were more likely than white males to report that they played football and basketball. White students were more likely to report participating in "other sports," primarily, baseball and track.[26]

In What Regions of the Country Are Powerhouse High Schools Located?
(N=141)

Table 4

	Northeast	South	Midwest	West
U.S. High Schools	17%	21%	31%	31%
Powerhouse High Schools	11%	43%	21%	26%
Football	10%	52%	18%	20%
Basketball	11%	32%	30%	26%
Baseball	10%	45%	12%	33%

NAEP categories used to sort states into regions. Data from U.S. Department of Education, National Center for Education Statistics, Common Core of Data, "Public Elementary/Secondary School Universe Survey," 1999-2000.

Who Attends Powerhouse High Schools?
(N=141)

Table 5

	% Poverty	Black	White	Hispanic	Asian
U.S. High Schools	20%	13%	72%	10%	3%
Powerhouse High Schools	21%	28%	58%	9%	5%
Football	18%	26%	64%	6%	3%
Basketball	30%	42%	40%	11%	6%
Baseball	13%	12%	73%	10%	5%

Poverty and race/ethnicity data from U.S. Department of Education, National Center for Education Statistics, Common Core of Data, "Public Elementary/Secondary School Universe Survey," 1999–2000.

How do the powerhouses perform on tests of reading and math?

How well do dominant sports schools perform on state tests of reading and mathematics? We collected the powerhouses' most recent test scores in reading and math, in most cases 2001 test scores, and converted the data to z-scores. Z-scores express school achievement relative to the average school in each state. State means are set at 0.00, with a standard deviation of 1.00.[27] In other words, schools with a positive z-score scored above average and those with a negative z-score, below average.

Schools serve students of vastly different backgrounds, of course, and characteristics such as the percentage of students in poverty are known to influence test scores. To place schools on a level playing field, z-scores within each state were adjusted

Achievement of Powerhouse High Schools
(Means and standard errors of z-scores, N=141)

Table 6

	Z-score (SE)
Powerhouse High Schools	+0.05 (.06)
Football	+0.06 (.10)
Basketball	+0.07 (.12)
Baseball	+0.02 (.09)

NOTE: Adjustments made for poverty and racial composition.

Achievement of Powerhouse High Schools by Demographic Characteristics
(Means and standard errors of z-scores, by quartile, N=141)

Table 7

	Q1 (Low)	Q2	Q3	Q4 (High)
% Poverty	+0.46* (.10)	+0.06 (.09)	−0.11 (.12)	−0.24 (.16)
% Non-white	+0.34* (.11)	+0.10 (.11)	−0.02 (.12)	−0.24 (.16)

* $p < .05$, two-tailed test of z-score = 0

NOTE: Data report national means of z-scores adjusted for poverty and racial composition at the state level.

Achievement of Powerhouse High Schools by Community
(Means and standard errors of z-scores, N=141)

Table 8

Urban	Suburban	Rural
−0.01 (.13)	+0.14* (.07)	−0.25 (.15)

* $p < .05$, two-tailed test of z-score = 0

NOTE: Data report national means of z-scores adjusted for poverty and racial composition at the state level.

using a regression equation, a standard statistical technique employed by researchers. The analysis controlled for school racial composition and the percentage of students qualifying for free lunch, an indicator of poverty. This treatment allows for each school to be compared to other schools in the same state serving students of similar racial and socioeconomic backgrounds.[28]

It doesn't hurt to be a powerhouse.
As displayed in Table 6, the test data do not support the idea that dominance in sports diminishes a school's academic achievement. The powerhouses' average z-score is .05, the equivalent of the 52nd percentile. Put simply, powerhouse high schools score about the same as non-powerhouses. Indeed, in all three sports, the powerhouse high schools score slightly above—but not statistically significantly different from—state averages in reading and math. The range of school scores is quite large, however, from −1.80 to 2.45. Is it possible to explain why some powerhouse schools get an academic boost from their extraordinary accomplishments in sports while other schools that are equally accomplished in sports do not?

Who gets a boost?

We pooled the powerhouses' z-scores nationally and employed regression analysis to tackle this question. Three demographic variables emerged as significant—the percent of students in poverty, the percent of nonwhite students, and being located in a suburban area. Rather than attempting to tease apart these three variables—a task that is extraordinarily difficult and not always enlightening—it is useful to consider them as a demographic cluster. What do academically high achieving powerhouses look like? They are located in relatively wealthy neighborhoods and serve predominantly white, non-Hispanic populations (see Table 7). Table 8 reveals the achievement benefit suburban powerhouses get from excelling in sports. Urban powerhouses score no better or worse than schools that are not powerhouses and serve similar populations. Powerhouses located in rural areas achieve slightly below similar non-powerhouse schools, but not to a degree that is statistically significant.

The study has limitations. In any analysis of school achievement, the purpose of controlling demographic variables is to filter out the effects of non-school factors on student achievement. Otherwise, in measuring student learning, one might actually measure poverty or the number of students from single parent families or a host of other social conditions that affect achievement, then misconstrue the effect of these conditions as the effect of schools on student achievement. The variables employed here are rather crude estimates. A study with more precise measures of student characteristics might uncover different findings. In addition, even if demographic characteristics are statistically controlled through within-state comparisons of school achievement—which calculating adjusted z-scores should have accomplished—"exporting" the z-scores for national compar-

Comparing the Academic Performance of Powerhouses and Non-Powerhouses in 24 states

Table 9

Who scores better?	Urban	Suburban	Rural
Powerhouses	12 (60%)	15 (75%)	4 (44%)
Non-Powerhouses	8 (40%)	5 (25%)	5 (56%)
NA	4	4	15

NOTE: NA (not applicable) refers to states that do not have powerhouses in the category.

isons could introduce other influences that skew the results.[29]

We scrutinized the data more closely to see if the suburban advantage for powerhouses holds up. Table 9 presents a simple count of states in which the average z-scores of powerhouses and non-powerhouses are compared (with poverty and racial composition controlled). The comparisons are broken out by urban, suburban, and rural status. In three-quarters of the states, sports powerhouses in suburban communities score higher on academic tests than non-powerhouse suburban schools with similar demographic profiles. Suburban powerhouses appear to get an extra academic boost from excellence in sports.

Conclusion

This study provides an important lesson for schools. Some high schools have built extraordinary programs in basketball, football, and baseball, with winning traditions that rival famous professional franchises. On average, such powerhouses do not sacrifice academics for athletics. That is good news. Winning at basketball can go hand in hand with winning at mathematics. However, high schools with advantaged socioeconomic circumstances are better able than other schools to integrate excellence at sports into an ethos of achievement that pervades school culture.

How do they do it? Speculation is necessary since the current study did not collect information that can answer that question. Suburban schools may be more likely to adopt policies that stress the importance of athletes' academic progress. They also may have more resources that allow them to offer special assistance to student athletes who struggle academically. Parents may also help. Suburban parents of athletes may be able to hire tutors to shore up academic deficiencies.

Being able to replicate success on the playing field in the classroom is a challenge for schools in less favorable socioeconomic circumstances. It is not that the study discovered evidence that athletic success detracts from academics, but schools in disadvantaged communities do not experience the same boost in test scores that schools in wealthier areas get from fielding powerhouse teams. Compared to their suburban peers, promising young athletes in rural areas must overcome two handicaps. First, they are much less likely to attend a school large enough to become dominant in team sports. Second, if they are fortunate enough to attend a sports powerhouse, the school is less likely to be academically successful. More research is needed to explain the strategies that allow some schools to harness excellence in sports and carry it over into classrooms.

Sports are an integral part of high schools. Competition in football, basketball, and baseball is vitally important to high school athletes, their parents, and communities across the country. The surveys of foreign exchange students and of American students who have studied abroad demonstrate that the value placed on athletic excellence is deeply ingrained in U.S. teen culture. Moreover, participating in sports seems to provide numerous benefits to student-athletes: elevated status in the eyes of peers, closer ties to school, a social network of watchful, caring adults, greater motivation for academic learning, greater likelihood of attending college, and higher wages as an adult. These are not trivial rewards. They underscore the need for schools to offer sports as part of an education that stresses excellence in all of its dimensions.

Part III CHARTER SCHOOLS

CHARTER SCHOOLS ARE PUBLIC SCHOOLS OF CHOICE. Parents enroll their children in a charter school because they want their kids to attend that particular school, not, as in the case of regular public schools, because the family's home sits within the school's enrollment boundaries. In exchange for meeting educational outcomes, charter schools are freed from most regulations. The outcomes are promised in a renewable license to operate a "charter," which is reviewed periodically. In the typical state, a review is conducted every five years. Schools that meet their goals are granted a fresh charter. Those that don't may be closed down.

The nation's first charter school legislation was passed in Minnesota in 1991, and a few schools opened their doors the following fall. California followed in 1992, and six more states in 1993. Then the charter movement spread like wildfire. In 1995, eighteen states had passed charter laws. By 1999, the number of charter states reached thirty-seven. Supported by leading Democrats and Republicans, charter schools grew in a single decade from a modest experiment in educational reform to 2,400 schools open in the 2001–2002 school year.[30]

How do charter schools perform on tests of academic achievement? Two major studies recently reviewed the existing research on this question, one released in 2001 by Gary Miron and Christopher Nelson, the other in 2002 by Brian Gill and colleagues at RAND. Both reviews described the evidence on charter school achievement as mixed to slightly favorable. The reports also stressed that, with so many charter schools being relatively new, much more research into charter school achievement must be conducted to arrive at any definitive conclusions about their academic performance.[31]

A study of charter schools

Brown Center researchers selected a sample of charter schools for the purpose of examining their academic achievement. The specific

Summary Statistics for Charter School Sample
(N=376)

Table
10

	Mean	Standard Deviation	Minimum	Maximum
Enrollment	252*	351	18	2,938
Poverty	0.38	0.25	0.00	1.00
White	0.54	0.36	0.00	1.00
Black	0.23	0.33	0.00	1.00
Hispanic	0.18	0.24	0.00	0.99
Asian	0.03	0.08	0.00	0.81
At-Risk	0.13	0.34	0	1
New in 1999	0.25	0.43	0	1

* For Enrollment, the median is substituted for the mean (368). At-Risk denotes schools specially designed to serve at-risk students.

research objective was to compare charters' performance on state tests from 1999 to 2001 with the performance of regular public schools. Did they score better, worse, or about the same? In addition to test scores, information was collected on the number of students enrolled in charter schools and the schools' racial and socioeconomic composition. Demographic data were used to compare charters to regular public schools serving students with similar background characteristics.

A limitation of the study is important to note. With the data at hand, it is impossible to tell whether charter schools' test scores reflect the quality of education at the schools. This is because charters' test scores may be influenced by what statisticians call "selection effects." Students attend charters because their parents have decided to send them there. They select the school. If charter students or their families are fundamentally different from kids attending regular public schools, these differences—not differences in the quality of schools—may produce differences in school test scores. Selection effects can be negative or positive. Charter students may have struggled academically before parents placed them at the school. But they also are probably blessed with parents who take an active interest in their children's education.

Despite this caveat, examining the test scores of charter schools is useful. States are currently testing charter school students, releasing the test scores, and issuing watch lists comprised of schools, including charters, that are failing. This study aggregates charter schools' scores across ten states and looks for patterns in their performance. Explaining why these patterns occur will require more specific information on the children attending charters and more rigorous statistical techniques than employed here.

We focused on ten states with the following qualifications: they had at least thirty charter schools open in 1999, tested students in grades 4, 8, and 10 (allowing for substitution of adjacent grade levels), and used the same achievement test in 1999, 2000, and 2001. The ten states had a total of 638 charter schools operating in 1999. Of these schools, we were able to assemble a complete panel of data on 376 charters. We did not add charters opening in 2000 or 2001 to the sample so that the number of schools remains fixed during the three year time frame. Test data were collected—on charters and regular public schools—from state departments of education and from websites maintained by state assessment programs. Demographic and enrollment statistics were taken from the National Center of Educational Statistics Common Core of Data.[32]

Table 10 contains summary statistics on the study's sample of 376 charter schools. The average charter in the study is noticeably smaller than regular public schools in the U.S. (the national average is 520 students for a regular public school).[33] Median enrollment in the charters is 252. About 38% of students in the charters are poor, close to the national average for regular public schools. Approximately 13% of the charters are specially designed to serve at-risk students. The charters serve a higher proportion of black students (23% vs. 17% nationally) and Hispanic students (18% vs. 15% nationally) than the average public school. About 25% of the charters in the study were new in 1999.[34]

Estimating charter school performance

To estimate the charters' academic performance, we employed a strategy similar to that used with the sports powerhouses in Part II. We collected test score data from the ten states, combined reading and math achievement from 1999 through 2001 into a composite score, and computed z-scores for all schools—regular and charter—in each state. The z-scores in Table 11 have been statistically adjusted for student background (socioeconomic status and racial composition) and weighted for enrollment. This allows us to compare charter schools to regular public schools with similar demographic characteristics. Within each state, an average z-score is 0.00.[35]

Computing a weighted mean allows larger schools to count for more than smaller schools. Why is this done? Imagine that you want to compute an overall test score for the schools in a small town. The town has two schools. How should the town's average achievement be reported? Pretty simple, one might answer, add the two schools' scores together and divide by two. But what if one of the schools has 300 students and the other only thirty? Treating the schools the same would be misleading. Giving the first school ten times more weight in computing the average score provides a better indication of how students are doing in the town as a whole. It is also a statistical property of test scores that those from large schools are more reliable than those from small schools, another reason for weighting averages by enrollment. Recall that many of the charter schools in the current study are quite small.

Charter schools score significantly below regular public schools on achievement tests, about .24 z-scores below average. As mentioned above, care must be exercised in interpreting the charter school test score deficit. The study does not possess evidence and therefore cannot shed light on why charters score below average. One possible explanation is that charter schools are not doing a very good job. But an equally plausible explanation is that charters attract large numbers of students who are struggling academically in public schools before ever setting foot on a charter school campus. The charters, in fact, may be doing an excellent job, bringing these low achievers up to a level that, although still below average, is not as low as when the students attended public schools.

Data on students' achievement before and after they enrolled in charters would help determine which of these explanations is true. Computing the academic gains that students make as they move through grade levels is better at isolating a school's contribution to learning than simply analyzing the level at which a school is performing. In addition, an analysis of how students perform after being randomly assigned to charter and regular schools would be valuable. Comparing the achievement gains of randomized samples, for example, has significantly advanced the research on vouchers. Many charter schools are oversubscribed, with more people seeking entry than space allows. Charter school administrators usually decide who gets to attend by a random draw, making such experimental research possible.[36]

By itself, a simple test score is not the best tool for explaining a school's contribution to its students' learning. But it remains the best indicator for assessing what students at any particular school know and can do in academic subjects—whether they can read, compute accurately, grasp the fundamental principles of science, or understand the importance of famous events in history. As Table 11 shows, charter schools in four states (Massachusetts, Michigan, Minnesota, Texas)

Charter School Achievement in Ten States — Table 11

(Means and standard errors of z-scores)

State	Z-score
Arizona (N=51)	−0.03 (.11)
California (N=97)	−0.02 (.07)
Colorado (N=31)	+0.18 (.12)
Florida (N=29)	−0.37 (.22)
Massachusetts (N=21)	−0.53* (.16)
Michigan (N=84)	−0.63* (.08)
Minnesota (N=16)	−0.44* (.16)
Pennsylvania (N=11)	+0.05 (.27)
Texas (N=25)	−1.09* (.33)
Wisconsin (N=11)	−0.18 (.41)
Average (N=376)	−0.24* (.04)

* $p < .05$, two-tailed test of z-score = 0

NOTE: Adjustments made for poverty and racial composition, weighted by enrollment.

Achievement of Charter Schools by Community — Table 12

(Means and standard errors of z-scores, N=376)

Urban	Suburban	Rural
−0.13 (.07)	−0.34* (.06)	−0.36* (.11)

* $p < .05$, two-tailed test of z-score = 0

NOTE: Adjustments made for poverty and racial composition, weighted by enrollment.

Achievement of Charter Schools by Enrollment

(Means and standard errors of z-scores, N=376)

Table 13

Up to 155 Students	**-0.44*** **(.11)**
156-246 Students	**-0.36*** **(.11)**
247-480 Students	**-0.24*** **(.10)**
481-2,938 Students	**-0.19*** **(.08)**

* $p < .05$, two-tailed test of z-score = 0

NOTE: Adjustments made for poverty and racial composition, weighted by enrollment.

score significantly below state averages for similar schools. Charter achievement in the other six states is indistinguishable from average. Colorado charters' raw scores are significantly above average (+.44); however, once school composition has been controlled, the Colorado charters' performance is not significantly different from the performance of schools serving similar populations (+.18). It is important to note that, compared to other states, Colorado's charters are uniquely suburban.

Urban charters score higher than suburban or rural charters.

When charters in the study are grouped together by common characteristics and compared across states, several interesting patterns emerge. For example, urban charter schools exhibit higher achievement than suburban or rural charters (see Table 12). Urban charters' test scores are just slightly below state averages (–.13). Rural and suburban charters, on the other hand, score significantly below schools with similar racial and socioeconomic profiles. This is important when thinking about charters as somewhat risky educational options for parents. Charters may be housed in old strip malls, church basements, or long-abandoned school buildings. They often hire teachers without official teaching certificates or extensive experience in the classrooms. And, as pointed out above, the research on charters' effectiveness is inconclusive. The results in Table 12 suggest that parents in urban schools are assuming less risk—at least when it comes to a prospective school's academic standing—when transferring children to charters than parents who do the same in rural and suburban areas. This is good news since urban parents may be leaving relatively bad schools and therefore be willing to consider riskier alternatives.

Large charters score higher than small charters.

Table 13 examines achievement in charters of different sizes. Large charters achieve at higher levels than smaller charters. This is somewhat counter-intuitive considering the popular "small school" movement, which advocates breaking down large schools into smaller organizational units. Small school advocates are concerned that students get overlooked in large institutions and are more likely to bond with an adult in smaller settings. But the largest charters in this study, those serving 481 students or more, are achieving significantly higher on state tests (–.19) than charters with 155 or fewer students (–.44).

What could explain the discrepancy? One potential reason is related to school administration. Many large charters are run by educational management organizations, or EMOs. Professionals might have the know-how to produce higher achievement compared to the typical mom and pop administration of small charter schools. Economies of scale may also play a part. Even the most devoted small school advocates recognize that schools might have to grow to a certain size to be viable as institutions. Extremely small schools may have trouble raising funding or securing loans, receiving favorable treatment from vendors when purchasing textbooks and other instructional materials, or attracting star teachers. Some charters may be too small to operate efficiently.

New charters have depressed scores for the first two years.

In 1999, about one-fourth of the study's charter schools were new. Their test scores fluctuate in an interesting way. In their first and second years, the new schools scored significantly below schools that were already open in 1999 (see Figure 13). In the third year, 2001, the new charter schools caught up with the older ones. Previous state evaluations of charter schools have noted that test scores are depressed the first year that a new charter is open. The current study is indicating that the negative new school effect extends for two years.

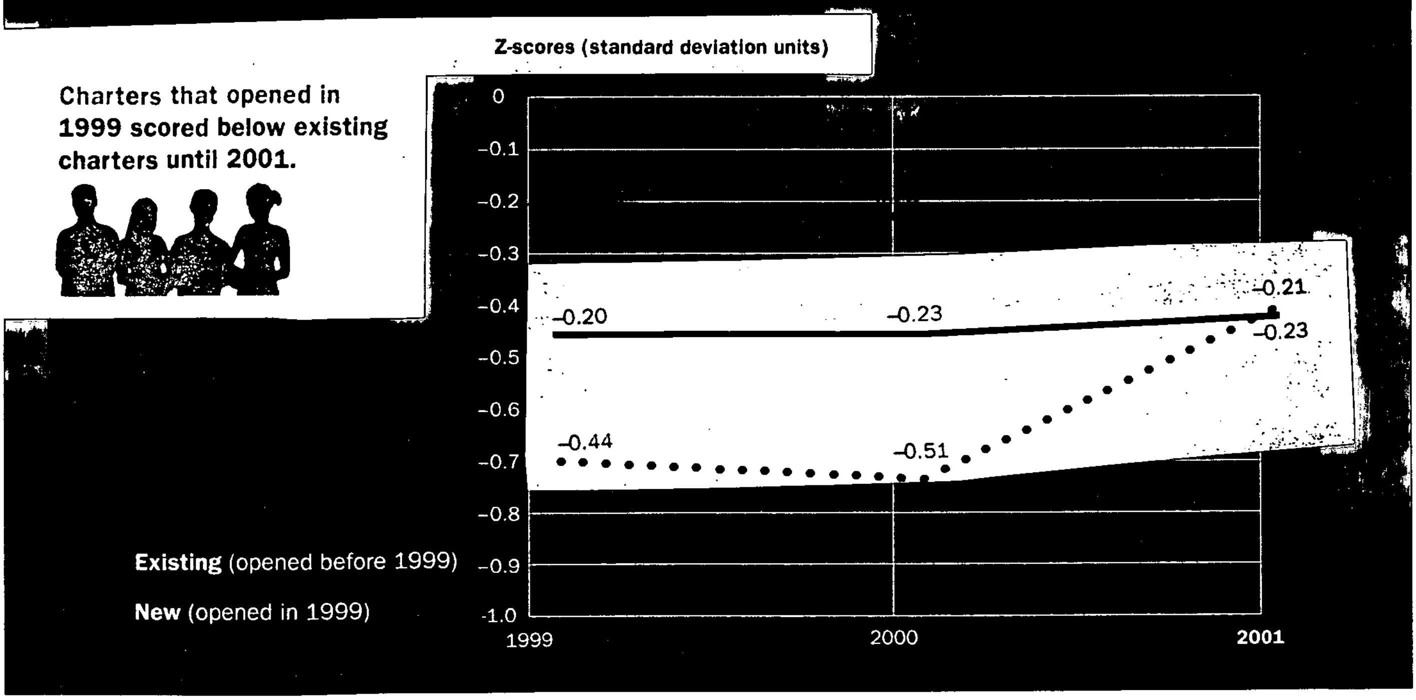
What is behind the two year lull in new charters' test scores? Speculation is necessary here. The stress and strain of opening a new school may be partially to blame. Founders of charter schools face a mountain of difficult tasks—finding adequate facilities, hiring teachers, preparing curriculum. Moreover, students are moving from their previous schools. Prior research has shown quite convincingly that student mobility depresses test scores.[37] The new school effect could also mean that right from the start charter schools are attracting a disproportionate share of low achieving students. This relates to the discussion of selection effects above.

If charters attract initially low achieving students, it may take two years for these students to be brought up to speed. The new schools in 1999 progressed from –.44 to –.21, a gain of .23 z-scores. Again, careful analysis of longitudinal data from students would shed light on whether the new school phenomenon is real or a statistical aberration.

Summary and recommendations

This section of the report presented a study of charter schools test scores from 1999 to 2001. In the study's ten states, charters scored about .24 z-scores below regular public schools of similar composition. Urban charters scored higher than suburban or rural charters, larger charters scored higher than smaller charters, and charters already in existence in 1999 scored higher than charters opening their doors for the first time that year. New charters' test scores lagged existing

New charter schools take two years to catch up with existing charters. 13



It is clear that charter schools are scoring below average on tests of academic achievement, but why they do so remains a question.

charters for two years, but in 2001, the new charters' scores jumped, and the test scores from new and old charter schools were statistically indistinct.

Two recommendations are appropriate. First, additional study of charter schools is needed, especially research that controls for selection effects. It is clear that charter schools are scoring below average on tests of academic achievement, but why they do so remains a question. It could be because charters offer an inferior education, or it could be because charters attract students who are low achieving in the first place.

The second recommendation addresses the new school effect. If charter schools are at a systematic disadvantage for the first two years that they are open, policymakers should consider special treatment for them in accountability programs. States frequently place schools with three years of poor test scores on watch lists or warning lists. Sanctions are threatened if achievement does not improve. A grace period might be appropriate for new charters—and for new regular public schools if they experience the same phenomenon—so that they are given a fair chance to produce learning. States should consider delaying the "accountability clock" on new schools until the third year.

A final word on charter schools. There may be no such thing as a "charter school effect" in the sense that an inherent quality of charter schooling influences achievement. Charters are nothing more than an institutional vessel into which several elements are poured—a founder's inspiration, a new principal and teaching staff, a new curriculum, and perhaps several innovative ideas. Charters are incredibly diverse. There are Montessori charters, Waldorf charters, back-to-basics charters, Afrocentric charters, and Core Knowledge charters. Some charter schools serve gifted youngsters, and others serve adolescents recently released from the criminal justice system.

Charters share two characteristics: they serve students whose families have chosen for them to be there, and they commit to attaining certain outcomes within a stipulated period of time. These are elements of governance. And they are process variables. If future research shows that charters produce a universal educational gain or loss from such a diverse group of schools, then how schools are governed will be proven more influential than all but a few people have ever imagined. The greater likelihood is that charters will be found to produce a wide range of outcomes. Some charters will be terrific places for educating children and others will be failures. Identifying the characteristics of excellent charter schools and encouraging their adoption should be the main objectives of the next wave of charter school research and policy.

ENDNOTES

1 Tom Loveless, *The 2001 Brown Center Report on American Education*, (The Brookings Institution, 2001), p. 8.

2 For a description of arithmetic's importance to learning algebra, see H. Wu, "How to Prepare Students for Algebra," *American Educator*, Vol. 25, No. 2 (Summer 2001), pp. 10-17. For the economic benefits that individuals reap from mastering basic mathematics, see Richard J. Murnane and Frank Levy, *Teaching the New Basic Skills*, (The Free Press, 1996), pp. 40-46.

3 U.S. Department of Education, The National Assessment Governing Board (NAGB), *Mathematics Framework for 2005, Pre-Publication Edition* (December 2001), pp. 9-10. Available at NAGB website: www.nagb.org.

4 Age 9 arithmetic cluster consists of 21 items assessing addition, subtraction, multiplication, and division of whole numbers. Age 13 arithmetic cluster consists of 23 items measuring addition and subtraction of whole numbers, fractions, and decimals. Age 17 arithmetic cluster includes addition of whole numbers, fractions, decimals, and converting decimals into fractions.

5 The age 13 fractions cluster consists of four items; the age 17 cluster consists of five items. For a dissenting view on the importance of fractions, see Patrick Groff, "The Future of Fractions," *International Journal of Mathematics, Education, Science, and Technology*, Vol. 25, No. 4 (1994), pp. 549-561.

6 The pattern displayed in Figure 7 was first noted by Robert L. Linn, "Assessments and Accountability," *Educational Researcher*, Vol. 29, No. 2 (March 2000), pp. 4-6.

7 The number of Limited English Proficiency (LEP) students in Iowa increased from 0.9% in 1992 to 2.3% in 2001 and non-white students from 6.0% in 1992 to 9.8% in 2001. Computed from data on Iowa Department of Education website: www.state.ia.us/educate/reports.html

8 Chicago's scores on ITBS computation rose from the mid-to-late 1990s, but Chicago can be considered unique in its emphasis on basic math skills during this time period. See Brian Jacob, "Test-Based Accountability and Student Achievement Gains: Theory and Evidence," Paper presented at the Taking Account of Accountability Conference, Program on Education Policy and Governance (PEPG), Harvard University, Cambridge, MA, June 10, 2002.

9 See Tom Loveless, *The Brown Center Report on American Education*, (The Brookings Institution, 2000), pp. 18-19.

10 The surveyed students attended school abroad for an entire academic year. The AFS conducts other programs of shorter duration.

11 Wording and response categories displayed in Figures 9-12 have been slightly changed to preserve meaning across two complementary surveys.

12 James S. Coleman, *The Adolescent Society*, (The Free Press, 1961); John H. Bishop, "Nerd Harassment, Incentives, School Priorities, and Learning," in *Earning and Learning: How Schools Matter*, edited by Susan E. Mayer and Paul E. Peterson, (Brookings Institution Press, 1999), pp. 231-279. On the stigma suffered by high-achievers, Jens Ludwig and Phil Cook provide fascinating contrary evidence from a large national data set. For both blacks and whites, students with mostly A's in mathematics and those who were on the honor roll were marginally *less likely* to report being "put down by students," being "threatened at least once since last fall," being "not popular," or being "not part of the leading crowd.": Philip J. Cook and Jens Ludwig, "The Burden of Acting White: Do Black Adolescents Disparage Academic Achievement," in *The Black-White Test Score Gap*, edited by Christopher Jencks and Meredith Phillips, (Brookings Institution Press, 1998), pp. 375-400.

13 Herbert W. Marsh, "The Effects of Participation in Sport During the Last Two Years of High School," *Sociology of Sport Journal*, Vol. 10, No. 1 (1993), pp. 18-43.

14 Beckett A. Broh, "Linking Extracurricular Programming to Academic Achievement: Who Benefits and Why?" *Sociology of Education*, Vol. 75, No. 1 (January 2002), pp. 69-91.

15 Alyce Holland and Thomas Andre, "Participation in Extracurricular Activities in Secondary School: What is Known, What Needs to be Known," *Review of Educational Research*, Vol. 57, No. 4 (Winter 1987), pp. 437-466; Jacquelynne S. Eccles and Bonnie L. Barber, "Student Council, Volunteering, Basketball, or Marching Band: What Kind of Extracurricular Involvement Matters?" *Journal of Adolescent Research*, Vol. 14, No. 1 (January 1999), pp. 10-33; Naomi Fejgin, "Participation in High School Competitive Sports: A Subversion of School Mission or Contribution to Academic Goals," *Sociology of Sport Journal*, Vol. 11 (1994), pp. 211-230; Donald F. Sabo, Kathleen E. Miller, Michael P. Farrell, Merrill J. Melnick, and Grace Barnes, "High School Athletic Participation, Sexual Behavior and Adolescent Pregnancy: A Regional Study," *Journal of Adolescent Health*, Vol. 25 (1999), pp. 207-216.

16 Steven J. Picou, Virginia McCarter, and Frank Howell, "Do High School Athletics Pay? Some Further Evidence," *Sociology of Sport Journal*, Vol. 2 (1985), pp. 72-76; John Barron, Bradley T. Ewing, and Glen R. Waddell, "The Effects of High School Athletic Participation on Education and Labor Market Outcomes," *The Review of Economics and Statistics*, Vol. 82, No. 3 (August 2000), pp. 409-421.

17 Eric R. Eide and Nick Ronan, "Is Participation in High School Athletics an Investment or a Consumption Good? Evidence from High School and Beyond," *Economics of Education Review*, Vol. 20 (2001), pp. 431-442.

18 Bradley T. Ewing, "High School Athletics and the Wages of Black Males," *The Review of Black Political Economy*, Vol. 23, No. 1 (Summer 1995), pp. 65-78.

19 Tamela M. Eitle and David J. Eitle, "Race, Cultural Capital, and the Educational Effects of Participation in Sports," *Sociology of Education*, Vol. 75, No. 2 (April 2002), pp. 123-146; Laurence Steinberg, *Beyond the Classroom*, (Simon and Schuster, 1996).

20 Eide and Ronan, 2001.

21 Jie Chen and Thomas Ferguson, "School Districts' Performance Under the MCAS," John W. McCormack Institute, (University of Massachusetts, 2002).

22 We dropped the four states without any standout schools (ND, SD, ME, VT), so technically, the true state population percentages differ slightly from that of our sample.

23 H.G. Bissinger, *Friday Night Lights*, (Da Capo Press, 2000); William Gildea, *Where the Game Matters Most*, (Triumph Books, 2000).

24 Magnet schools may also have a recruiting advantage, even though they are public schools. We were able to identify fifteen of the powerhouse sample, about 10%, as public school magnets.

25 The following values for our community variable "Locale00" in the Common Core were collapsed: 1-2 (urban); 3-5 (suburban); 6-8 (rural).

26 Eitle and Eitle, 2002, report the following participation rates by race: football—black-36%, white-22%; basketball—black-33%, white-13%; other sports—black-31%, white-41%.

27 Because z-scores were adjusted using residuals from a regression line that minimizes deviations, the within-state standard deviations were actually less than 1.00, with most approximately .75.

28 For each high school, we first computed a composite achievement score by averaging math and reading scores. These scores were converted into z-scores for every school within each state. We then regressed the z-scores on school demographic variables: racial composition and the percentage of students eligible for the federal free lunch program. We used the residuals (the amount each school scored below or above the expected value for a school of similar SES) as SES-adjusted z-scores. The adjustment lowers the relative ranking of schools with SESs above the state mean (i.e., serving students from wealthier families) and raises it for schools with SESs below the mean (serving students from poorer families). Some states do not release scores of schools serving small numbers of students (e.g. 10 or fewer) or schools where an inadequate percentage of total enrollment took the test. We dropped these schools from the analysis, as well as those schools on which we didn't have SES data.

29 The national estimate could be biased, for example, if an effect is linear in some states and non-linear in others.

30 Information on charter schools are from the Center for Education Reform: www.edreform.com. Demographic variables were obtained from the Common Core.

31 Gary Miron and Christopher Nelson, "Student Academic Achievement in Charter Schools: What We Know and Why We Know So Little," (National Center for the Study of Privatization in Education, Teachers College, Columbia University, 2001); Brian P. Gill, P. Michael Timpane, Karen E. Ross, Dominic J. Brewer, *Rhetoric Versus Reality: What We Know and What We Need to Know About Vouchers and Charter Schools*, (The RAND Corporation, 2002).

32 Other aspects of the data and methods are detailed in Tom Loveless, "Charter School Achievement and Accountability," Paper presented at the Taking Account of Accountability Conference, Program on Education Policy and Governance (PEPG), Harvard University, Cambridge, MA, June 10, 2002.

33 The current study focuses on states with charter schools that have been open the longest, giving the charters time to grow. The study's charters are larger than the average charter that was open in 1999. In 1999, a federal survey estimated the median charter served about 140 students. See RPP International, *The State of Charter Schools 2000*, National Study of Charter Schools, Fourth Year Report, (U.S. Department of Education, Office of Educational Research and Improvement, 2000).

34 U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics 2000*, (NCES 2001-034, U.S. Government Printing Office, 2001), Table 44, p. 58.

35 For each school, we first computed a composite achievement score by averaging 1999, 2000, and 2001 math and reading scores, across grade levels. We computed a z-score for every school in each state using the composite scores. We then adjusted the scores for poverty and racial composition as described in note 28.

36 William G. Howell and Paul E. Peterson, *The Education Gap*, (Brookings Institution Press, 2002).

37 U.S. Government Accounting Office (1994). *Elementary School Children:Many Change Schools Frequently, Harming Their Education* (GAO/HEHS Publication No. 94-45). Washington, DC: U.S. Government Printing Office.

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