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Selected Data on P-20 Education in America

From the College Board's Task Force on Admissions in the 21st Century

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Summary

This report, Selected Data on P-20 Education in America, is a comprehensive but not exhaustive review of data on several contemporary issues in American education, from preschool through college graduation. It explores 10 significant indicators of educational health, including international comparisons, student achievement, child well-being, demographic change, workforce needs, the education pipeline, educational costs, admissions standards and conditions of teaching, as well as STEM needs in the United States (science, technology, engineering and mathematics).

Among the major conclusions emerging from the indicators:

Indicator 1 **Economic Competitiveness**

- The United States has the most competitive economy on the face of the globe, with the most highly educated and productive workforce.
- Of the top 10 universities in the world (ranked by research productivity), eight are in the United States, as are 36 of the top 50.

Indicator 2 **Educational Attainment**

- The reading performance of American 15-year-olds is slightly above international averages, while mathematics and science performance is slightly below.
- According to the Organization for Economic Cooperation and Development, the U.S. can draw on the most highly educated labor force among the principal industrialized nations, when measured in terms of the formal qualifications attained by 25- to 64-year-olds in the labor force.
- The U.S., which was first in the world in the 1960s in the proportion of the population attaining a high school diploma, slipped to 13th in the 1990s; Korea, which had been 27th, jumped to first, in part because diploma attainment rates rose in many OECD countries during the same period.
- Meanwhile, between 1995 and 2005 the U.S. slipped from second to 15th place in university completion for young people (excluding advanced research programs), because completion rates rose so much faster in many OECD countries.

Indicator 3 **Child Well-Being**

- The U.S. combines the highest rates of childhood poverty in the developed world with the lowest level of public expenditures on social and human services. On both dimensions, the United States is an extreme outlier.

Indicator 4 **Demographics**

- The number of high school graduates will be relatively stable over the next decade. All the net new growth will be made up of minority students, as the number of white students declines and the number of students from minority groups grows.
- Demographic change will be felt differentially, with "explosive growth" in some states and contraction in others.

Indicator 5 **Need for Baccalaureates**

- Estimates of the need for college-educated workers in the years ahead differ.
- According to U.S. Department of Labor data, roughly one in five jobs in occupations that will experience the largest job growth in the next decade will require a four-year degree.
- Though over 40 percent of new jobs in the fastest-growing occupations will require a four-year degree, these occupations involve relatively few jobs compared to occupations experiencing the largest job growth.
- Assuming that current rates of college attendance, persistence and "offshoring" do not change, analyst Anthony P. Carnevale concludes that by 2012, the U.S. will face a cumulative 10-year shortage of 850,000 associate degrees, 3.2 million bachelor's degrees and 2.9 million graduate degrees.
- The National Center for Higher Education Management Systems estimates that 55 percent of the population will need college degrees by 2025 in order to equal degree attainment in top-performing countries, a potential "degree gap" of 15.6 million.

Indicator 6 K-12 and College Finance

- The U.S. now spends over half a trillion dollars on K-12 education.
- K-12 per-pupil state expenditures range from lows of around $6,500 or less in Arizona, Idaho and Utah to amounts that are more than twice as high in Connecticut, New Jersey and New York.
- Higher education is a $235 billion enterprise.
- As college prices have escalated while family income growth has stalled, student debt has increased dramatically in recent years.

Indicator 7 The Educational Pipeline

- Nearly one-quarter (22 percent) of 4-year-olds are enrolled in preschool programs; the figure for 3-year-olds is just 3 percent.
- Kindergarten enrollment is now near universal.
- During the elementary years, school enrollments are likely to increase from year to year, perhaps indicating the enrollment of immigrant, private or home-schooled students in public schools.
- A grade 9 "bulge" appears (probably reflecting the number of students repeating grade 9), after which public school enrollments enter a sharp decline, one that accelerates precipitously when students enter college.
- School dropout rates for minority Americans, particularly males, are substantially higher than for white Americans and Asian Americans.

Indicator 8 Standards

- Only one state (Virginia) met the American Federation of Teachers' criteria for strong standards in four core content areas (English, mathematics, science and social studies) across elementary, middle and high school levels.
- If California's "A-G" admissions standards or something similar were imposed as a blanket admissions standard on American higher education, many urban and rural high schools would have trouble offering the courses and about one-third of American four-year colleges and universities would be required to raise their published admissions requirements.

Indicator 9 Teaching

- The teaching profession is in a chronic, ongoing crisis that is characterized by high rates of turnover, low salaries and large numbers of math and science classes being taught by unqualified teachers.

Indicator 10 STEM Needs

- What seemed to be a settled question only a few years ago is now in dispute.
- Organizations such as the Business Roundtable and the National Science Foundation argue that a shortage of scientists and engineers, serious enough to threaten American competitiveness, either exists or lies ahead.
- Analysts from organizations such as RAND and the Urban Institute, on the other hand, report that there is no evidence of a shortage or a pending shortage. On the contrary, there is some evidence of underemployment of scientists and engineers.
- There seems to be no dispute that meeting math and science teaching needs requires the production of substantially more math and science teachers.

Preface

The College Board's Task Force on Admissions in the 21st Century developed this data book. It was designed as both a guide to the task force's work and as a resource for the College Board's Commission on Access, Admissions and Success in Higher Education.

A comprehensive but not exhaustive review of data on several contemporary issues in American education, this document explores 10 significant indicators of our national educational health. It includes the best national evidence we could find on each of these indicators, whether global competitiveness, children's well-being, student achievement or high school and college graduation rates.

The task force has also produced a separate statement, "Preserving the Dream," to guide the profession of school counselors and admissions, financial aid and enrollment management officers as education responds to the new realities of the 21st century.

With respect to this data book, we wish simply to note two things. First, Americans can take great pride in all that their schools, colleges and universities have accomplished over the years. We have the most highly educated population on the face of the globe. Our economy is the most productive in the family of nations. And our best universities, judged by research output, remain the envy of the world.

Second, if we are to maintain these advantages, the leaders of our schools, colleges and universities must pay attention to the alarming indicators outlined in this document. Most of our educational strengths are what economists call "first mover advantages." Other nations are rapidly catching up. We no longer lead the world in the proportion of high school graduates. We will have to play catch-up to regain our position as number one in terms of producing young college graduates. We lose shamefully high numbers of students, from both our high schools and our colleges and universities. And large numbers of high school graduates are prepared for neither work nor higher education.

The members of the task force have appreciated the opportunity to explore these issues and are pleased to provide the commission with this data as it goes about its work.

Jerome A. Lucido
Vice Provost for Enrollment Policy
and Management
University of Southern California

Chairman
Task Force on Admissions in the 21st Century

Indicator 1. How well does the United States stack up internationally in terms of competitiveness and workforce productivity? [1]

National Competitiveness

According to the World Economic Forum (*Global Competitiveness Report*, 2007-08), the United States has the most competitive economy in the world. To accommodate the many factors involved in competitiveness, including stability, good governance, educational quality and market size, WEF created a weighted index of several dozen components. The results are presented below.

Nation	Rank	Score
United States	1	5.67
Switzerland	2	5.62
Denmark	3	5.55
Sweden	4	5.54
Germany	5	5.51
Finland	6	5.49
Singapore	7	5.45
Japan	8	5.43
United Kingdom	9	5.41
Netherlands	10	5.40
Korea, Rep.	11	5.40
Hong Kong SAR	12	5.37
Canada	13	5.34
Taiwan, China	14	5.25
Austria	15	5.23
Norway	16	5.20
Israel	17	5.20
France	18	5.18
Australia	19	5.17
Belgium	20	5.10
Malaysia	21	5.10
Ireland	22	5.03
Iceland	23	5.02
New Zealand	24	4.98
Luxembourg	25	4.88

[1] According to the Organization for Economic Cooperation and Development: "The U.S. can draw on the most highly educated labor force among the principal industrialized nations, when measured in terms of the formal qualifications attained by 25- to 64-year-olds in the labor force." Stated Edward Lazear, chairman of the U.S. Council of Economic Advisers, in 2006: "The United States is the most productive country in the world…U.S. output per capita is approximately 30 percent higher than the developed European countries and Japan."

University Quality

"Academic Rankings of World Universities" produced by Shanghai Jiao Tong University indicates that eight of the top 10 and 36 of the top 50 universities in the world are in the United States (judged on output measures of academic and research performance).[2]

Rank	Institution
1	Harvard University
2	Stanford University
3	University of California - Berkeley
4	University of Cambridge
5	Massachusetts Inst. of Technology
6	California Institute of Technology
7	Columbia University
8	Princeton University
9	University of Chicago
10	University of Oxford
11	Yale University
12	Cornell University
13	UC - Los Angeles
14	UC - San Diego
15	University of Pennsylvania
16	University of Washington
17	University of Wisconsin - Madison
18	UC - San Francisco
19	Tokyo University
20	Johns Hopkins University
21	University of Michigan
22	University College, London
23	Kyoto University
24	Swiss Federal Institute of Technology - Zurich
24	University of Toronto
26	University of Illinois - Urbana-Champagne
27	Imperial College, London
28	University of Minnesota - Twin Cities
29	Washington University - St. Louis
30	Northwestern University
31	New York University
32	Duke University
32	Rockefeller University
34	University of Colorado - Boulder
35	University of British Columbia
36	University of California - Santa Barbara
37	University of Maryland - College Park
38	University of North Carolina - Chapel Hill
39	University of Texas - Austin
40	University of Manchester

[2] Downloaded Aug. 26, 2008, from http://www.arwu.org/rank2008/EN2008.htm.

Rank	Institution
41	Un. of Texas - Southwestern Medical Center
42	Pennsylvania State University
42	University of Paris, 06
42	Vanderbilt University
45	University of Copenhagen
46	University of California - Irvine
47	University of Utrecht
48	University of California - Davis
49	University of Paris, 11
50	University of Southern California

Indicator 2. On global comparisons of educational attainment, how well does the United States do?

Attainment of the Secondary School Diploma

The U.S. was an "early mover" in the drive following World War II to make secondary school completion near universal. The advantage of being the first to act has evaporated (Andreas Schleicher, "Seeing U.S. Education Through the Prism of International Comparisons," presentation to the College Board, March 2008). The U.S., which was first in the world in the 1960s in the proportion of the population attaining a high school diploma, slipped to 13th in the 1990s; Korea, which had been 27th, jumped to first.

Student Achievement

With respect to K-12 student achievement, results are mixed, both because they represent assessments in different subjects at different grade levels, frequently employing different benchmarks, and because it is difficult to compare international comparisons over time, since they rarely if ever use the identical samples of nations. The diversity of the American student population and regional variations in schooling in the United States also pose challenges, particularly when compared with the homogeneous enrollments in several "countries," some of which are cities while others (e.g., Canada and Belgium) are divided into different populations, based on language or regional control.

Against that backdrop, analyses in the mid-1990s indicated that American elementary students in grade 4 produced superior results in reading, mathematics and science on international comparisons, while their comparative performance dropped to around international averages by grade 8 and declined dramatically by grades 11 and 12.

The International Mathematics and Science Survey

More recent results (TIMSS, 2003 and the Programme for International Student Assessment, 2007) present a different picture. According to the TIMSS data, the performance of American fourth-graders in **mathematics** is slightly below the international average (ranked by the proportion of students meeting advanced international benchmarks), while the performance of American eighth-graders is slightly above the international average (found at http://timss.bc.edu/timss2003i/mathD.html).

In **science**, American fourth- and eighth-graders are well above international averages, according to TIMSS, ranked once again by the proportion of students meeting advanced benchmarks (found at http://timss.bc.edu/timss2003i/scienceD.html). TIMSS did not assess student performance at the high school level.

The Program for International Student Assessment

Starting in 2002, the Organization for Economic Cooperation and Development, a consortium of nearly 30 advanced economies, began assessing how students "nearing the end of compulsory education" in their nations were performing on assessments of reading (2000), mathematics (2003) and science (2006). OECD plans to repeat those assessments, which test 15-year-olds in participating nations, between now and 2015. Some 60 nations, including OECD members and partner countries, have participated in these assessments.

Reading (2000 results): In reading, the performance of American 15-year-olds is slightly above international averages but not in any statistically significant way. Across OECD nations, socioeconomic status explains about 20 percent of the variation in student performance in reading. The SES factor for individuals is compounded when large numbers or proportions of low-SES students attend the same school, perhaps a factor of peer influence, low teacher expectations or lack of school resources (see http://www.pisa.oecd.org/NewsArchives/0,3460,en_32252351_32235731_1_1_1_1_1,00.html).

Mathematics (2003 results): In "mathematics literacy," the performance of American 15-year-olds is below international averages. Fifteen-year-olds in the U.S. achieve a mean score of 483 score points on a scale with an OECD average of 500 — placing Americans 24th out of 29 participating OECD nations. When "confidence levels" (similar to a poll's margin of error) are applied, the United States ranks between 22nd and 24th (see *U.S. Performance in Mathematics Literacy and Problem Solving*, NCES, 2004, found at http://www.nces.ed.gov/surveys/pisa/pisa2003highlights_2.asp).

Science (2006 results): In science, the performance of American 15-year-olds is below international averages. Fifteen-year-olds in the U.S. achieve a mean score of 489 points on a scale with an OECD average of 500, placing them 21st out of 30 participating OECD nations. When "confidence levels" are applied to that ranking, the United States results might place American 15-year-olds as high as 18th or as low as 25th (see *PISA 2006: Science Competencies for Tomorrow's World*, OECD Briefing Note for the United States, Dec. 4, 2007).

Interpreting PISA: PISA assessed 15-year-olds, but sampling comparisons are quite difficult. Some countries excluded special-needs students. The age-based sampling produced a Japanese sample with 100 percent of its students in 10th grade. Both Korea and Norway had over 98 percent of their students in 10th grade. In the U.S., by contrast, just 61 percent of the 15-year-old sample was in 10th grade, with a third of the sampled students in ninth grade or lower (Lowell and Salzman, 2007). OECD reports that the difference of one year of schooling corresponds to an average 41-point score differential on the PISA math scale.

Higher Education: OECD reported a surprising piece of data just a few years ago: The U.S., which was first in the world in the proportion of young people with a college degree 35 to 45 years ago, ranked 10th in the world in the proportion of young people getting a degree by 2006. For total population (ages 25-64), the U.S. ranked third in 2006, while Korea tied for seventh.

Indicator 3. With regard to children's well-being, what do social indicators tell us?

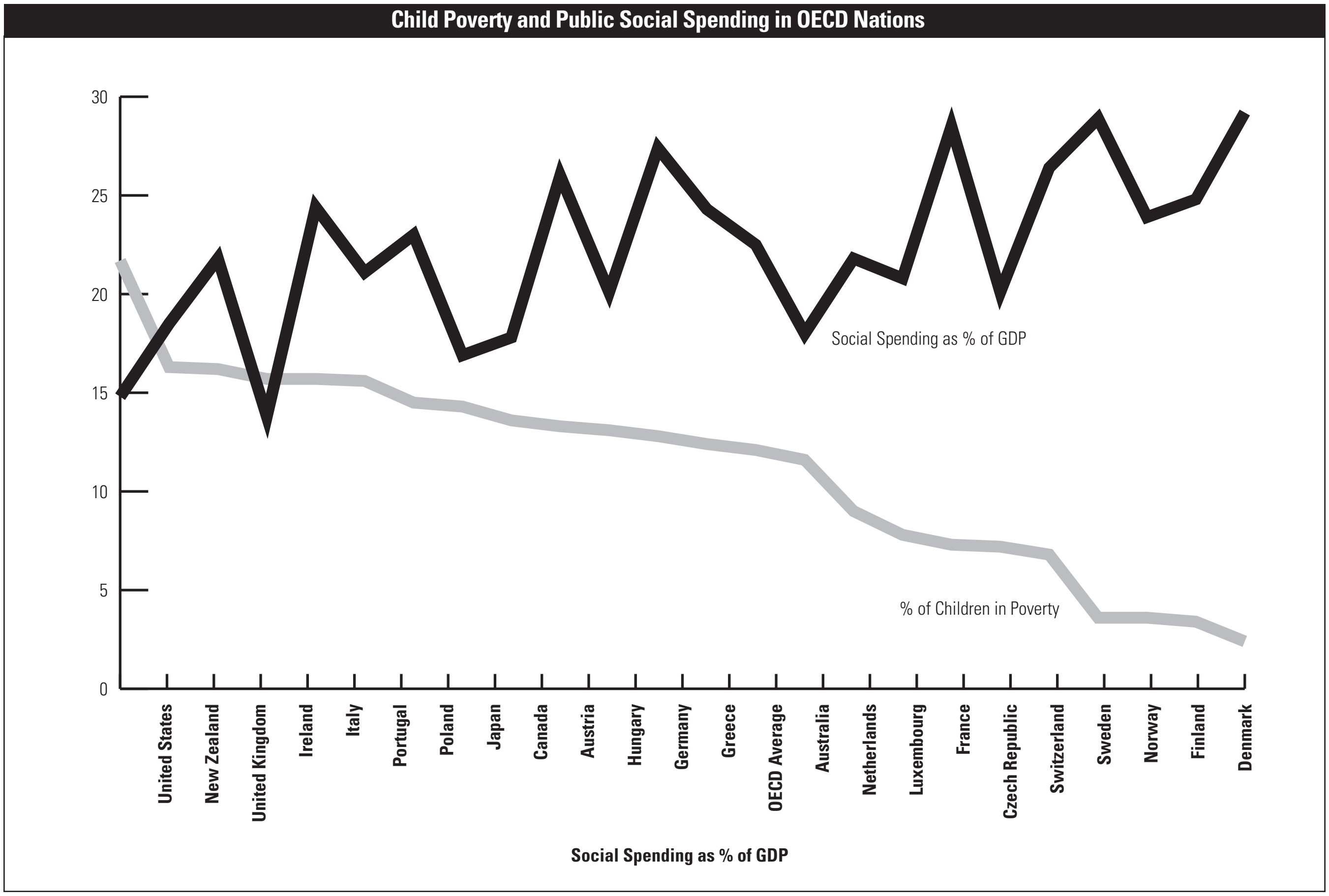
A long history of research, in both the United States and Europe, relates childhood poverty, community assets and parent education to student achievement.

On a measure incorporating several factors (including poverty, health, safety, risk-taking behavior and education), the children in the United States are at much greater risk than they are elsewhere in the developed world (An Overview of Child Well-Being in Rich Countries: Child Poverty in Perspective, UNICEF, 2007).

Child Well-Being

1	Netherlands	11	Germany
2	Sweden	12	Canada and Greece
3	Denmark	14	Poland
4	Finland	15	Czech Republic
5	Spain	16	France
6	Switzerland	17	Portugal
7	Norway	18	Austria
8	Italy	19	Hungary
9	Ireland	20	United States
10	Belgium	21	England

According to OECD (Society at a Glance, 2006), the U.S. combines the highest rates of childhood poverty in the developed world with the lowest rates of expenditure on social and human services. On both dimensions, the United States is an extreme outlier. Sweden, Norway, Denmark and Finland present the opposite pattern: very low levels of childhood poverty combined with very high levels of spending on social needs.


Child Poverty and Public Social Spending in OECD Nations
30
25
20
15
10
5
0
Social Spending as % of GDP
% of Children in Poverty
United States
New Zealand
United Kingdom
Ireland
Italy
Portugal
Poland
Japan
Canada
Austria
Hungary
Germany
Greece
OECD Average
Australia
Netherlands
Luxembourg
France
Czech Republic
Switzerland
Sweden
Norway
Finland
Denmark
Social Spending as % of GDP

Indicator 4. **How will the demographic makeup of high school graduates (the traditional pool of college applicants) change in the coming decade?**

The Western Interstate Commission on Higher Education anticipates stable high school graduation rates through 2015, dramatic changes in the demographics of high school graduates and different demographic shifts by region (*Knocking at the College Door*, 2008). WICHE's data indicate that minority students will account for the entire growth among public high school graduates between 2008 and 2015.

Change in Public High School Graduates by Race and Ethnicity (2004-05 to 2014-15)

	Cumulative Growth over Ten Years	Percentage Growth
African American	+ 12,000	+ 3%
American Indian/Alaska Native	+ 2,000	+ 7%
Asian-American/Pacific Islander	+ 46,000	+ 32%
Hispanic	+207,000	+54%
White	-197,000	-11%

Anticipated State Changes in Public and Nonpublic High School Graduates (2004-05 to 2014-15)

	Definition	States
Stable Production	Changes between -5% and +5%	Alaska, California, Connecticut, Hawaii, Illinois, Iowa, Kentucky, Maine, Maryland, Mississippi, Missouri, New Mexico, Oklahoma, Oregon, South Carolina, Tennessee and Washington (17 states)
Slowing Production	Losses between –5% and -10%	Massachusetts, Michigan, Minnesota, Nebraska, New York, Ohio, Pennsylvania, Rhode Island, West Virginia and Wisconsin (10 states)
Dwindling Production	Losses of 10% +	Kansas, Louisiana, Montana, New Hampshire, North Dakota, South Dakota, Vermont and Wyoming (8 states)
Manageable Expansion	Increases between +5% and +10%	Alabama, Colorado, Delaware, District of Columbia, New Jersey and Virginia (5 states and D.C.)
Rapid Expansion	Increases between +10% and +20%	Arkansas, Idaho, Indiana and North Carolina (4 states)
Explosive Growth	Increases of 20%+	Arizona, Florida, Georgia, Nevada, Texas and Utah (6 states)

Indicator 5. What is the need for graduates with bachelor's degrees in the years ahead?

Estimates of the need for postsecondary education vary. According to the U.S. Department of Labor, the vast majority of new jobs will require education beyond high school. That is, in order to become fully qualified for their occupations, most workers will need postsecondary education, including two- and four-year colleges.

The fastest-growing, best-paying jobs will require at least a bachelor's degree. However, only about one in five new jobs overall in the coming decade will require workers with a four-year degree. The table below outlines the occupations that require a bachelor's degree or more, promise very high earnings, and are predicted to grow the fastest between 2006 and 2016. The Bureau of Labor Statistics defines "very high" as a median income of $46,360 or more. Median means that half the incomes would be above that figure and half below.

The fastest-growing occupational categories (i.e., those with the highest rate of growth) do not account for most new jobs. In fact, the number of new jobs in occupations that will see the largest job growth (in terms of raw numbers) between 2006 and 2016 is three and a half times as large as the number of new jobs in occupations that will experience the fastest growth during this time.

Fastest-Growing Occupations (2006-16) with Very High Annual Earnings Requiring at Least a Bachelor's Degree

Occupation	Job growth in decade	% Increase over decade	Education required
Network systems/data analysts	140,000	53.4	Bachelor's
Computer software engineers/applications	226,000	44.6	Bachelor's
Personal financial advisors	72,000	41.0	Bachelor's
Veterinarians	22,000	35.0	First Professional
Financial analysts	75,000	33.8	Bachelor's
Computer systems analysts	146,000	29.0	Bachelor's
Database administrators	34,000	28.6	Bachelor's
Computer software engineers/software	99,000	28.2	Bachelor's
Physical therapists	47,000	27.1	Master's
Physician assistants	18,000	27.0	Bachelor's
Total Job Growth in 10 years	**879,000**		

Source: Bureau of Labor Statistics (http://www.bls.gov/emp/emptab21.htm).

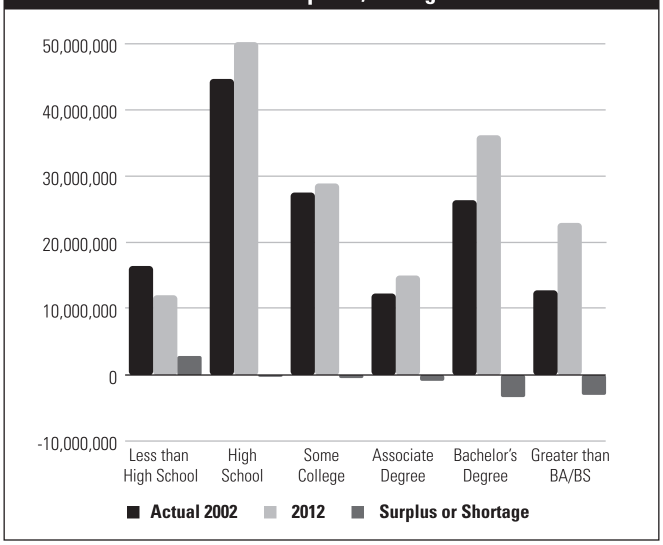
Projected Job Growth, 2006-16, in Occupations with Largest Job Growth by Education Required				
Occupation by education	New jobs in decade	% Increase over decade	Total by education	All jobs in these occupations
Jobs requiring short- or medium-term training			**5,772,000**	**71.3%**
Retail sales	557,000	12.4		6.9%
Customer service	545,000	24.8		6.7%
Food prep & fast food	452,000	18.1		5.6%
Office clerk	404,000	12.6		5.0%
Personal & home care aide	389,000	50.6		4.8%
Home health aide	384,000	48.7		4.7%
Janitor/cleaner	345,000	14.5		4.3%
Bookkeeping/accounting/auditing clerk	264,000	12.5		3.3%
Waiter/waitress	255,000	10.8		3.1%
Child care worker	248,000	17.8		3.1%
Executive secretary/assistant	239,000	14.8		3.0%
Landscaping/groundskeeping	221,000	18.1		2.7%
Receptionist	202,000	17.2		2.5%
Heavy-truck driver	193,000	10.4		2.4%
Maid/cleaner	186,000	12.7		2.3%
Security guard	175,000	16.9		2.2%
Carpenter	150,000	10.3		1.9%
Medical assistant	148,000	35.4		1.8%
Maintenance worker	140,000	10.1		1.7%
Food preparation	138,000	15.3		1.7%
Teacher assistant	137,000	10.4		1.7%
Jobs requiring less than bachelor's degree			**851,000**	**10.5%**
Registered nurse	587,000	23.5		7.2%
Nursing aide/orderly	264,000	18.2		3.3%
Jobs requiring bachelor's degree or higher			**1,478,000**	**18.2%**
Postsecondary teacher	382,000	22.9		4.7%
Computer software engineer	226,000	44.6		2.8%
Accountant/auditor	226,000	17.7		2.8%
Elementary teacher	209,000	13.6		2.6%
Management analyst	149,000	21.9		1.8%
Computer systems analyst	146,000	29.0		1.8%
Network systems/data analyst	140,000	53.4		1.7%
GRAND TOTAL			**8,101,000**	

Source: Bureau of Labor Statistics (http://www.bls.gov/emp/emptab3.htm).

As this table reveals, the demand for jobs in the middle of the labor market — those that require more than high school but less than a four-year degree — will remain very high. Inability to fill these middle-class jobs will threaten both the workforce and national needs.

Different assumptions invariably produce different results. Assuming that current rates of college attendance, persistence and sending jobs for educated labor offshore do not change, analyst Anthony P. Carnevale concludes that by 2012, the United States will face a significant cumulative 10-year shortage of well-educated people. His calculations (see figure below) suggest an oversupply of some 40,000 high school graduates, along with cumulative shortages as follows: a need for about 250,000 more people with some college, 850,000 with an associate degree, 3.2 million with a bachelor's degree and 2.9 million educated beyond the bachelor's (Carnevale, presentation at Aspen Institute's "Forum for the Future of Higher Education," June 2008).

Projections of Cumulative Workplace Demands by Education Required, Through 2012



The National Center for Higher Education Management Systems produces a different estimate. To equal the top-performing countries in terms of degree attainment, the U.S. should increase the proportion of the population with two- or four-year degrees to 55 percent by 2025. This would require closing a "degree gap" of 15.6 million by that time (Travis Reindl, *Hitting Home: Quality, Cost, and Access Challenges Confronting Higher Education Today*, 2007).

Indicator 6. How much is spent on education in the United States?

K-12 Finance. Because school finance is where politics, funding and educational programming come together, it is both complex and challenging. State spending per pupil differs dramatically from state to state — from lows of around $6,500 or less in the 2005-06 school year in Arizona, Idaho and Utah to amounts that are more than twice as high in Connecticut, New Jersey and New York (NCES, *Revenues and Expenditures for Public Elementary and Secondary Education*, 2008, Table 3).

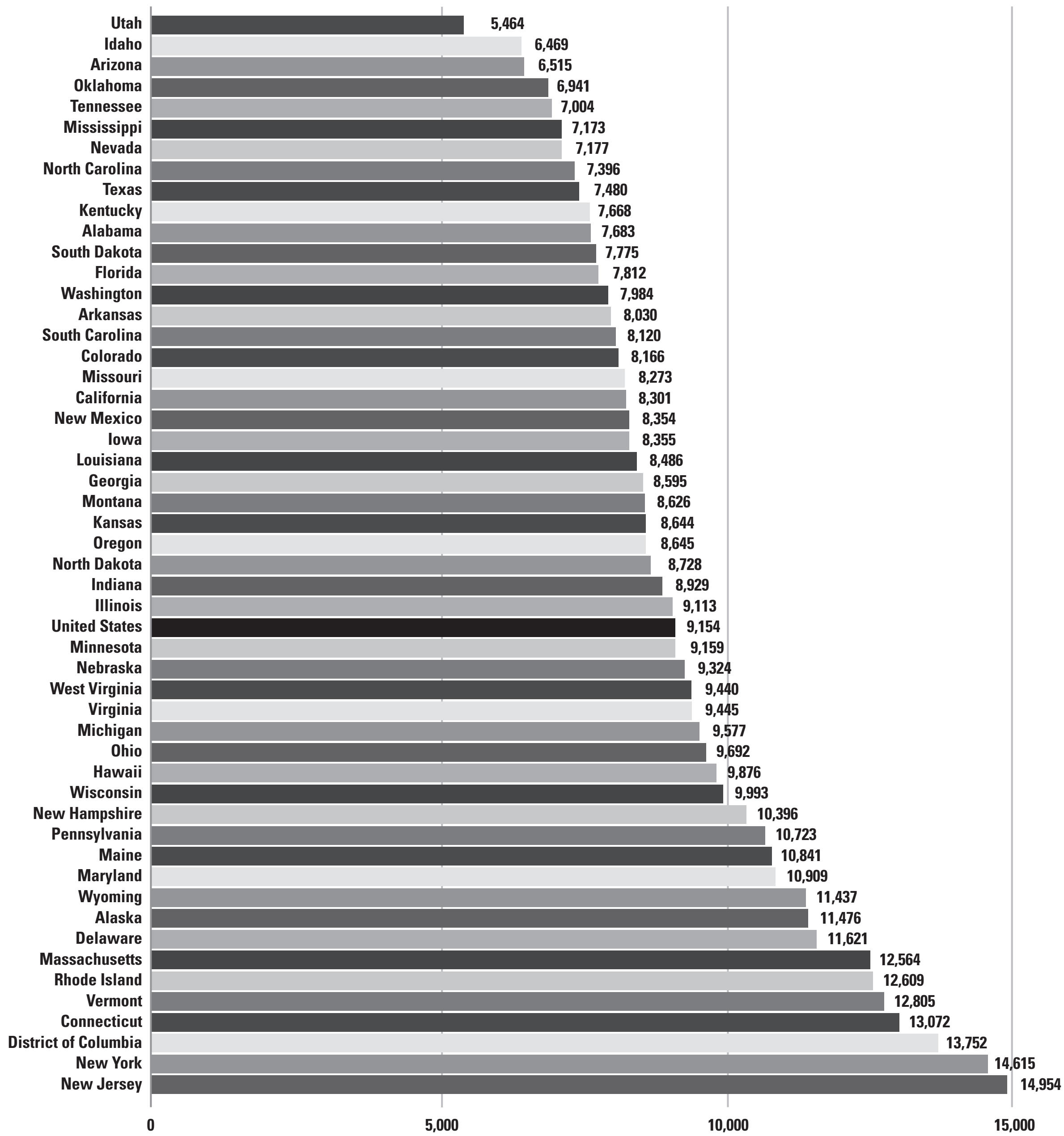
There is a massive amount of money in the K-12 system. In 2005-06, expenditures on K-12 public education amounted to nearly $529 billion for instruction, support services, administration, capital outlays, meals, transportation and debt service (NCES, *Revenues and Expenditures for Public Elementary and Secondary Education*, 2008, Table 8). These funds support a large and complex system made up of some 14,000 school districts, 97,000 schools, 50 million students, three million teachers and three million administrative and support staff (NCES, *Digest of Education Statistics*, 2008, Tables 83, 34 and 80).

Higher Education. There is also a lot of money in American higher education. In 2004-05, revenues for public and private two- and four-year degree-granting colleges amounted to nearly $235 billion, including funds from tuition and fees; federal, state and local appropriations; gifts; sales; capital appropriations; additions to endowment; and other income (NCES, *Digest of Education Statistics*, 2008, Table 338). These funds also support a large and complex system made up of some 4,250 public and private colleges and universities (NCES, *Digest of Education Statistics*, 2008, Table 224), nearly 18 million students, and 3.4 million teachers, administrators and support staff (NCES, *Digest of Education Statistics*, 2008, Table 177).

Although financial aid certainly makes college more affordable than published sticker prices, college costs are rising. After adjusting for inflation, average published tuition and fees at four-year public and private colleges doubled between 1977 and 2007 (The College Board, *Trends in College Pricing*, 2007). Over the past decade, published tuition and fees rose at an average rate of 2.9 percent above inflation at private four-year colleges,

[3] See also: Paul Barton, "How Many College Graduates Does the U.S. Labor Force Really Need?" (*Change*, January/February 2008); National Association of Manufacturers, *2005 Skills Gap Report — A Survey of the American Manufacturing Workforce* (Washington: NAM, undated); and Harry J. Holzer and Robert I. Lerman, *America's Forgotten Middle-Skill Jobs: Education and Training Requirements in the Next Decade and Beyond* (Washington: Workforce Alliance, November 2007).

State Expenditures Per Pupil: 2005-06 School Year



4.4 percent at public four-year colleges and 1.5 percent at public two-year institutions.

Despite the public attention paid to these developments, the truth is that most undergraduates enroll at institutions where tuition and fees are relatively low. Of all degree-seeking undergraduates, over 35 percent are enrolled in public community colleges, where tuition and fees averaged $2,361 in 2007-08. An additional 34 percent are enrolled at in-state public four-year institutions, where tuition and fees averaged $6,185 in the same year (tuition details from The College Board, *Trends in College Pricing*, 2007; enrollment information derived from NCES, *Digest of Education Statistics*, 2007, Table 177, when taking into account the College Board estimation that 86 percent of students at four-year public institutions pay in-state rates). After grant aid is factored into the charges, 44 percent of full-time students face tuition charges of $3,000 or less, including 42 percent attending four-year public institutions and 90 percent attending public two-year institutions (American Council on Education, 2008). On average, full-time students enrolled in public four-year colleges and universities receive about $3,600 in grants from all sources and tax benefits. This aid reduces the average tuition and fees paid to about $2,600. Similarly, aid reduces the average tuition and fees paid by full-time students enrolled in public two-year colleges to about $320 per year (The College Board, *Trends in College Pricin*g, 2007).

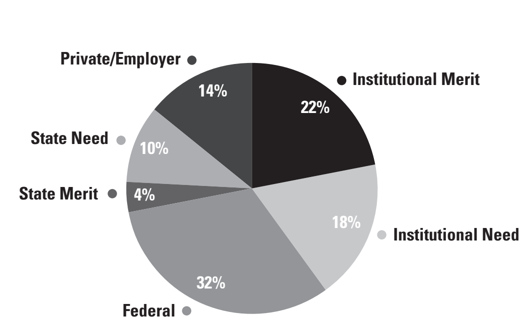
Adequacy of Student Aid. Financial aid increased substantially in the last 10 years. After accounting for inflation, total aid over the decade more than doubled (The College Board, *Trends in Student Aid*, 2007). Both grant and loan funds increased substantially, but the rate of loan growth has outpaced the rate of growth in grants since 1996. Federal grants have dropped from 40 percent of aid in 1990 to 29-34 percent in 1996-2006. Whereas subsidized federal loans accounted for 28 percent of available aid in 1996, they made up only 16 percent of total aid 10 years later. Furthermore, subsidized Stafford loans dropped from 54 percent of education loans in 1996 to 32 percent in 2006, while unsubsidized loans now account for 31 percent of borrowing. Consistent and striking growth was seen in the proportion of loans taken on by parents (growing from 8 percent to 13 percent) and attained through nonfederal sources (growing from 6 percent to 24 percent).

Forty percent of undergraduate aid was in the form of federal loans in 2006-07, compared to 61 percent of aid to graduate students. However, when taking into account nonfederal loan sources (i.e., state sponsored or private sector), loans compose 49 percent of the total funds used by undergraduates and 64 percent of the funds used by graduate students to supplement their own resources in paying for education. Throughout the decade, students have relied more heavily on institutional grant aid than on federal grant aid. Work-study, like the minimum wage, has not kept pace with inflation and constitutes only about 1 percent of student aid.

As college prices have escalated while family income growth has stalled, students have had to rely more on grants and loans to finance their education. Student debt consequently has increased dramatically. The average amount borrowed (adjusted for inflation) between 1992-93 and 2003-04 increased 44 percent, 36 percent and 34 percent for full-time undergraduates attending four-year private, four-year public and two-year public institutions, respectively.

In the face of rising student debt, both states and institutions have increasingly relied on merit-based, instead of need-based, aid. According to a 2008 presentation from Pennsylvania State University's Donald Heller at the University of Southern California's Center for Enrollment Research, Policy, and Practice, need-based aid provided by states has grown since 1993 at a rate of 7 percent annually; meanwhile, merit aid from states has jumped at a rate of 18 percent a year. This is part of a pattern in which merit-based aid (from institutions, states and the private sector) threatens to overtake need-based aid. As Heller's data show (see chart below), institutions provide more merit-based grants than those that are need based.

Grant Aid to Undergraduates 2006-07



Indicator 7. A lot of attention has been paid in recent years to the issue of "leaks" in the educational pipeline. What do we know about how fast and how well students progress from preschool through college graduation?

Concern about the pipeline is warranted, especially from grade 9 through attainment of the baccalaureate degree. During the elementary years, public school enrollments tend to increase from year to year, perhaps indicating the addition of immigrant, private or home-schooled students. A grade 9 "bulge" appears (probably reflecting the number of students repeating grade 9), after which public school enrollments enter a sharp decline, one that accelerates precipitously when students enter college (NCES, *Digest of Education Statistics*, 2008, Tables 34 and 190).

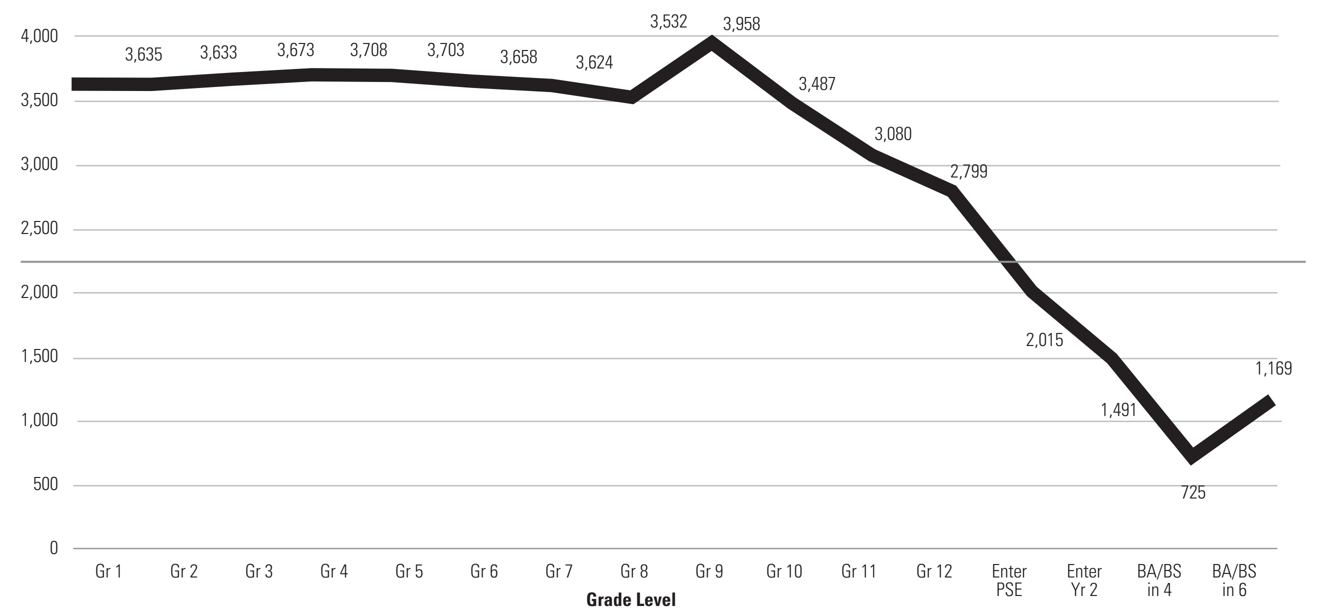
While data limitations make this pipeline analysis less than ideal, it provides a reasonably good picture of how well American schools and colleges and universities keep students on track for success. Although described by Haney et al. as a "cohort" analysis, the pipeline numbers do not represent a true cohort, which would track the 3,635,000 students who enrolled in grade 1 until 2,799,000 of them enrolled in grade 12. Instead, the "pipeline" simply displays enrollment at each grade level in the 2000-01 school year. The figure then assumes that (1) all grade 12 enrollees graduated; (2) 72 percent of them enrolled in postsecondary education, of whom 74 percent entered the second year, 36 percent received a bachelor's degree in four years and 58 percent received a bachelor's degree in six years. While less than ideal, the figure is a reasonably good approximation of cohort patterns, which are unlikely to change dramatically from year to year.

Preschool Programs. According to the National Institute for Early Education Research, 22 percent of 4-year-olds are enrolled in preschool programs and 3 percent of 3-year-olds (*The State of Preschool*, 2007).

K-12 Pipeline. According to the National Center for Education Statistics, 9.3 percent of 16- to 24-year-olds could in 2006 be described as "status dropouts," defined as those "who are not enrolled in school and who have not earned a high school diploma or equivalency credential, irrespective of when they dropped out." The estimate is based on an annual census household sample of self-reported data and is an indicator of the overall proportion lacking a high school credential in that age group. This rate is down from 14.6 percent in 1972 (NCES, *Dropout and Completion Rates in the United States*, 2008).

With the exception of Asian-American students who at 3.6 percent demonstrate the lowest status dropout rate, dropout rates for minority Americans and males are considerably higher than they are for white Americans and females.

Educational Pipeline, 2001-01, Grade 1 thru Bachelor's



Status Dropouts	White %	Black %	Hispanic %	Total %
All	5.8	10.7	22.1	9.3
Male	6.4	9.7	25.7	10.3
Female	5.3	11.7	18.1	8.3

In *The Education Pipeline in the United States: 1970-2000*, Walt Haney and associates at the National Board on Educational Testing and Public Policy reviewed dropout rates from kindergarten through grade 12. Their main findings included the following:

- Kindergarten enrollment is now near universal. About 94 percent of all children entered school in kindergarten since the early 1990s.
- The rate at which students disappear from schools between grades 9 and 10 has tripled in the last 30 years. The grade 9 to grade 10 loss of students is now the biggest leak in the pipeline.
- In the last 30 years a significant enrollment "bulge" has developed in grade 9. Whereas there were roughly 4 percent more students enrolled in grade 9 compared to grade 8 in 1970, there were 13 percent more students in grade 9 in 2000. This reflects the fact that more students were repeating grade 9 — a trend that probably contributed to the increased grades 9-10 losses over time.
- Based on the percentage of students in grade 9 who complete high school three and a half years later, graduation rates have fallen from about 77 percent in 1971-72 to 67 percent in the late 1990s. Only two out of three young people in the late 1990s were progressing normally from grade 9 to graduation.
- The authors conclude that the "constriction in the high school pipeline" (grade 9 bulge, grades 9-10 attrition and declining graduation rates) is likely an unintended consequence of three successive waves of reform: minimum competency testing, standards-based reform and high-stakes testing.

Community College Success Rates. Many students enter community colleges with no interest in transferring to four-year institutions to earn the baccalaureate degree. They search for basic skills, employment credentials or personal enrichment. Community colleges annually award 800,000 certificates and associate degrees and produce the vast majority of the nation's police officers, firefighters and nurses (see *Winning the Skills Race and Strengthening America's Middle Class: An Action Agenda for Community Colleges*). But for those community college students hoping to attain a four-year degree, transfer rates are not encouraging. According to the U.S. Department of Education, about one-quarter to one-third of these students are successful in transferring to a four-year college or university (U.S. Department of Education, 2001). However, among those community college students who are successful in transferring to a four-year college or university, data reveal that baccalaureate completion rates are comparable to rates for students who began college at a four-year Institution (Pascarella and Terenzini, 2005).

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Pascarella, E. T., and Terenzini, P. T. (2005). *How College Affects Students: A Third Decade of Research* (Vol. 2). San Francisco: Jossey-Bass.

U.S. Department of Education (2001). *Community College Transfer Rates to 4-Year Institutions Using Alternative Definitions of Transfer*. (NCES 2001-197). Washington, DC: U.S. Department of Education, National Center for Education Statistics, Office of Educational Research and Improvement.

Four-Year Graduation Rates. In 2001, according to the National Center for Education Statistics, just 58.4 percent of those who enrolled as first-time four-year college students in 1995 (six years earlier) had received a bachelor's degree. The chances of completing a bachelor's decreased with age at the time of enrollment — declining from 64.7 percent for students 18 or younger in 1995 to 10.3 percent for students 30 or older. Asian-American/Pacific Islander students were the most persistent (69.1 percent attain bachelor's degrees), followed by white (61.9 percent), American Indian/ Alaska Native (51.7 percent), Hispanic (44 percent) and African American (43.4 percent) students. Greater persistence was also associated with higher levels of parental education and family income (NCES, *Digest of Education Statistics*, 2008, Table 318).

In the same year, University of Virginia economist Sarah Turner published a paper with some timeline information: Among 23-year-olds in 1999, 67 percent had enrolled in college for some period, but only 24 percent had attained a bachelor's degree within five years after high school graduation. For the same age group in 1970, about 51 percent had enrolled in college for some period, while 23 percent had completed a degree. Over that 29-year period, although college enrollment rates increased substantially, completion increased just one point.

Averages, of course, conceal as much as they reveal. Among Division I schools, private research universities reported an overall graduation rate of 84 percent and public research universities reported a graduation rate of 60 percent, while public institutions not awarding the doctorate reported a graduation rate of about 37 percent within six years (Sarah E. Turner, "Going to College and Finishing College: Explaining Different Educational Outcomes," in Caroline Hoxby, ed., *College Decisions: How Students Actually Make Them and How They Could*, Chicago: University of Chicago Press, 2004).

Indicator 8. What is the relationship between traditional admissions methods and practices and the ongoing effort to reform American schools? How hard is it for a student to gain admission to a four-year college or university in the United States?

Standards and Competencies. In 1990, Marshall S. Smith, later undersecretary of education in the Clinton administration, and Jennifer O'Day, then at Stanford University, published a seminal paper, "Systemic School Reform." The authors laid the foundation for a new movement toward school reform, variously defined as "alignment," "standards-based" or "systemic" reform. Their general concept provided the basis for the work of the Clinton administration's (Goals 2000), the Bush administration's (No Child Left Behind), Achieve (a coalition of governors and corporate leaders) and the American Diploma Project (a coalition of Achieve, the Education Trust and the Fordham Foundation). In general, the paper called for aligned and coherent policies governing learning standards, instructional materials and curriculum, teacher preparation, and accountability and assessment systems. At its most elaborate, the systemic strategy would align high school exit examinations with college admissions tests, placement tests and tests for merit scholarships.

Nearly two decades later, some progress has been made, but a lot remains to be done. According to Achieve (*Closing the Expectations Gap*, 2008):

- Nineteen states have aligned high school standards with postsecondary expectations, and nine states have built college readiness measures into statewide assessment systems.
- In 11 states, a college-preparatory program has become the "default" high school curriculum; ninth-graders are automatically enrolled unless their parents opt out. Seven states and the District of Columbia have made a college-preparatory program in which students cannot opt out the default.
- Twelve states are planning on adopting this more rigorous course sequence.
- The standards are more rigorous, calling, for example, for four years of mathematics through Algebra II.

It is not self-evident, from examining the American Diploma Project's Web site, that the program provides clear and readily accessible guidance to educators about the shape or nature of the curriculum, apart from a mathematics sequence that includes geometry, Algebra I and Algebra II. English benchmarks are organized into eight strands involving reading, writing, literature, logic and the like. Outside those specifications, states are urged to "define how other subjects (such as science, history and the arts) can prepare students to meet college and workplace readiness standards."

It should be noted that, at least with respect to reading and mathematics competencies, empirical evidence supports the proposition that the skills required in complex modern workplaces are similar to those required for success on campus. That is to say that the competencies developed by both reading and mathematics are as important on the job as they are in the college classroom. This argues for establishing a college-preparatory curriculum as the default school curriculum, whatever students' preliminary plans involve (ACT, *Ready for College and Ready for Work: Same or Different?* 2006).

In April 2008, the American Federation of Teachers, a union that has supported a standards-based approach since shortly after *A Nation at Risk* appeared in 1983, issued a report (*Sizing Up State Standards*) critically appraising where states are with the standards movement. While some states have demonstrated marked improvement in standard setting, according to AFT, too many are lagging behind, offering vague, inconsistent and weak guidance to educators. Among the key findings:

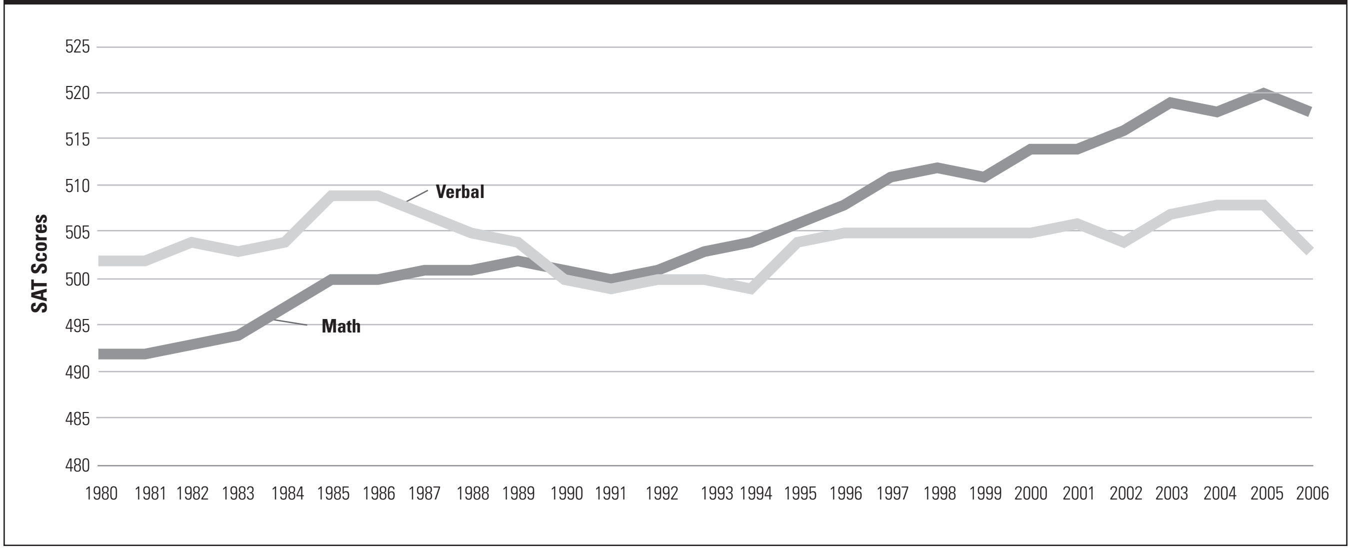
- Math and science standards generally are stronger than English and social science standards.
- For most subjects, high school standards are the weakest.
- The three main problems are that standards are repeated from grade to grade, are clustered for a range of grades (e.g., 9-12) or are incomplete or vague.

It would be a mistake to conclude that slow progress on standards-based reform has had little effect. The rigor of secondary school curriculum has increased substantially. Between 1990 and 2000, the average number of Carnegie units earned by public high school graduates increased across the board — whether measured in terms of mathematics, science, foreign language or total units (B. Lindsay Lowell and Harold Salzman, *Into the Eye of the Storm*, Urban Institute, 2007). Moreover, between 1998 and 2008 course-taking patterns of college-bound seniors revealed more rigor in their preparation in math and science. Over 10 years, the percentage of seniors taking precalculus increased 9 percent, with the proportions taking calculus, physics and chemistry increasing by 2 percent, 2 percent and 3 percent, respectively (*2008 College-Bound Seniors Report*, The College Board).

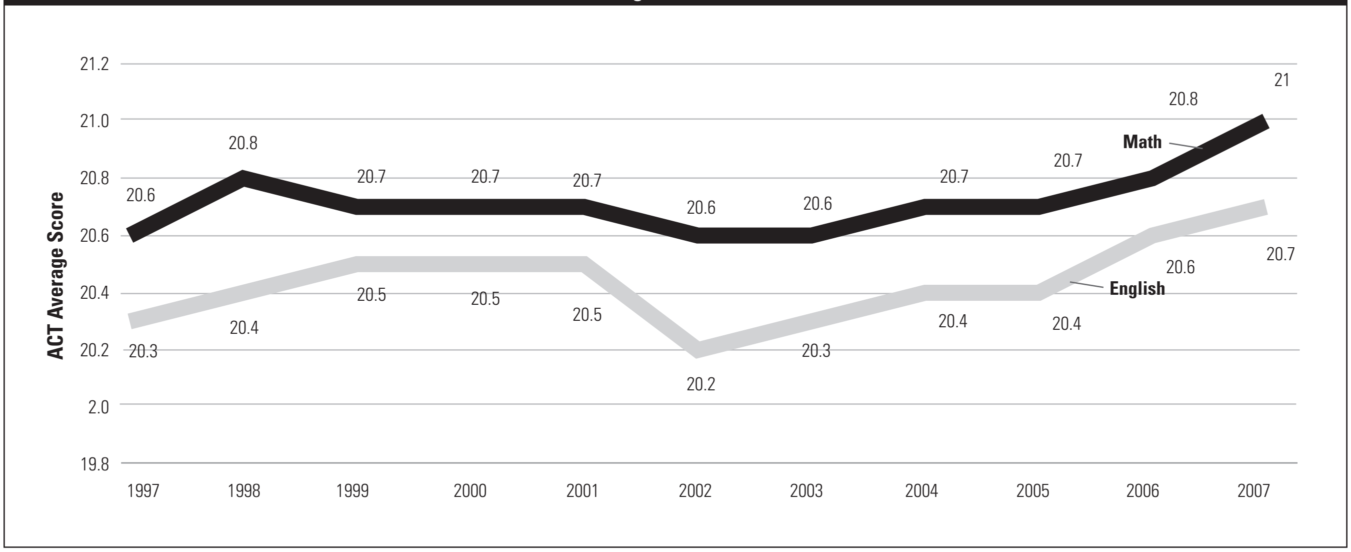
Meanwhile, despite some annual dips, average achievement in mathematics on the SAT® has demonstrated fairly consistent increases since 1980, despite increasing numbers of test-takers. Increases in the verbal area have been more modest and harder to sustain while taking into account the growth in linguistic diversity in the test-taking population.

On the ACT, taken by fewer students, mathematics and English results also demonstrate steadily increasing achievement levels through the late 1990s, a decline between 2002 and 2005, and then increases through 2007 (http://www.act.org/news/data/07/charts/text.html#three).

SAT-Verbal Math Trends 1980-2006



ACT Results, English and Math, 1997-2007



Carnegie Units. In recent years, the University of California began to require a mandatory high school curriculum (the A-G requirements) of 18 high school Carnegie units (school years), of which 15 are required and three recommended. The requirements were developed to make sure that students were well prepared for college work and could benefit from first-year undergraduate study. The California State University system adopted the A-G requirements as well.

A-G Requirements for the University of California and the California State University System

Program of Study	
a. History and social science	Two years required
b. English	Four years required
c. Mathematics	Three years (Algebra I or higher); four years recommended
d. Laboratory science	Two years required; three recommended
e. Language other than English	Two years required; three recommended
f. Visual and performing arts	One year required
g. College prep electives	One required

It turns out that many high schools in the state (and elsewhere) are unable to offer the full sequence of A-G courses. Some schools are too small; some, too isolated; and many do not have the teaching staff qualified to offer mathematics and science courses, not to mention Advanced Placement®. In some rural states and communities (e.g., Montana), small high schools graduating 40 or fewer students annually are not unusual; frequently such high schools do not have the faculty depth required to offer advanced mathematics, science and language sequences (Charles Reed, chancellor, California State University, comments on California's A-G requirements at the meeting of the Commission on Access, Admissions and Success in Higher Education, Chicago, March 7, 2008; also e-mail to William "Brit" Kirwan, Commission chairman and Commission staff, May 20, 2008. See also Clifford Adelman, *The Toolbox Revisited*, U.S. Department of Education, 2006, and Matt Gouras, "Montana Town Loses Four Teens," *Seattle Times*, July 26, 2008).

No ethnic group in the United States attends high schools in which the full 18-unit curriculum outlined in the A-G program is universally available. Minority students and those from families of low socioeconomic status are disproportionately affected. Only 45 percent of Hispanic students attend a high school that offers calculus, and just 59 percent of white students do (Clifford Adelman, *The Toolbox Revisited*, U.S. Department of Education, 2006).

12th-Graders in 1992 in High Schools Offering These Courses

Race/Ethnicity	Calculus	Trigonometry
White	59%	77%
African American	51%	67%
Hispanic	45%	60%
Asian	61%	72%
Socioeconomic status	Calculus	Trigonometry
Highest Quintile	72%	83%
Second Quintile	56%	73%
Third Quintile	54%	71%
Fourth Quintile	49%	70%
Lowest Quintile	43%	64%

Admissions Requirements. It would be a mistake, however, to assume that every college and university in the United States could adopt the A-G requirements as an admissions requirement overnight.

The College Board annually produces the *College Handbook*, which provides details on the programs of study at virtually every college and university in the United States, and many abroad. Selecting just every 10th four-year institution in the United States from the 2008 *Handbook* produces 205 institutions, ranging in size from two that enroll fewer than 100 undergraduates to 14 enrolling 20,000 or more. All told, these 205 institutions are responsible for more than 1.2 million undergraduates. Regarding the A-G requirements, if we reduced the total number of required units to 16 and insisted that every four-year college adopt 16 units as a standard, that requirement would exceed the published requirements of 37 percent of American four-year colleges (represented by 75 institutions in this sample).[4]

About one-third of American four-year colleges and universities require 16 units in sequences similar to the A-G sequence. Another third (36 percent) require more than 16 units, including 41 institutions in this sample that require 20 or more units. However, 37 percent of institutions require 15 units or fewer, including 5 percent that specify 12 or fewer.

[4] Colleges describe the units in the *College Handbook* as either "required" or "recommended." Although "recommended" would seem to have less force than "required," this analysis accepted either term.

Indicator 9. A great deal of public discussion revolves around teacher adequacy issues. What do the data show here?

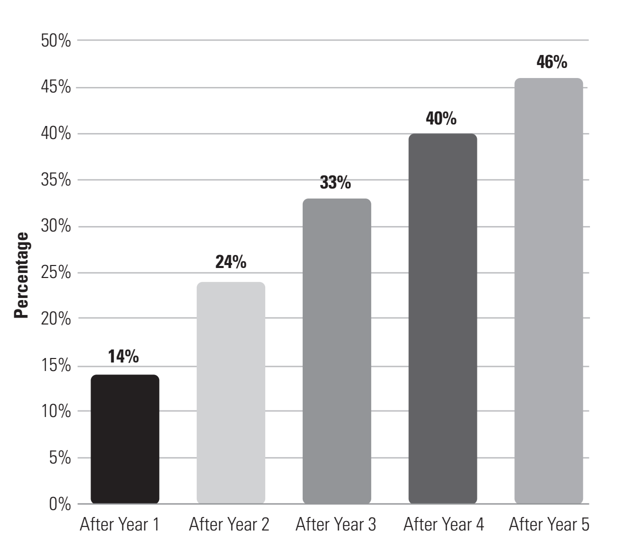
On one hand, teaching seems to be improving. The number of teachers produced annually has increased from 187,000 to 220,000, and these new teachers seem to be doing well on licensing exams. However, there are challenges in meeting the needs of English language learners, a growing school population; special needs students, particularly those with disabilities; the distribution of teaching talent between high- and low-poverty schools; and meeting teaching needs in shortage areas, including STEM fields (Sharon Robinson, president and chief executive officer, American Association of Colleges for Teacher Education, presentation to the Commission on Access, Admissions and Success, November 2007).

On the other hand, it is easy to make the case that a genuine and chronic crisis exists in teaching. It extends across the board and has particular ramifications for the teaching of science and mathematics and the development of the nation's STEM workforce.

Turnover. The general crisis is that on an ongoing basis, school administrators are forced to replace half the teaching workforce every five years. Year in and year out, about 10 percent of teachers leave the field, giving up on a profession in which the financial rewards are meager and working conditions are frequently unprofessional.

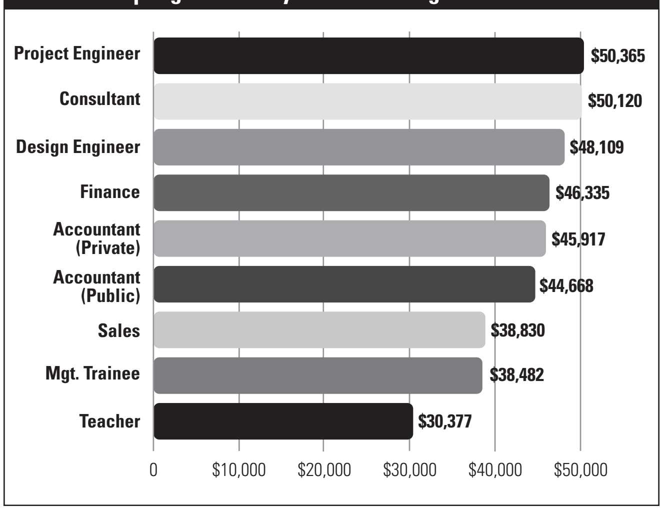
The following figure (from a national commission chaired by former Governor James Hunt of North Carolina) reveals that beginning teacher attrition approaches 50 percent in the first five years of the teacher's career. Combined with midcareer changes and retirements, overall attrition exceeds 50 percent for the profession.

Beginning Teacher Attrition: A Chronic Problem



Salaries. Salaries undoubtedly contribute to the problem of early teacher attrition and to the larger challenge of attracting first-rate students into the teaching profession in the first place. The figure below displays average salary offers for college graduates in the spring of 2006. If consumers respond to market signals, college graduates get a very clear signal from these data about what the market economy considers to be important.

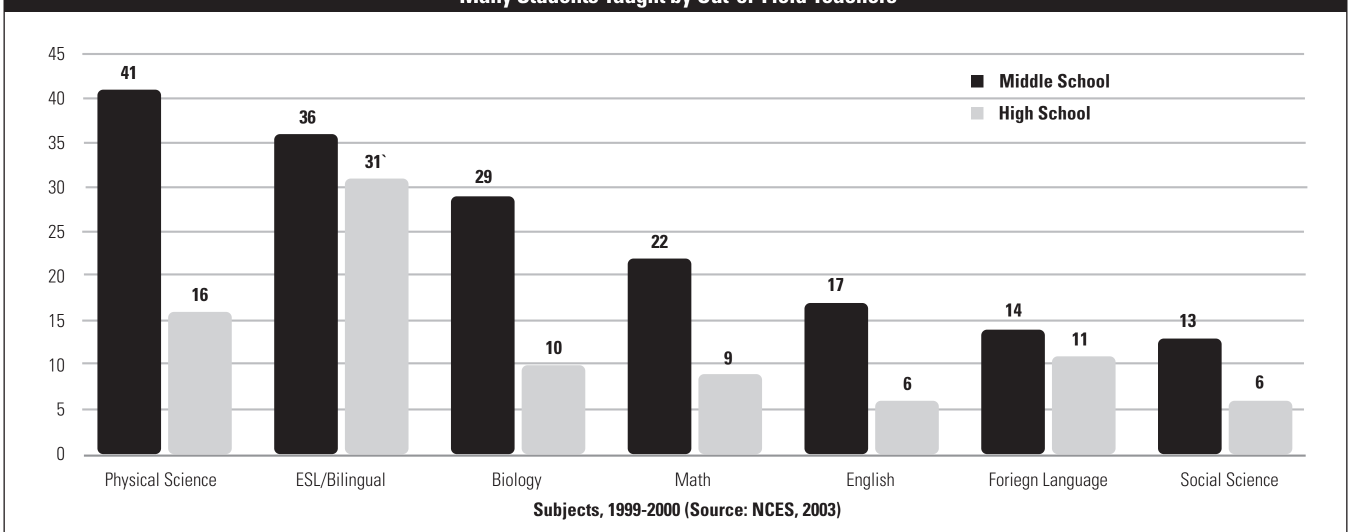
Spring 2006 Salary Offers to College Graduates



Working Conditions. What accounts for turnover rates of the kind outlined above? Some teachers undoubtedly discover the classroom is not for them. They change careers. Others leave to raise and spend time with families. But in recent surveys conducted by the National Center on Education Statistics and the California State University system, many former teachers report that they left the classroom as a result of working conditions. Large proportions in both surveys (in excess of 50 percent) point to bureaucracy, lack of support in the classroom and poor staff morale as explanations for their decision to leave. They complain that facilities are poor, classes are too large and the lack of planning time combined with high workloads makes effective teaching impossible.

A Crisis in Mathematics and Science Teaching. The challenge of keeping adequately trained teachers in front of classrooms is particularly acute in science and mathematics. Properly prepared middle and high school teachers should have a major or a minor in their field, but the difficulty of finding math and science teachers means that many of the people teaching math and science have neither. The problem can be displayed in several ways: the number of teachers "out-of-field," the number of classrooms being taught by "out of field" teachers or the number of students being taught by teachers without either a major or a minor in a given discipline. The figure below reveals that in the physical sciences, 41 percent of public school students in 1999-2000 were taught by out-of-field teachers, compared to 16 percent of high school students. For biology, the figures are 29 percent and 10 percent, respectively, with similar numbers (22 percent and 9 percent) in mathematics.

Many Students Taught by Out-of-Field Teachers



The Business-Higher Education Forum estimates that to meet STEM teaching needs, the United States needs to produce an additional 280,000 math and science teachers by 2015 (*An American Imperative*, 2007).

Indicator 10. **Another topic of pressing national concern has to do with the need to produce more graduates in science, technology, engineering and mathematics. What do the data say?**

What had appeared to be settled questions just 24 months ago — namely that the United States is not producing enough STEM graduates and is falling badly behind other nations, particularly China and India in technological capacity — has erupted into a major debate in which critics of conventional wisdom argue that there are no data to support what is widely believed to be true.

Organizations such as the Business Roundtable, the Business-Higher Education Forum and the National Science Foundation argue that a shortage of scientists and engineers, serious enough to threaten American competitiveness, either exists or lies ahead. Most people have been inclined to agree.

The debate started shortly after 2004, when the National Academies' National Academy of Sciences' advance publicity on a report, "Rising Above the Gathering Storm," reported data in the executive summary — but not reflected in the body of the report — to the effect that in 2004 the United States graduated roughly 70,000 undergraduate engineers, while China graduated 600,000 and India 350,000. These figures received widespread attention and were accepted at face value.

Duke University. However, researchers at Duke University's Pratt School of Engineering raised such doubts about the validity of these statistics in December 2005 that the National Academy of Sciences withdrew them from the published report. The Duke analysts argued that unlike the American numbers, the Chinese and Indian statistics included not only four-year degrees but also three-year degrees and diploma holders. The Chinese and Indian data also included information technology specialists and technicians. Apples-to-apples comparisons indicated that the United States produced 137,000 engineering baccalaureates compared to 112,000 for India and 352,000 for China (Gary Gereffi and Vivek Wadhwa, Framing the Engineering Outsourcing Debate, 2005). Clearly, both China and India are formidable emerging high-technology competitors, but the revised figures seem to present a more realistic appraisal of the challenge.

Moreover, the Pratt School analysts pointed out that since India and China have populations three to four times the size of the American population, the United States remains, on a per capita basis, the most technologically sophisticated nation in the world:

Nation	Technical Bachelor's Degrees per Million Citizens	Associate Degrees per Million Citizens
U.S.	289	468
China	271	226
India	104	95

Subsequently, other analysts called into question the issue of whether there is a shortage of American scientists and engineers trained at the baccalaureate level and beyond. These analysts include specialists at the Sloan Foundation, the RAND Corporation and the Urban Institute.

Sloan Foundation. In testimony before the Committee on Science and Technology of the U.S. House of Representatives in November 2007, Michael S. Teitelbaum, vice president of the Alfred P. Sloan Foundation, concluded that no one has produced objective data suggesting general shortages or pending shortages of scientists and engineers. Teitelbaum also took issue with the belief that the number of engineers and scientists graduating from American colleges is insufficient to meet employer needs.

RAND Corporation. Concerned about reports of science and technology shortfalls for its own workforce needs, NASA asked the RAND Corporation to examine the issue. In 2004, RAND responded with a report that received little attention, perhaps because it seemed to be narrowly couched in terms of federal hiring. But the RAND analysis considered the larger question of STEM production.

The final report found that despite concerns about potential shortages of STEM personnel, particularly in engineering and information technology, there is little evidence of shortages, currently or on the horizon. Economic indicators that one would expect to accompany shortages, notably low levels of unemployment or rising wages, have failed to materialize.

Likewise, "underemployment patterns" — for example, STEM workers involuntarily working out of their fields — suggest that underemployment of STEM workers is relatively high compared with that of non-STEM workers, indicating that STEM workers are having trouble finding work in the field. Engineering is the one exception — underemployment in this field appears to have been lower than that for non-STEM workers. These indicators suggest neither an inadequate supply of STEM workers for the nation's current needs nor shortages in the near future (William P. Butz et al., *Will the Scientific and Technical Workforce Meet the Requirements of the Federal Government?* 2004).

The Urban Institute. Another detailed report was issued in 2007 by the Urban Institute. Georgetown University's B. Lindsay Lowell and the Urban Institute's Hal Salzman concluded that while the educational pipeline around STEM production would undoubtedly benefit from improvements, it is not as dysfunctional as many believe. The pool of graduates with science and engineering degrees exceeds the number of job openings in these fields each year (B. Lindsay Lowell and Hal Salzman*, Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality, and Workforce Demand*, Washington: Urban Institute, October 2007).

Surprisingly, according to Lowell and Salzman, many students who start along the path toward S&E careers do not remain in the field. If there is a problem, they argue, it is not one of too few S&E qualified college graduates but rather the inability of S&E firms to attract qualified graduates. Anecdotally, undergraduates who start out in S&E fields find themselves attracted to careers in finance, where the remuneration is so much higher (William P. Butz et al., *Will the Scientific and Technical Workforce Meet the Requirements of the Federal Government?* 2004).

The Urban Institute report concludes that the pool of S&E-qualified secondary and postsecondary graduates is several times larger than the number of annual job openings in the United States.

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