

How Do Our Students Measure Up?

Executive Summary

Three recent comparisons show that performance of Florida and U.S. students is improving, but that other countries' students are improving even faster. Therefore, we are falling further behind. To make matters worse yet, another recent test indicates that too few students are presently prepared for college or the workforce! The tests are:

1. Trends in International Mathematics and Science Study (TIMSS). This assessment measures learning of mathematics and science concepts addressed in the school curriculum. U.S. students are well behind strong economic competitors such as Japan, Korea, Singapore, and several European Countries and in the middle of the pack generally.
2. Program for International Student Assessment (PISA). This assessment focuses on 15-year-old (9th and 10th grade) students reading, mathematics, and science literacy with an emphasis on application of what has been learned. In 2003, the performance of U.S. students in science, mathematics and general problem-solving was below the average of most countries in the Organization for Economic Cooperation and Development (OECD). The OECD represents a majority of the developed countries in the world.
3. National Assessment of Educational Progress (NAEP). The National Assessment of Educational Progress (NAEP) measures all major curriculum components including mathematics and science on a continuing basis. Florida participated in the latest mathematics assessments in 2003 (but not in the last science assessment in 2000). Florida fourth graders ended up in the middle of the pack while 8th graders performed below the national average. Only 23% of Florida eight graders rated at the proficient or advanced levels (two highest) while 38% of Massachusetts and 32% of students from New York and North Carolina rated in these categories. Conversely 38% of Florida students rated below basic (lowest of four categories) whereas only 24% of Massachusetts students rated in this category
4. American College Testing (ACT). The ACT is one of America's most widely accepted college entrance exams. It assesses high school students' general educational development and their ability to complete college-level work. A new report from ACT, titled "*Crisis at the Core: Preparing All Students for College and Work*" finds that only 22 percent of the 1.2 million high school graduates who took the [ACT Assessment](#) in 2004 achieved scores that would deem them ready for college in all three basic academic areas—English, math, and science.

The following sections, taken from their websites, provide more detail on each of these tests. Web addresses are included for access to the complete reports and extensive tabular information.

TIMSS Summary

(Taken from National Center for Education Statistics (NCES))

<http://nces.ed.gov/pubs2005/timss03/>

(NOTE: all tables and figures are available at web site)

The Trends in International Mathematics and Science Study (TIMSS) 2003 is the third comparison of mathematics and science achievement carried out since 1995 by the International Association for the Evaluation of Educational Achievement (IEA), an international organization of national research institutions and governmental research agencies. TIMSS can be used to track changes in achievement over time. Moreover, TIMSS is closely linked to the curricula of the participating countries, providing an indication of the degree to which students have learned concepts in mathematics and science they have encountered in school. In 2003, some 46 countries participated in TIMSS, at either the fourth- or eighth-grade level, or both.

This summary highlights initial findings on the performance of U.S. fourth- and eighth-grade students relative to their peers in other countries on the TIMSS assessment. The summary is based on the findings presented in two reports published by the IEA:

- *TIMSS 2003 International Mathematics Report: Findings from IEA's Trends in International Mathematics and Science Study at the Eighth and Fourth Grades* (Martin et al. 2004) and
- *TIMSS 2003 International Science Report: Findings from IEA's Trends in International Mathematics and Science Study at the Eighth and Fourth Grades* (Mullis et al. 2004).

These two IEA reports were simultaneously published with this summary report and are available online at <http://www.timss.org>.

Average student performance in the United States is compared to that of students in other countries that participated in each assessment. All countries were required to draw random, nationally representative samples of students and schools.

- At fourth grade, comparisons are made among students in the 25 countries that participated in TIMSS 2003, and in the 15 countries that participated in TIMSS 2003 and TIMSS 1995.
- At eighth grade, comparisons are made among students in the 45 countries that participated in TIMSS 2003,
- All estimates for the United States are based on the performance of students from both public and private schools, unless otherwise indicated.

In addition to the assessments, students, their teachers, and principals were asked to complete questionnaires related to their school and learning experiences. At fourth grade, the assessment took approximately 72 minutes to complete. At eighth grade, the assessment took approximately 90 minutes.

TIMSS Fourth Grade Mathematics Summary:

- In 2003, U.S. fourth-grade students scored 518, on average, in mathematics, exceeding the international average of 495 ([Table 2](#) and Table C1 in Appendix C). U.S. fourth-graders outperformed their peers in 13 of the other 24 participating countries, and performed lower than their peers in 11 countries.
- In comparison to students in the other 10 OECD-member countries (Organization for Economic Cooperation and Development) participating in the fourth-grade TIMSS assessment, U.S.

fourth-graders outperformed their peers in mathematics in five countries (Australia, Italy, New Zealand, Norway, and Scotland) and were outperformed by their peers in the other five countries (Belgium-Flemish, England, Hungary, Japan, and the Netherlands) ([Table 2](#)).

Eight Grade Mathematics Summary:

- In 2003, U.S. eighth-graders scored 504, on average, in mathematics. This average score exceeded the international average as well as the average scores of their peers in 25 of the 44 other participating countries ([Table 3](#) and Table C2 in Appendix C). U.S. eighth-graders were outperformed by students in nine countries: five Asian countries—Chinese Taipei, Hong Kong SAR, Japan, Korea, and Singapore—and four European countries—Belgium-Flemish, Estonia, Hungary, and the Netherlands.
- In comparison to their peers in the other 12 OECD-member countries participating in the eighth-grade TIMSS assessment, U.S. eighth-graders outperformed students in mathematics in two countries (Italy and Norway) and were outperformed by their peers in five countries (Belgium-Flemish, Hungary, Korea, Japan, and the Netherlands) ([Table 3](#)).

TIMSS Science Summary Fourth Grade:

- In 2003, fourth-graders in the United States scored 536, on average, on the TIMSS science assessment, which was higher than the international average of 489 ([Table 8](#) and Table C1 in Appendix C). Of the 24 other participating countries, fourth-graders in 16 countries demonstrated lower science scores, on average, than fourth-graders in the United States, while students in three countries—Chinese Taipei, Japan, and Singapore—outperformed their peers in the United States.
- In comparison to the other 10 OECD-member countries in science, U.S. fourth-grade students outperformed their peers in seven countries in 2003 (Australia, Belgium-Flemish, Italy, the Netherlands, New Zealand, Norway, and Scotland; [Table 8](#)). Japanese fourth-grade students were the only group of students to outperform U.S. fourth-grade students among the participating OECD-member countries

Science Eighth Grade:

- In science, U.S. eighth-graders exceeded the international average and outperformed their peers in 32 of the 44 other participating countries ([Table 9](#) and Table C2 in Appendix C). U.S. eighth-graders performed lower, on average, than their peers in seven countries and were not found to perform measurably different from students in five countries.
- An examination of the performance of students from the other 12 OECD-member countries shows that U.S. eighth-grade students outperformed their peers in science in five of the countries (Belgium-Flemish, Italy, Norway, Scotland, and the Slovak Republic) and were outperformed by their peers in three of the countries (Hungary, Japan, and Korea; [Table 9](#)).

PISA 2003 Summary

The following descriptions are taken from the PISA website:

<http://nces.ed.gov/surveys/pisa/index.asp>

(note all tables and figures can be accessed at the website)

The **Program for International Student Assessment (PISA)** is an assessment (initiated in 2000) that focuses on 15-year-olds' capabilities in reading literacy, mathematics literacy, and science literacy. In the United States, this age corresponds largely to grade 9 and 10 students. PISA also includes measures of general or cross-curricular competencies such as learning strategies. PISA emphasizes skills that students have acquired as they near the end of mandatory schooling. PISA is currently being administered every three years. PISA 2000 focused on reading literacy, PISA 2003 focused on mathematics literacy and in 2006, PISA will focus on science literacy. In addition, PISA 2003 reported on problem-solving skills and PISA 2006 will utilize technology in conjunction with the science assessment

US Performance in Mathematics Literacy and Problem Solving

In 2003, **U.S. performance in mathematics literacy and problem solving was lower than the average performance for most OECD** (Organization for Economic Cooperation and Development) countries ([table 2](#) and [table 3](#)). The United States also performed below the OECD average on each mathematics literacy subscale representing a specific content area (space and shape, change and relationships, quantity, and uncertainty). This is somewhat different from the PISA 2000 results, when reading literacy was the major subject area, which showed the United States performing at the OECD average (Lemke et al. 2001).

Along with scale scores, PISA 2003 also uses six proficiency levels (levels 1 through 6, with level 6 being the highest level of proficiency) to describe student performance in mathematics literacy ([exhibit 5](#)) and three proficiency levels (levels 1 through 3, with level 3 being the highest level of proficiency) to describe student performance in problem solving ([exhibit 9](#)). In mathematics literacy, the United States had greater percentages of students below level 1 and at levels 1 and 2 than the OECD average percentages ([figure 5](#)). The United States also had a lower percentage of students at levels 4, 5, and 6 than the OECD average percentages. Results for each of the four mathematics content areas followed a similar pattern. In problem solving, the United States also had greater percentages of students below level 1 and at level 1 than the OECD average percentages, and a lower percentage of students at levels 2 and 3 than the OECD average percentages ([figure 8](#)). In mathematics literacy and problem solving in 2003, even the highest U.S. achievers (those in the top 10 percent in the United States) were outperformed on average by their OECD counterparts ([figure 4](#) and [figure 7](#))

There were no measurable changes in the U.S. scores from 2000 to 2003 on either the space and shape subscale or the change and relationships subscale, the only content areas for which trend data from 2000 to 2003 are available. In both 2000 and 2003, about two-thirds of the other participating OECD countries outperformed the United States in these content areas.

US Performance in Reading Literacy and Science Literacy

The **U.S. average score in reading literacy was not measurably different** from the **OECD average** in 2000 or 2003 ([figure 9](#)), nor was there any measurable change in the U.S. reading literacy score from 2000 to 2003.

The **U.S. score was below the OECD average science literacy score** in 2003 ([figure 9](#)). There was no measurable change in the U.S. science literacy score from 2000 to 2003.

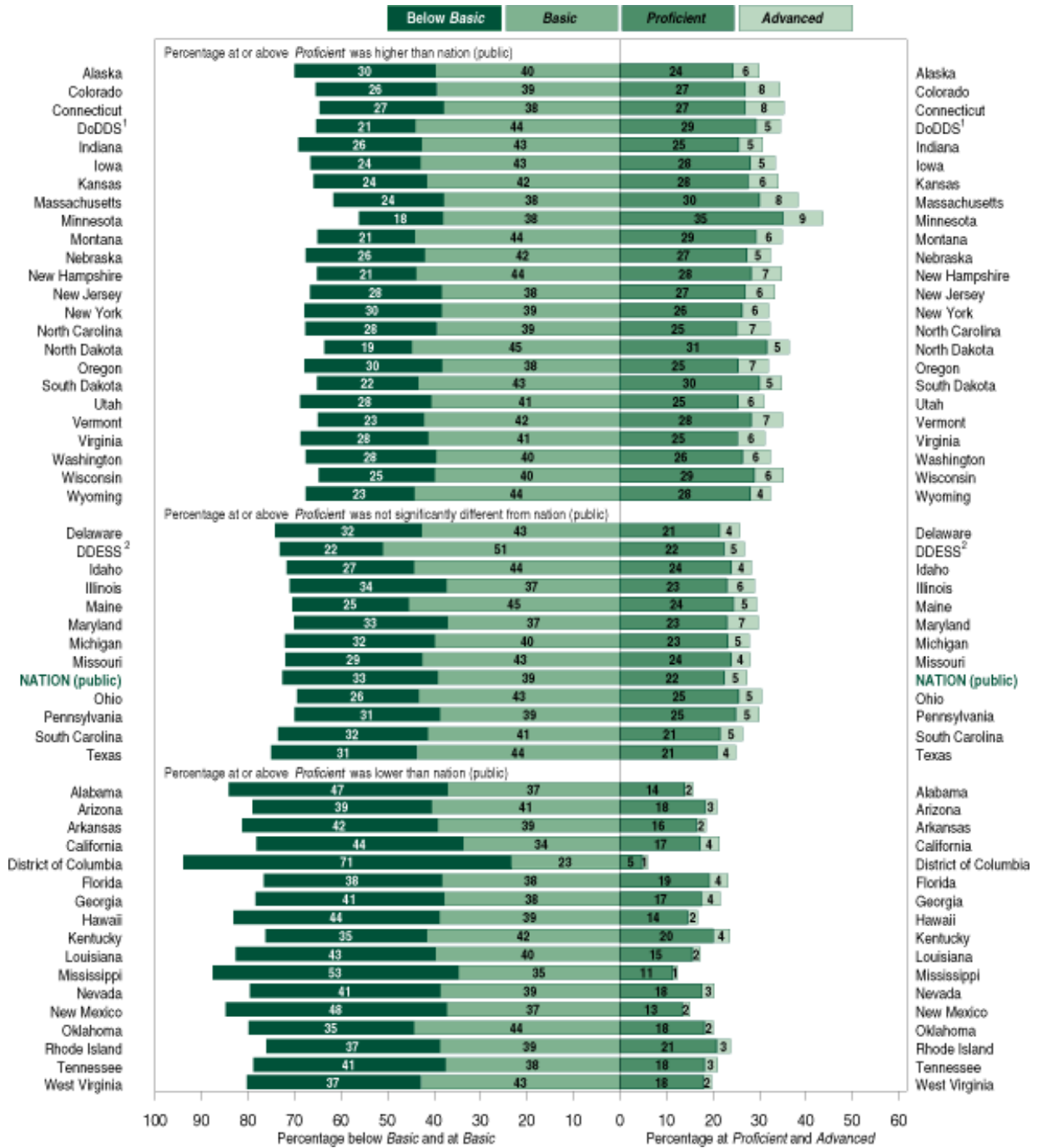
National Assessment Of Educational Progress (NAEP)

<http://nces.ed.gov/nationsreportcard/>

The National Assessment of Educational Progress (NAEP) measures all major curriculum components including mathematics and science on a continuing basis. It has provided a nationally representative and continuing assessment of student performance since 1969. Aggregated data for each state that participates allows comparisons among states and provides one gauge of state educational programs effectiveness. Information on the assessment and outcomes can be found at <http://nces.ed.gov/nationsreportcard/>

Florida participated in the latest mathematics assessments in 2003 but not in the last science assessment in 2000 (Note science will be monitored again in 2005). Florida fourth graders ended up in the middle of the pack while 8th graders performed below the national average (see table below). Only 23% of Florida eight graders rated at the proficient or advanced levels (two highest) while 38% of Massachusetts and 32% of students from New York and North Carolina rated in these categories. Conversely 38% of Florida students rated below basic (lowest of four categories) whereas only 24% of Massachusetts students rated in this category. Even a short examination of the eighth grade results (see Table below) indicates that Florida ranks behind those states where high technology is a prominent or an increasing part of the economies.

NAEP Percentage of students within each mathematics achievement level, grade 8 public schools: By State, 2003 - The bars below contain percentages of students in each of three NAEP mathematics achievement levels—Basic, Proficient, and Advanced—as well as the proportion below Basic. Each population of students is aligned at the point where the Proficient category begins, so that the percentage at or above Proficient may be examined. Jurisdictions are listed alphabetically within three groups: the percentage at or above Proficient was higher than, not found to be significantly different from, or lower than the nation.



¹ Department of Defense Dependents Schools (Overseas).

² Department of Defense Domestic Dependent Elementary and Secondary Schools.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2003 Mathematics Assessment.

American College Testing (ACT)

<http://www.act.org/news/releases/2004/10-14-04.html>

Readiness for College and the Workforce an ACT Report

The ACT is one of America's most widely accepted college entrance examinations. It assesses high school students' general educational development and their ability to complete college-level work. A recent report from this testing agency strongly questions the readiness for college and the workforce of our graduating seniors and of those who will soon follow. This troubling report (see press release below and full report at the website <http://www.act.org/news/releases/2004/10-14-04.html>) clearly indicates there is more work to be done in preparing students for their future.

"College Readiness Crisis Spurs Call for Change by ACT in Nation's Core High School Curriculum"

October 14, 2004 (ACT Inc.)

IOWA CITY, Iowa—Even with a diploma in hand, many high school graduates do not have all of the skills to succeed in college-level coursework or workforce training. This is the conclusion of a new report from ACT, titled *Crisis at the Core: Preparing All Students for College and Work*. Among the findings, only 22 percent of the 1.2 million high school graduates who took the [ACT Assessment](#) in 2004 achieved scores that would deem them ready for college in all three basic academic areas—English, math, and science.

Among the class of 2004, only 26 percent of ACT-tested high school graduates had scores indicating that they are ready to earn a "C" or higher in their first college Biology course, and only 40 percent had scores indicating that they are ready to earn a "C" or higher in their first college Algebra course. In addition, results from ACT's assessments for eighth and tenth graders—[EXPLORE](#) and [PLAN](#), respectively—have suggested that students who graduate from high school in 2006 and 2008 will be no better prepared for college than this year's graduates.

Since the 1983 U.S. Department of Education report, *A Nation At Risk*, was released, ACT has advocated a "core" curriculum that specifies the number of courses a student should take. This core includes four years of English and three years each of math, natural sciences and social studies. ACT's report argues that "core" is no longer enough to ensure success in college or the workplace.

"Far too many of the seniors in the class of 2004 aren't ready for college or for workforce training," said Richard L. Ferguson, ACT's chief executive officer. "This is a problem that can't be solved overnight. However, we can begin addressing key issues right now."

The report urges schools to strengthen the high school core curriculum to help improve students' readiness for college and the workforce. Students in K-8 who are not learning the foundational skills for rigorous high school coursework should be identified earlier and provided with supportive interventions, thus preparing them for higher level math and science courses such as trigonometry, pre-calculus, chemistry, and physics.

ACT's research shows that certain courses such as biology, chemistry, and physics, and advanced math courses beyond Algebra II have a strong impact on student performance and college readiness. ACT refers to these as Courses for Success.

"Our study clearly shows that not only is the number of courses important, but the quality and intensity of these classes will determine if a high school student is ready for college and work," said Ferguson.

The benefit of taking these courses can be seen in the ACT test scores for the national class of 2004. Students who took trigonometry in addition to the math core—Algebra I, Algebra II, and geometry—scored 2.6 points higher on the ACT Mathematics Test. Similar gains were seen on the ACT Science Test for students who took physics in addition to the science core—biology and chemistry.

Those who took trigonometry and another advanced math course scored even higher, as much as 4.4 points higher over those who took the math core. Score increases were seen for both genders and all racial/ethnic groups. The ACT Assessment is scored on a 1 to 36 point scale.

"The news is encouraging," said Ferguson. "Our research shows that students don't have to take honors or advanced placement courses to be ready for college. If we can ensure that both the core courses and the *Courses for Success* focus on rigorous skills in all high schools, then students will have an opportunity to be better prepared for college and the workplace."

The report suggests that these conclusions are also applicable to students who have no intention of going to college. It points to recent research which indicates that the skills required for workforce training beyond high school are the same as those expected of a first-year college student. In addition, it has been estimated that 85 percent of all jobs are now classified as "skilled," meaning that they require some education beyond high school.

"Increasingly, a high school graduate who is not prepared for college is also not prepared for many jobs available to those without a college degree," said Ferguson.

Some critics might argue that not all high school students are capable of learning advanced subjects such as trigonometry and physics. However, research has shown that students at all levels of achievement can benefit from taking rigorous courses. Of particular concern, however, are those students who lack the fundamental skills on which higher-level skills can be based.

"Too often, students who struggle with foundational skills are not diagnosed early enough to correct the problems," said Ferguson. "When they reach high school, they are too far behind to catch up. They need to be identified and assisted much earlier."

To increase the number of students ready for college and work, ACT is launching "Ready to Succeed," a national demonstration project that will focus on course quality and rigor. Selected school districts will work with a team of specialists to evaluate the rigor of their courses, to provide the resources and training necessary to improve them, and to measure improvements in student achievement.

The report suggests that educators alone cannot be responsible for making the changes. Policymakers, business and community leaders, parents, and students themselves must also be involved in the process.

"We'll need to all work together to correct this problem," said Ferguson. "Our nation simply can't afford to keep producing high school graduates who are ill-prepared to succeed in college and the workforce if we want to maintain our economic competitiveness throughout the world."

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