U.S. States in a Global Context

Results From the 2011 NAEP-TIMSS Linking Study

NAEP
NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

TIMSS
USA

U.S. Department of Education
NCES 2013–460

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

Contents

What Is NAEP?

The National Assessment of Educational Progress (NAEP) is an assessment program conducted by the National Center for Education Statistics (NCES) to inform the public of what elementary and secondary students in the United States know and can do in various subject areas, including mathematics and science. Since 1969, NAEP, also known as The Nation's Report Card™, has been administered periodically to students at grades 4, 8, and 12 in order to report results for the nation, participating states, and selected large urban school districts. The National Assessment Governing Board oversees and sets policy for the NAEP program. Additional information about NAEP is available at http://nces.ed.gov/nationsreportcard/.

What Is TIMSS?

The Trends in International Mathematics and Science Study (TIMSS) is an international comparative study of student achievement developed and implemented by the International Association for the Evaluation of Educational Achievement (IEA). Since 1995, TIMSS has assessed the mathematics and science knowledge and skills of fourth- and eighth grade students. In addition to the United States, more than 50 countries and many subnational entities participate in TIMSS. More information on TIMSS is available at http://nces.ed.gov/timss/.

What Is the NAEP-TIMSS Linking Study?

NCES initiated this special study in an effort to link the NAEP scale to the TIMSS scale so that states could compare the performance of their students with that of students in other countries. The study was conducted in 2011 with eighth grade students in all 52 states/jurisdictions that participated in the NAEP mathematics and science assessments. This highlights report presents results of the linking study.

How do U.S. students compare internationally?

Educators and policymakers throughout the United States continue to debate the international competitiveness of their students. The ability of the United States to thrive in the growing global economy is influenced by how well our students compete internationally. Results from 2011 TIMSS[1] (Foy, Martin, and Mullis 2012) indicate how the performance of eighth-grade students in the United States as a whole compares with that of students in the other countries and subnational education systems that participated in the TIMSS assessment; it does not, however, provide results for individual U.S. states. NCES conducted the NAEP-TIMSS linking study to provide each state with a way to examine how their students compare academically with their peers around the world in mathematics and science.

NCES coordinated efforts across the NAEP and TIMSS assessment programs to conduct the 2011 NAEP-TIMSS linking study. The National Assessment Governing Board and NCES modified the NAEP assessment schedule so that eighth-graders in all 50 states, the District of Columbia, and the Department of Defense schools (hereafter referred to as "states" or U.S. states) could be assessed in mathematics and science in 2011.

The NAEP-TIMSS linking study used states' NAEP scores to predict performance on TIMSS. Nine states participated in 2011 TIMSS at the state level. In the linking study, their actual TIMSS scores were used to validate their predicted results.

The 38 countries and 9 subnational education systems from various countries that assessed eighth-graders in 2011 TIMSS are all referred to as "education systems" in this report. In tables and figures, seven of the subnational education systems are further identified by their nation's three-letter international abbreviation (e.g., Alberta-CAN and Dubai-UAE). Results in mathematics and science are reported as average scores on the TIMSS scale (0–1,000, with an average of 500).

Linking Study Results

Mathematics

- Average scores for public school students in 36 states were higher than the TIMSS average of 500.
- Scores ranged from 466 for Alabama to 561 for Massachusetts.
- Massachusetts scored higher than 42 of the 47 participating education systems.
- Alabama scored higher than 19 education systems.

Science

- Average scores for public school students in 47 states were higher than the TIMSS average of 500.
- Scores ranged from 453 for the District of Columbia to 567 for Massachusetts.
- Massachusetts and Vermont scored higher than 43 participating education systems.
- The District of Columbia scored higher than 14 education systems.

It should be noted that numerous differences between the NAEP and TIMSS administrations, assessment contents, and program policies could contribute to the sources of error around predicted TIMSS scores. Therefore, predicted TIMSS scores should not be interpreted as actual TIMSS scores.

[1] Foy, P., Martin, M.O., and Mullis, I.V.S. (2012). *TIMSS 2011 International Results in Mathematics* and *TIMSS 2011 International Results in Science*. Chestnut Hill, MA: International Association for the Evaluation of Educational Achievement (IEA), TIMSS and PIRLS International Study Center, Lynch School of Education, Boston College.

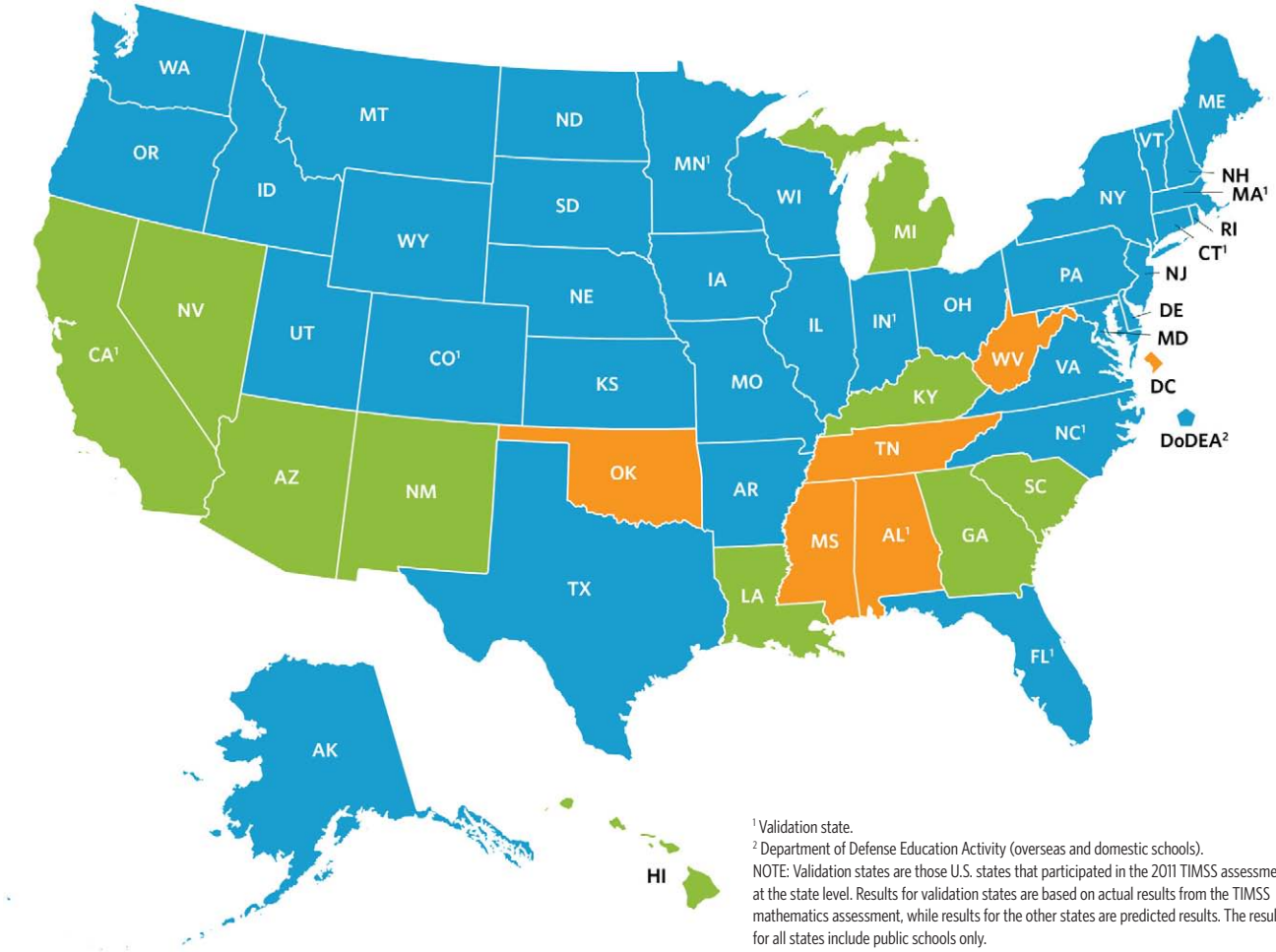
MATHEMATICS

Compared to the TIMSS average of 500, average scores for

36 states were higher

10 states were not significantly different

6 states were lower



[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for validation states are based on actual results from the TIMSS mathematics assessment, while results for the other states are predicted results. The results for all states include public schools only.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Find 2011 state NAEP mathematics results at **http://nces.ed.gov/nationsreportcard/mathematics/**.

Compare your state to participating education systems at **http://nces.ed.gov/nationsreportcard/studies/naep_timss/**.

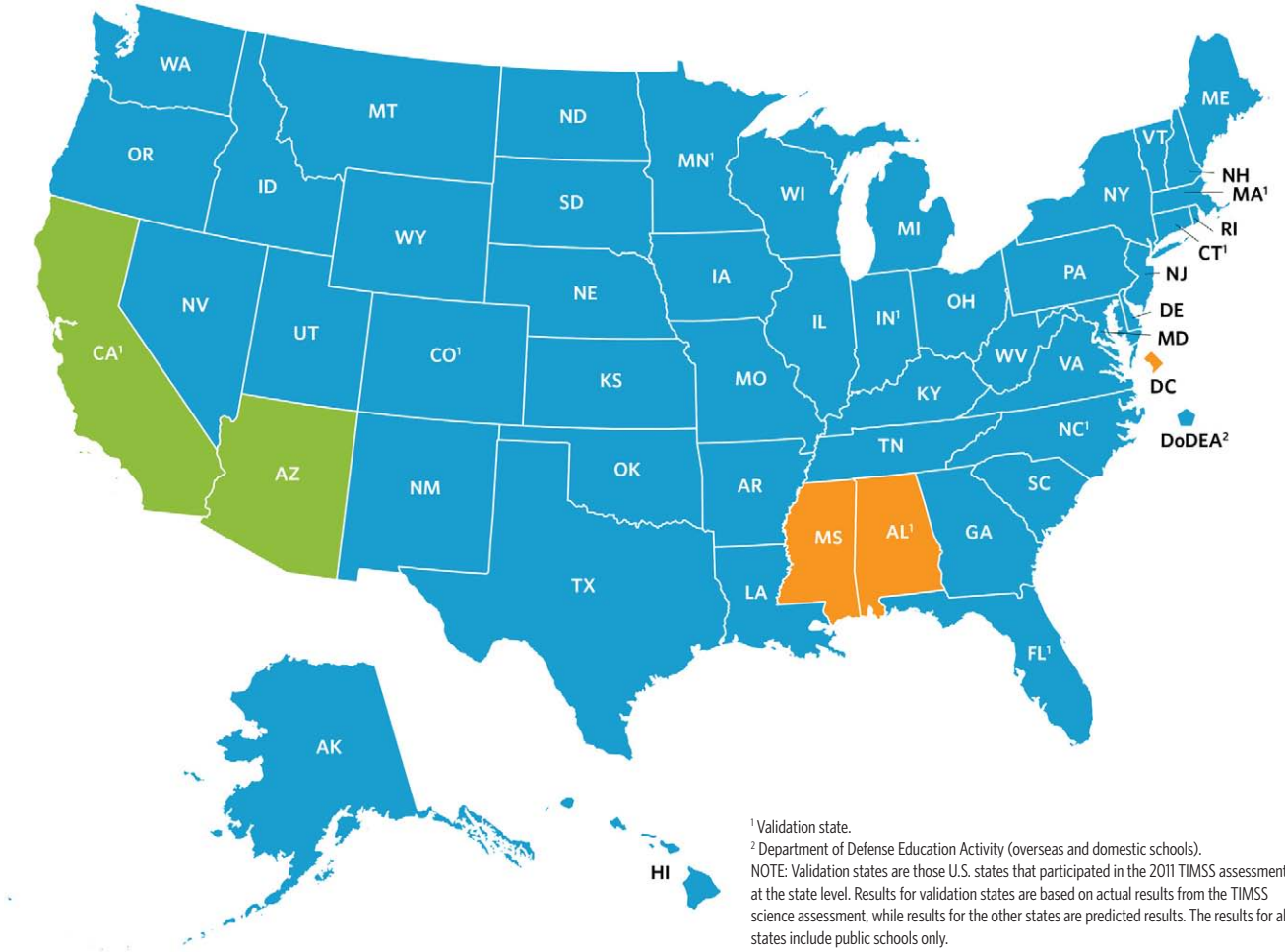
SCIENCE

Compared to the TIMSS average of 500, average scores for

47 states were higher

2 states were not significantly different

3 states were lower

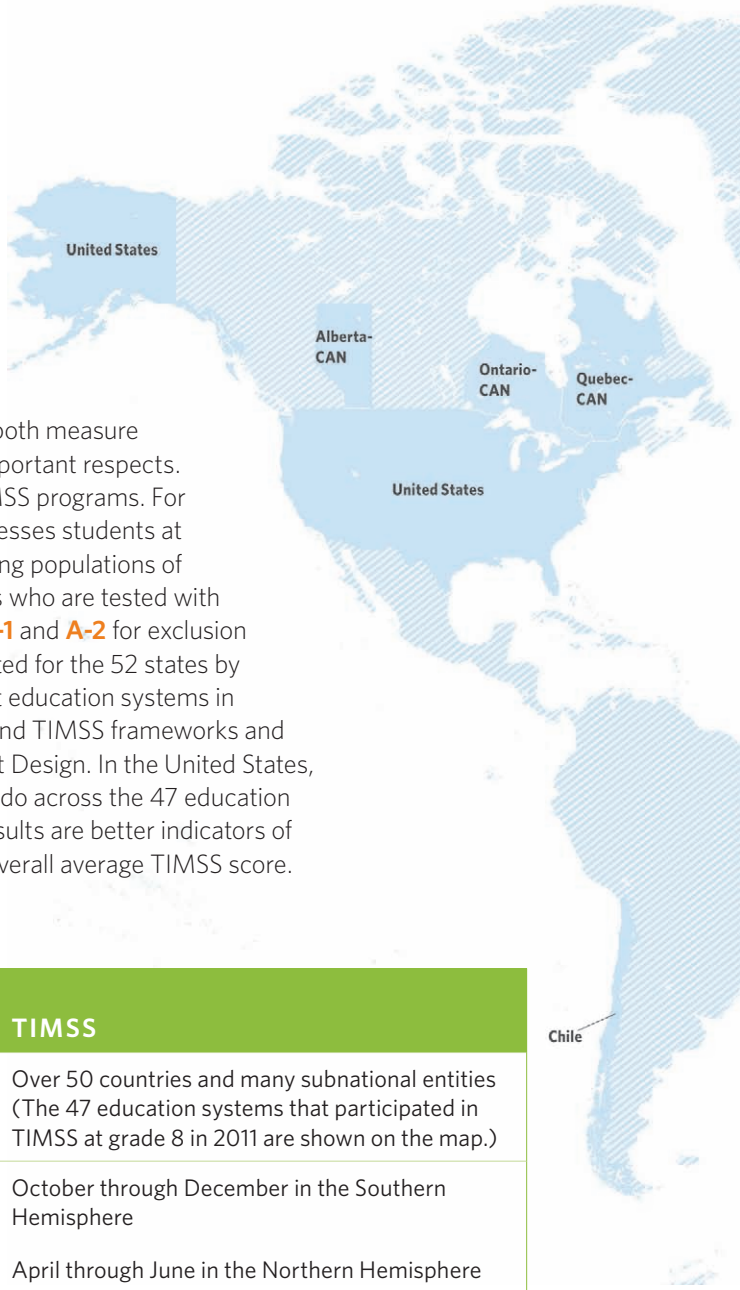


[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for validation states are based on actual results from the TIMSS science assessment, while results for the other states are predicted results. The results for all states include public schools only.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Find 2011 state NAEP science results at **http://nces.ed.gov/nationsreportcard/science/**.

Compare your state to participating education systems at **http://nces.ed.gov/nationsreportcard/studies/naep_timss/**.

NAEP AND TIMSS: A CLOSER LOOK



The NAEP and TIMSS assessments in mathematics and science both measure student achievement. The programs, however, differ in several important respects. The chart below contrasts selected features of the NAEP and TIMSS programs. For instance, NAEP assesses students in late winter, while TIMSS assesses students at different times of the year in different parts of the world. The testing populations of the two programs also vary. For instance, NAEP includes students who are tested with accommodations, while TIMSS does not. (See appendix **tables A-1** and **A-2** for exclusion rates for states and education systems.) In addition, results reported for the 52 states by NAEP are based on students in public schools only, whereas most education systems in TIMSS assess students in public and private schools. The NAEP and TIMSS frameworks and assessments are discussed later in this section under Assessment Design. In the United States, educational policies and resources vary across the states, as they do across the 47 education systems that participated in TIMSS 2011. Thus, individual state results are better indicators of the condition of education in the United States than the nation's overall average TIMSS score.

Comparison of the NAEP and TIMSS programs

Program features	NAEP	TIMSS
Where administered	50 U.S. states, the District of Columbia, and Department of Defense schools	Over 50 countries and many subnational entities (The 47 education systems that participated in TIMSS at grade 8 in 2011 are shown on the map.)
Testing window	January through March	October through December in the Southern Hemisphere April through June in the Northern Hemisphere
Results reported as	Average scores on separate scales for each subject • 0–500 for mathematics • 0–300 for science Percentages of students reaching the three achievement levels • Basic • Proficient • Advanced	Average scores on separate scales for each subject • 0–1,000 for mathematics • 0–1,000 for science Percentages of students reaching the four international benchmarks • Low • Intermediate • High • Advanced
Accommodations for students with disabilities and English language learners	Accommodations similar to most of those available for state assessments are provided, such as extra testing time or individual rather than group administration.	No accommodations are provided by TIMSS. However, school accommodations are permitted, such as magnifying glasses, dictionaries for translation of terms, and sitting near natural light.

Reporting Results

The NAEP 2011 mathematics results for eighth-graders in each state are based on representative samples of about 3,200 students from 50 to 230 schools. The NAEP 2011 science results for each state are based on representative samples of about 2,300 students from 50 to 220 schools. Results for the 52 NAEP state samples used in the linking study reflect the performance of students in public schools only.

The 2011 TIMSS results for each of the participating education systems are based on a representative sample of no fewer than 4,000 eighth-grade students from at least 150 public and private schools. Because Botswana, Honduras, and South Africa assessed ninth-graders, their results are not included in this report. In the United States, over 10,000 eighth-graders from about 500 public and private schools participated in the 2011 TIMSS.

Predicting TIMSS scores

The linking study design consisted of the following samples, in addition to the national samples of NAEP and TIMSS described previously. Separate samples of U.S. public school students were administered braided booklets containing NAEP and TIMSS test questions, one for mathematics and one for science, during the NAEP testing window. Similarly, a sample of U.S. students was administered braided booklets during the TIMSS testing window. Three linking methods—statistical moderation, calibration, and statistical projection—were applied in linking the NAEP and TIMSS scales. All three linking methods produced similar results.

The statistical moderation linking method was selected to predict the average TIMSS scores reported for the 43 U.S. states that participated only in NAEP. The

Find 2011 TIMSS mathematics and science reports at **http://timss.bc.edu/isc/publications.html**.

accuracy of the predicted scores was evaluated by comparing the actual TIMSS scores with predicted TIMSS scores for the nine validation states—Alabama, California, Colorado, Connecticut, Florida, Indiana, Massachusetts, Minnesota, and North Carolina. Find more information about the linking study design and methods used in the study beginning on page 24.

As with NAEP, the TIMSS mathematics and science scores cannot be compared to each other because the scales are developed independently.

The performance of students in the states is compared to the TIMSS average for each subject. Findings are reported based on a statistical significance level set at .05, with no statistical adjustments to account for multiple comparisons. Only those differences found to be statistically significant are discussed as higher or lower.

More information about the 2011 TIMSS assessment can be found in the *Highlights from TIMSS 2011* report (NCES 2013-009).

TIMSS benchmarks

In addition to reporting average scores, TIMSS reports on the performance of students at four international benchmarks for each subject and grade—Advanced (625), High (550), Intermediate (475), and Low (400). The cutpoint at the lower end of the range for each of the benchmarks is noted in parentheses. These benchmarks provide a way to interpret the average scores and understand how students' proficiency in mathematics and science varies along the TIMSS scale. They are based on the kinds of skills and knowledge that students reaching each score cutpoint would need to answer the mathematics and science questions successfully.

For example, at the Advanced level in mathematics at grade 8, students can reason with information, draw conclusions, make generalizations, and solve linear equations. At the High level, students can apply their understanding and knowledge in a variety of relatively complex situations. At the Intermediate level in mathematics, students can apply basic mathematical knowledge in a variety of situations, and at the Low level, students have some knowledge of whole numbers and decimals, operations, and basic graphs.

At the Advanced level in science at grade 8, students apply knowledge and understanding of scientific processes and relationships and show some knowledge of the process of scientific inquiry. At the High level, students apply their knowledge and understanding of the sciences to explain phenomena in everyday and abstract contexts. At the Intermediate level in science, students have basic knowledge and understanding of practical situations in the sciences. At the Low level , students show some elementary knowledge of life, physical, and earth sciences.

For more information on the TIMSS international benchmarks, see page 16 for mathematics and page 22 for science. Extensive descriptions of each benchmark are available in the TIMSS 2011 international reports in mathematics and science. Results are reported as the percentages of students reaching each of the benchmarks.

Context for Performance

The variation in student performance across the United States and around the world can be attributed to a variety of factors, including educational policies and practices, available resources, and the demographic characteristics of the student body. To provide context for the results, **tables 1** and **2** (see pages 9 and 10) present selected demographic, economic, and educational variables for the U.S. states and the 47 participating education systems.

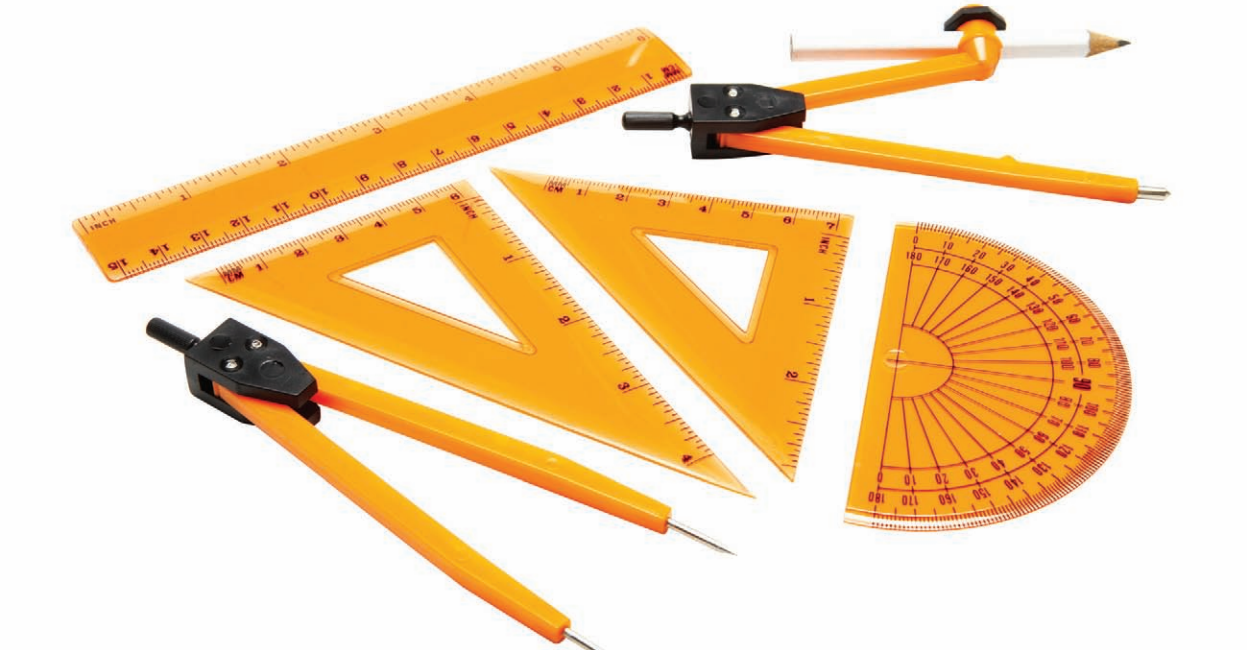
Assessment Design

The NAEP and TIMSS frameworks for mathematics and science describe the types of questions that should be included in the assessments and how they should be scored. The following charts on mathematics and science compare some features of the NAEP and TIMSS assessments that are more fully described in the frameworks. As shown in the charts, the content areas and their coverage in the assessments are somewhat different between NAEP and TIMSS. In addition, there are differences between the NAEP and TIMSS assessments in testing time and the testing aids allowed. The testing time is different because NAEP assesses the subjects separately, and NAEP allows more accommodations to have broader coverage of the population.

A comprehensive comparison of the NAEP and TIMSS assessment frameworks and a comparison of TIMSS assessment items against NAEP frameworks show that NAEP and TIMSS differ somewhat in what is assessed. Results of these comparisons are available at http://nces.ed.gov/nationsreportcard/studies/naep_timss/.

Mathematics

Assessment features	NAEP	TIMSS
Content areas (with percentage of assessment time in parentheses)	Number properties and operations (18%) Measurement (16%) Geometry (17%) Data analysis, statistics, and probability (16%) Algebra (33%)	Number (30%) Geometry (20%) Data and chance (20%) Algebra (30%)
Question types	Multiple-choice and constructed-response	Multiple-choice and constructed-response
Student testing time	Two 25-minute sections, each containing from 14 to 17 mathematics questions	Two 45-minute sections, each containing two blocks of approximately 12 to 18 questions. One section contains two mathematics blocks, and the other section contains two science blocks.
Testing aids allowed	Regular or scientific calculator permitted for some questions Ruler/protractor and geometric shapes or other manipulatives provided for some questions	Regular calculator permitted throughout the assessment for mathematics questions only



The complete 2011 NAEP mathematics framework is available at **http://www.nagb.org/publications/frameworks/math-2011-framework.pdf**, *and the complete 2011 TIMSS framework with sections on both mathematics and science is available at* **http://timss.bc.edu/timss2011/downloads/TIMSS2011_Frameworks.pdf**.

Science

Assessment features	NAEP	TIMSS
Content areas (with percentage of assessment time in parentheses)	Physical science (30%) Life science (30%) Earth and space sciences (40%)	Physics (25%) Biology (35%) Chemistry (20%) Earth science (20%)
Question types	Multiple-choice and constructed-response questions	Multiple-choice and constructed-response questions
Student testing time	Two 25-minute sections, each containing from 14 to 18 science questions	Two 45-minute sections, each containing two blocks of approximately 12 to 18 questions. One section contains two mathematics blocks, and the other section contains two science blocks.
Testing aids allowed	None permitted	None permitted for science questions

The complete 2011 NAEP science framework is available at **http://www.nagb.org/publications/frameworks/science-2011.pdf**, *and the complete 2011 TIMSS framework with sections on both science and mathematics is available at* **http://timss.bc.edu/timss2011/downloads/TIMSS2011_Frameworks.pdf**.

Table 1. Selected characteristics of states in NAEP-TIMSS linking study: 2009, 2010, and 2011

State	Total population	Public elementary school enrollment	Real GDP per capita (in U.S. dollars)	Public spending on education as a percentage of GDP	Public elementary school student-teacher ratio
Alabama[1]	4,802,740	534,000	$31,301	4	21
Alaska	722,718	92,000	61,853	5	17
Arizona	6,482,505	752,000	35,032	4	21
Arkansas	2,937,979	346,000	31,142	5	20
California[1]	37,691,912	4,294,000	46,041	4	25
Colorado[1]	5,116,796	601,000	45,792	4	22
Connecticut[1]	3,580,709	387,000	56,242	4	13
Delaware	907,135	90,000	63,159	3	20
District of Columbia	617,996	54,000	148,291	1	15
DoDEA[2]	—	—	—	—	—
Florida[1]	19,057,542	1,858,000	34,689	4	25
Georgia	9,815,210	1,202,000	37,270	4	17
Hawaii	1,374,810	128,000	42,171	3	21
Idaho	1,584,985	194,000	32,469	4	25
Illinois	12,869,257	1,455,000	45,231	4	14
Indiana[1]	6,516,922	729,000	36,970	4	22
Iowa	3,062,309	348,000	41,993	4	14
Kansas	2,871,238	343,000	39,484	5	20
Kentucky	4,369,356	480,000	32,331	4	21
Louisiana	4,574,836	512,000	45,002	3	14
Maine	1,328,188	129,000	33,746	5	11
Maryland	5,828,289	588,000	45,360	4	16
Massachusetts[1]	6,587,536	666,000	52,915	4	14
Michigan	9,876,187	1,076,000	34,166	5	30
Minnesota[1]	5,344,861	570,000	45,822	4	21
Mississippi	2,978,512	351,000	28,293	5	23
Missouri	6,010,688	643,000	35,952	4	19
Montana	998,199	98,000	32,041	4	14
Nebraska	1,842,641	210,000	43,356	4	14
Nevada	2,723,322	307,000	41,311	3	28
New Hampshire	1,318,194	132,000	42,916	4	12
New Jersey	8,821,155	981,000	48,380	5	15
New Mexico	2,082,224	239,000	33,857	5	25
New York	19,465,197	1,869,000	52,214	5	19
North Carolina[1]	9,656,401	1,058,000	39,879	3	21
North Dakota	683,932	66,000	50,096	3	12
Ohio	11,544,951	1,223,000	36,283	5	23
Oklahoma	3,791,508	483,000	35,381	4	21
Oregon	3,871,859	393,000	48,098	3	19
Pennsylvania	12,742,886	1,210,000	39,272	5	19
Rhode Island	1,051,302	98,000	41,532	4	18
South Carolina	4,679,230	516,000	30,620	5	15
South Dakota	824,082	88,000	41,795	3	14
Tennessee	6,403,353	702,000	36,543	3	15
Texas	25,674,681	3,587,000	44,788	4	21
Utah	2,817,222	425,000	38,452	4	32
Vermont	626,431	68,000	36,665	6	18
Virginia	8,096,604	871,000	46,408	4	27
Washington	6,830,038	714,000	45,520	3	25
West Virginia	1,855,364	201,000	30,056	6	21
Wisconsin	5,711,767	598,000	38,822	4	21
Wyoming	568,158	63,000	55,516	5	16

— Not available.

[1] Validation state.

[2] Department of Defense Education Activity (overseas and domestic schools).

NOTE: GDP = Gross domestic product. Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. The number of students enrolled is rounded to the nearest thousand.

SOURCE: U.S. Bureau of the Census; U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary," 2010–11; U.S. Bureau of Economic Analysis; Public Elementary-Secondary Education Finance: 2009–10; and 2010 Annual Survey of Local Government Finances - School Systems.

Table 2. Selected characteristics of education systems in TIMSS assessment at grade 8: 2010 and 2011

Education system	Population size (in millions)	Primary school enrollment	Gross national income per capita (in U.S. dollars)	Public spending on education as a percentage of GDP	Primary school pupil-teacher ratio
Abu Dhabi-UAE	2	—	—	—	11
Alberta-CAN	4	—	$70,826	4	—
Armenia	3	117,140	3,100	3	19
Australia	22	2,015,017	43,770	5	—
Bahrain	1	90,993	25,420	—	—
Chile	17	1,546,543	9,470	4	25
Chinese Taipei-CHN	23	—	16,471	4	16
Dubai-UAE	—	—	—	—	—
England-GBR	52	—	41,370	5	23
Finland	5	347,060	45,940	6	14
Georgia	4	289,137	2,530	3	9
Ghana	24	—	1,190	6	33
Hong Kong SAR[1]	7	348,549	31,570	5	16
Hungary	10	387,969	12,980	5	10
Indonesia	230	30,341,821	2,050	3	17
Iran, Islamic Republic of	73	5,629,585	4,530	5	20
Israel	7	807,424	25,790	6	13
Italy	60	2,822,146	35,110	4	10
Japan	128	7,098,862	38,080	4	18
Jordan	6	819,601	3,980	4	17
Kazakhstan	16	957,919	6,920	3	16
Korea, Republic of	49	3,306,192	19,830	4	24
Lebanon	4	461,719	8,060	2	14
Lithuania	3	122,458	11,410	5	13
Macedonia, Republic of	2	110,759	4,400	—	17
Malaysia	27	2,947,534	7,350	4	15
Morocco	32	3,945,201	2,770	6	27
New Zealand	4	348,492	28,810	6	15
Norway	5	424,052	84,640	7	11
Oman	3	—	17,890	4	12
Ontario-CAN	13	—	46,304	6	—
Palestinian National Authority	4	402,866	1,749	—	—
Qatar	1	88,723	71,008	—	11
Quebec-CAN	8	—	40,395	7	—
Romania	21	842,238	8,330	4	16
Russian Federation	142	—	9,340	4	17
Saudi Arabia	25	3,321,066	17,210	6	11
Singapore	5	—	37,220	3	19
Slovenia	2	106,883	23,520	6	17
Sweden	9	576,110	48,840	7	10
Syrian Arab Republic	21	2,429,450	2,410	5	18
Thailand	68	—	3,760	4	16
Tunisia	10	1,030,109	3,720	7	17
Turkey	75	6,635,156	8,720	4	22
Ukraine	46	1,540,282	2,800	5	16
United Arab Emirates	5	326,588	54,738	1	16
United States	307	24,393,002	46,360	6	14

— Not available.

[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.

NOTE: GDP = Gross domestic product.

SOURCE: TIMSS 2011 Encyclopedia: Education Policy and Curriculum in Mathematics and Science (Volume 1); and United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics, 2010.

MATHEMATICS

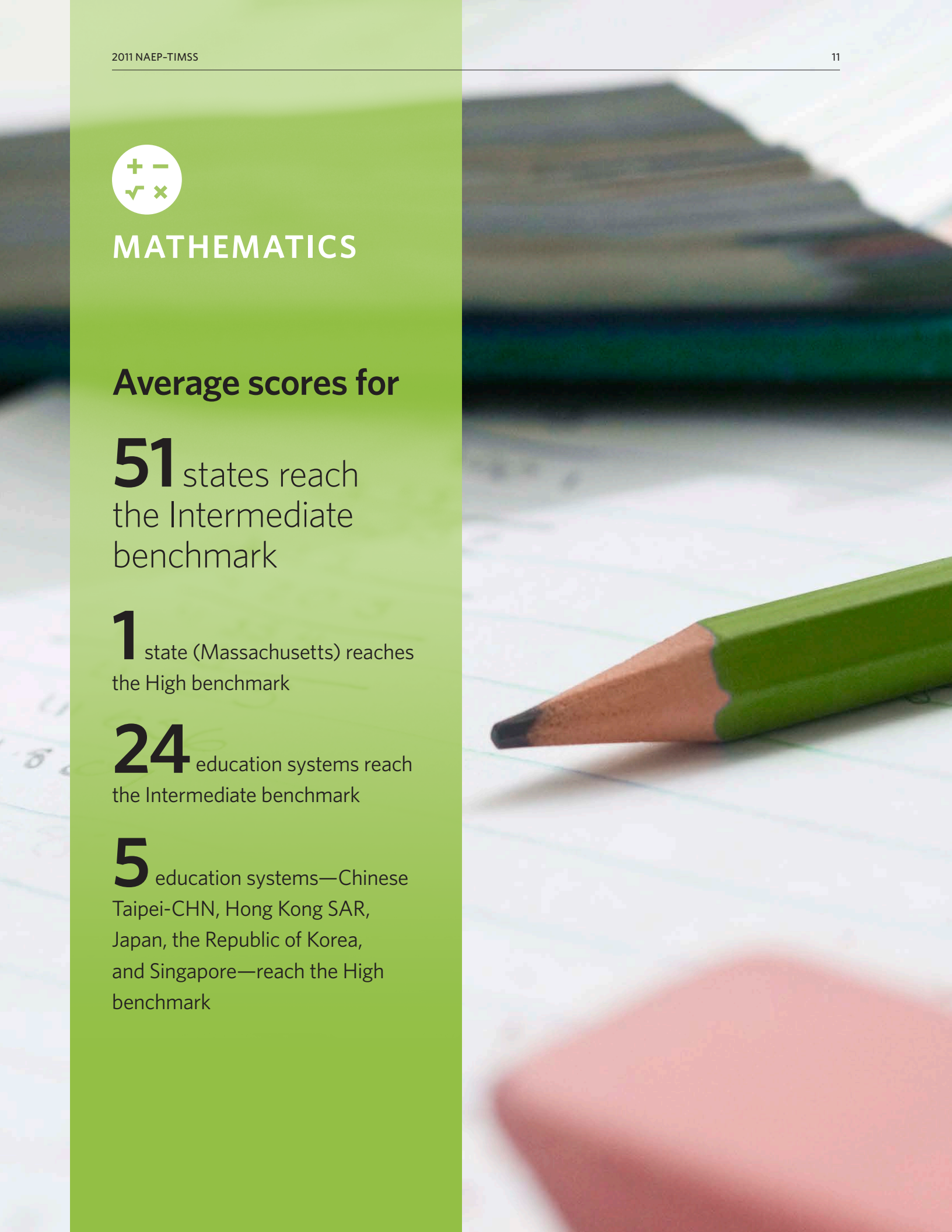
Average scores for

51 states reach the Intermediate benchmark

1 state (Massachusetts) reaches the High benchmark

24 education systems reach the Intermediate benchmark

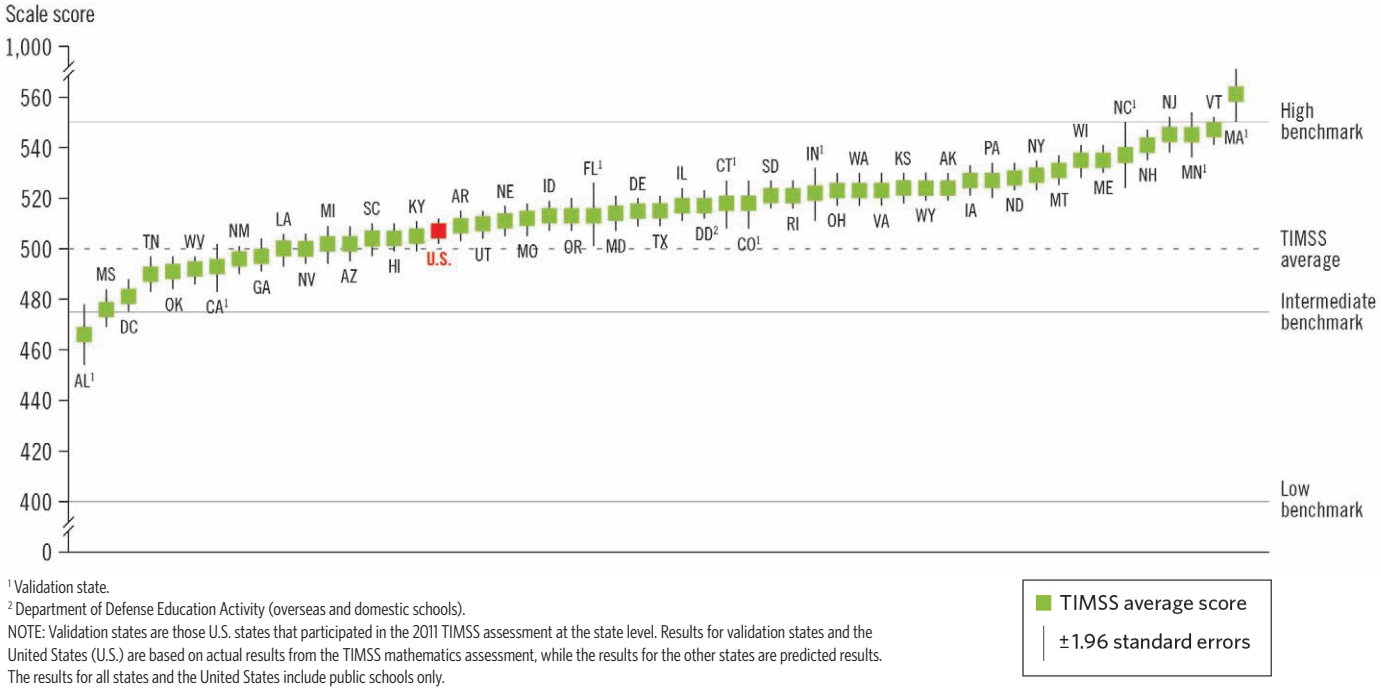
5 education systems—Chinese Taipei-CHN, Hong Kong SAR, Japan, the Republic of Korea, and Singapore—reach the High benchmark



How do U.S. states perform in relation to TIMSS international benchmarks in mathematics?

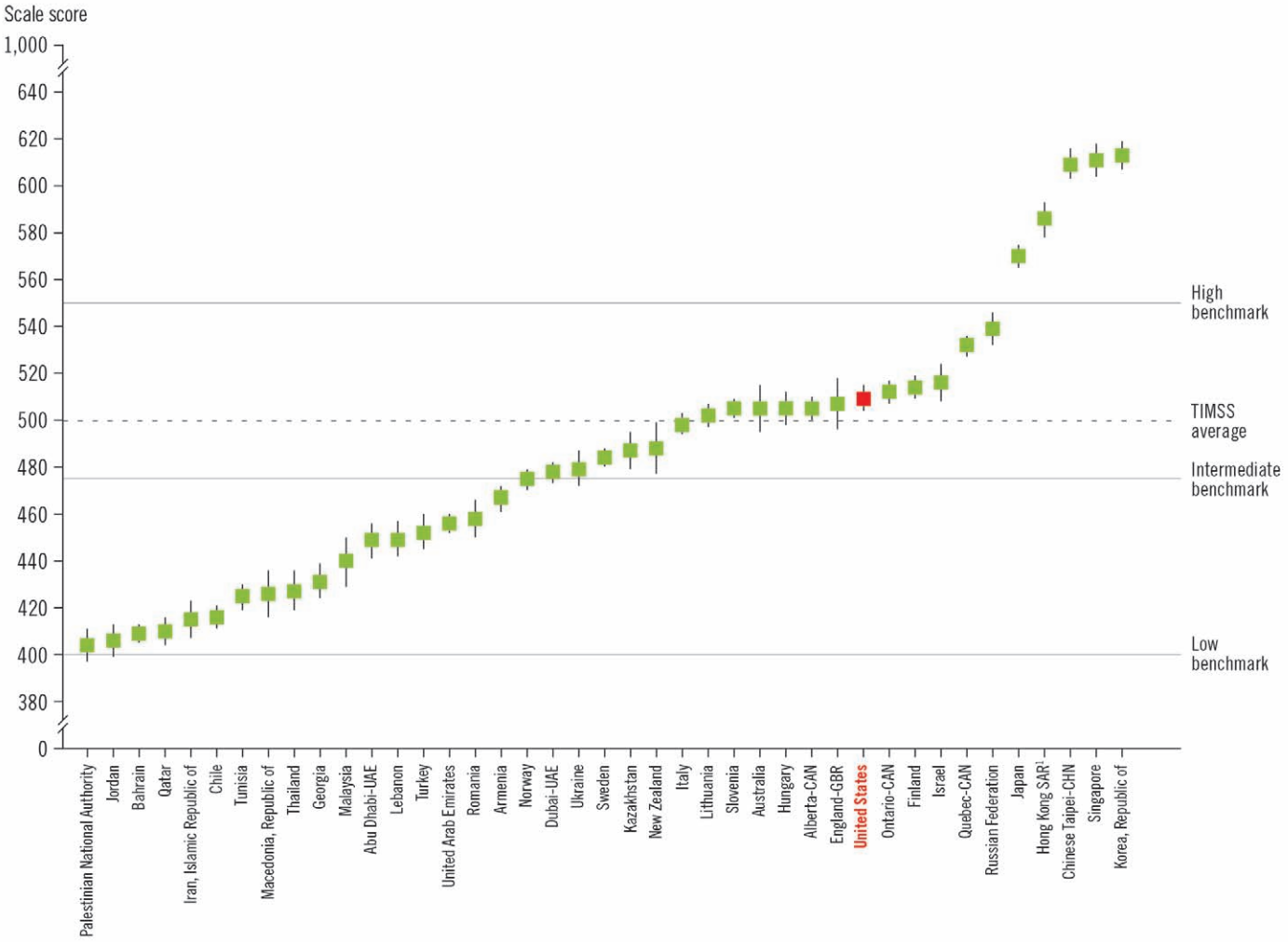
The average scores of students in 51 states were at or above the TIMSS Intermediate benchmark cutpoint of 475 (**figure 1**). TIMSS scores for 41 education systems ranged from below the Intermediate benchmark to above the High benchmark cutpoint of 550 (**figure 2**). Although not shown in the figure, six education systems scored below the Low benchmark cutpoint of 400. Mathematics performance varied more across the participating education systems than across the states. This variation in the performance of students across the U.S. states and around the world could be attributed to a range of factors such as educational policies and practices, available resources, and the demographic characteristics of the student body.

Figure 1. Average scores and confidence intervals in TIMSS eighth-grade mathematics, by state: 2011



[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for validation states and the United States (U.S.) are based on actual results from the TIMSS mathematics assessment, while the results for the other states are predicted results. The results for all states and the United States include public schools only.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Figure 2. Average scores and confidence intervals in TIMSS eighth-grade mathematics, by education system: 2011



[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.
NOTE: Results for all education systems include public and private schools. Results are not shown for education systems that scored below 400 (Ghana, Indonesia, Morocco, Oman, Saudi Arabia, and Syrian Arab Republic).
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

What is the margin of error for the scores?

Each score has a margin of error associated with it that is expressed in terms of a standard error. The size of the standard errors can be influenced by survey design factors, and, therefore, vary across states and education systems. The lines or "tails" above and below each boxed score in the graphic represent a confidence interval, which indicates the range of the boxed score with a 95 percent level of confidence. At this level of confidence, a score's confidence interval equals plus or minus 1.96 times the standard error around the score. The standard errors for U.S. state scores in mathematics ranged from 2.7 to 6.8, while the standard errors for education system scores ranged from 1.9 to 5.5 (see appendix **tables A-5** and **A-6**). Find more information about standard errors in the Linking Study section of this report.

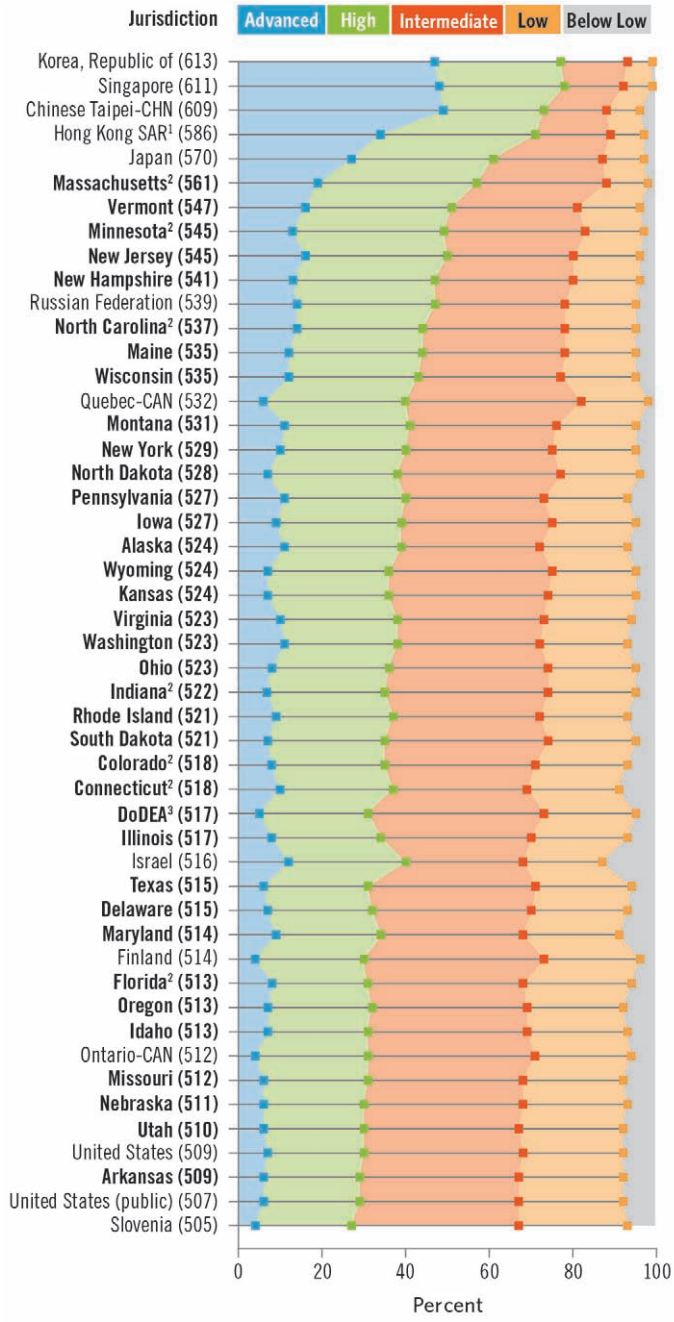
It should be noted that numerous differences between the NAEP and TIMSS administrations, assessment contents, and program policies could contribute to the sources of error around predicted TIMSS scores. Therefore, predicted TIMSS scores should not be interpreted as actual TIMSS scores.

How does student performance in states compare internationally in mathematics?

Average scores for over two-thirds of the U.S. states and one-quarter of the 47 education systems were higher than the TIMSS average (**figure 3-A**). Massachusetts scored higher than the TIMSS average and 42 of the 47 participating education systems. Average scores for 10 states were not significantly different from the TIMSS average (**figure 3-B**). Alabama, although the lowest scoring state, scored higher than 19 education systems (**figure 3-C**). Only four education systems—Chinese Taipei-CHN, Hong Kong SAR, the Republic of Korea, and Singapore—had TIMSS scores that were higher than the scores for all 52 states.

In addition to average scores, TIMSS reports the percentages of students scoring at or above four international benchmark levels. Differences in the proportions of students reaching each benchmark reflect differences in the mathematics knowledge and skills demonstrated by students in the states and education systems. All states and most participating education systems had some students performing at the High and Advanced benchmarks.

Figure 3-A. Benchmark-level results in TIMSS eighth-grade mathematics for students with average scores higher than the TIMSS average, by jurisdiction: 2011



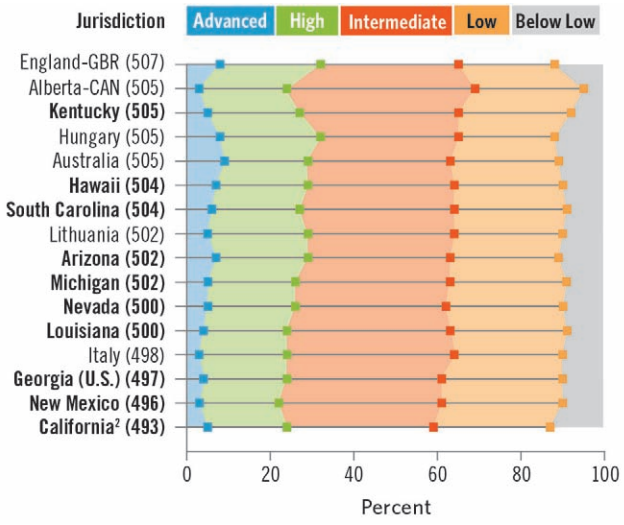
See notes at end of figure 3-C.

How to Read the Graphics

In New Jersey (**figure 3-A**), 16 percent of students scored at the Advanced benchmark, and 50 percent scored at or above the High benchmark.

At the Advanced benchmark in mathematics, eighth-graders can reason with data from several sources or unfamiliar representations to solve multi-step problems. The percentage of students in Massachusetts demonstrating these skills was higher than the percentages in 41 of the participating education systems. Nineteen percent of eighth-graders in Massachusetts reached the Advanced level, compared to about 50 percent of students in Chinese Taipei-CHN, the Republic of Korea, and Singapore.

Figure 3-B. Benchmark-level results in TIMSS eighth-grade mathematics for students with average scores not significantly different from the TIMSS average, by jurisdiction: 2011

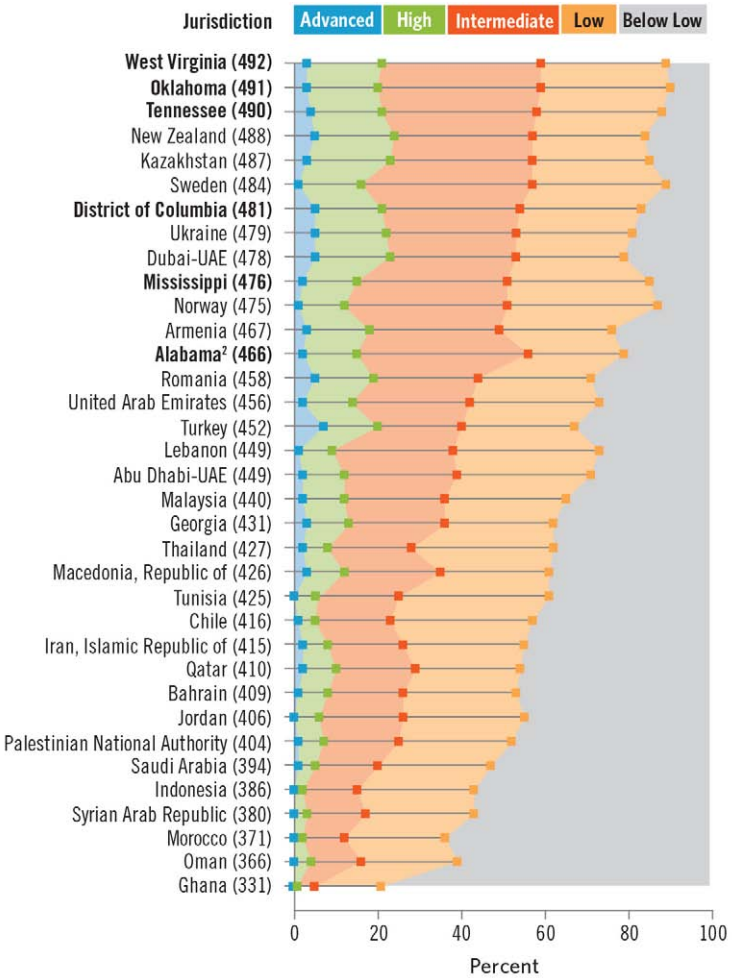


See notes at end of figure 3-C.

In South Carolina (figure 3-B), 6 percent of the students reached the Advanced benchmark, while over one-quarter of the students scored at or above the High benchmark.

In the states with average scores higher than the TIMSS average, the percentages of students scoring at or above the High benchmark ranged from 29 percent in Arkansas to 57 percent in Massachusetts. In the education systems that scored higher than the TIMSS average, the percentages of students scoring at or above High ranged from 27 percent in Slovenia to 78 percent in Singapore. See appendix **tables A-9** and **A-10** for benchmark percentages and standard errors.

Figure 3-C. Benchmark-level results in TIMSS eighth-grade mathematics for students with average scores lower than the TIMSS average, by jurisdiction: 2011



[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.
[2] Validation state.
[3] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Average scores appear in parentheses. Jurisdictions are ordered based on unrounded average scores. Results for validation states and education systems are based on actual results from the TIMSS mathematics assessment, while the results for other U.S. states are predicted results. In addition, the results for all U.S. states and United States (public) include public schools only. Results for education systems include public and private schools.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

TIMSS International Benchmarks for Achievement in Mathematics at Grade 8

Presented below are brief descriptions of what eighth-graders should know and be able to do at the Low, Intermediate, High, and Advanced benchmarks in mathematics. TIMSS benchmarks are cumulative; therefore, student performance at the High benchmark includes the competencies associated with the Low and Intermediate benchmarks. Extensive descriptions of what students should know and be able to do at each benchmark can be found in the *TIMSS 2011 International Results in Mathematics* report.

ADVANCED INTERNATIONAL BENCHMARK

625

Students can reason with information, draw conclusions, make generalizations, and solve linear equations.

Students can solve a variety of fraction, proportion, and percent problems and justify their conclusions. Students can express generalizations algebraically and model situations. They can solve a variety of problems involving equations, formulas, and functions. Students can reason with geometric figures to solve problems. Students can reason with data from several sources or unfamiliar representations to solve multi-step problems.

HIGH INTERNATIONAL BENCHMARK

550

Students can apply their understanding and knowledge in a variety of relatively complex situations.

Students can use information from several sources to solve problems involving different types of numbers and operations. Students can relate fractions, decimals, and percents to each other. Students at this level show basic procedural knowledge related to algebraic expressions. They can use properties of lines, angles, triangles, rectangles, and rectangular prisms to solve problems. They can analyze data in a variety of graphs.

INTERMEDIATE INTERNATIONAL BENCHMARK

475

Students can apply basic mathematical knowledge in a variety of situations.

Students can solve problems involving decimals, fractions, proportions, and percentages. They understand simple algebraic relationships. Students can relate a two-dimensional drawing to a three-dimensional object. They can read, interpret, and construct graphs and tables. They recognize basic notions of likelihood.

LOW INTERNATIONAL BENCHMARK

400

Students have some knowledge of whole numbers and decimals, operations, and basic graphs.

SCIENCE

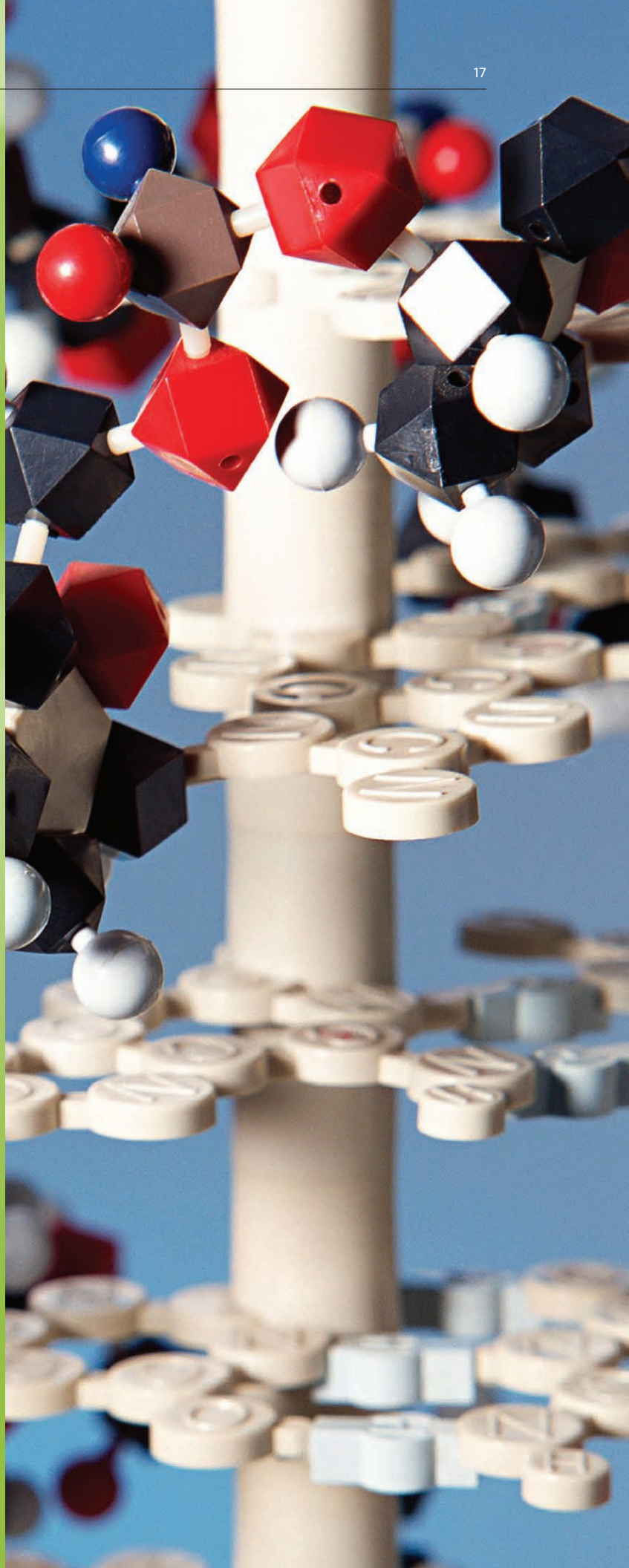
Average scores for

51 states reach the Intermediate benchmark

8 states—Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Vermont, and Wisconsin—reach the High benchmark

25 education systems reach the Intermediate benchmark

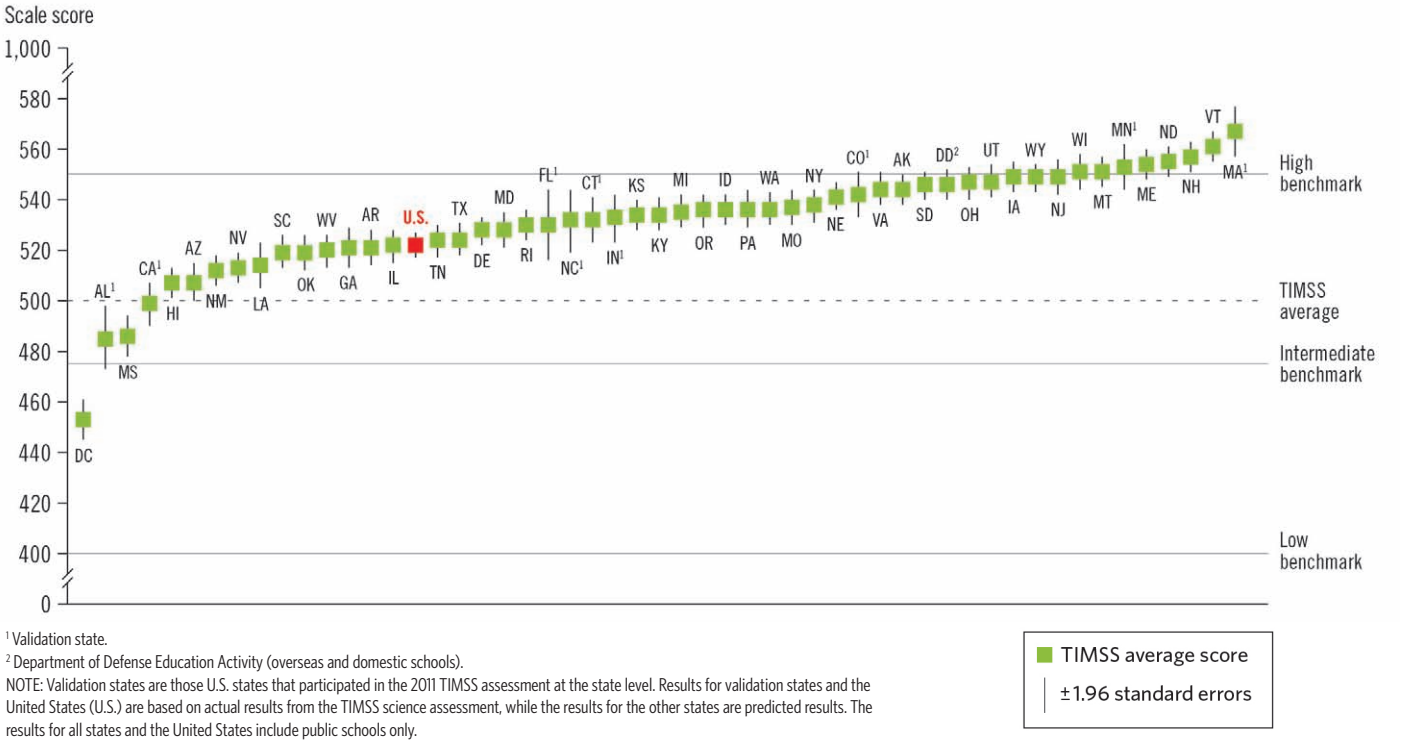
5 education systems—Chinese Taipei-CHN, Finland, Japan, the Republic of Korea, and Singapore—reach the High benchmark



How do U.S. states perform in relation to TIMSS international benchmarks in science?

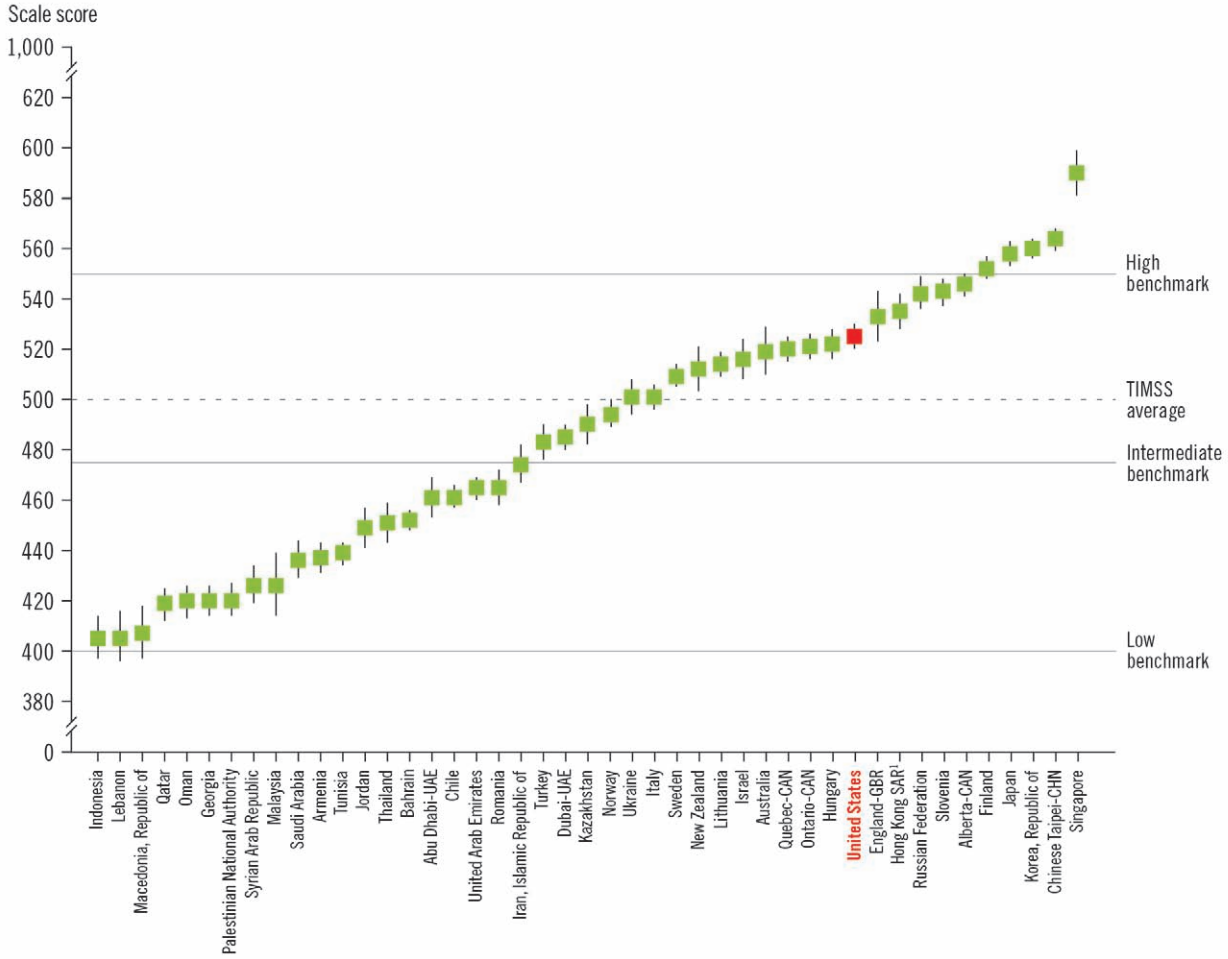
The average scores of students in 51 states were at or above the TIMSS Intermediate benchmark cutpoint of 475 (**figure 4**). Average scores for eight states—Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Vermont, and Wisconsin—reached the High benchmark cutpoint of 550. The average scores of the 45 participating education systems included in the figure spanned from just above the Low benchmark to above the High benchmark (**figure 5**). Although not shown, Ghana and Morocco scored below the Low benchmark cutpoint of 400. Scores in TIMSS science varied more across the 47 participating education systems than across the 52 states.

Figure 4. Average scores and confidence intervals in TIMSS eighth-grade science, by state: 2011



[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for validation states and the United States (U.S.) are based on actual results from the TIMSS science assessment, while the results for the other states are predicted results. The results for all states and the United States include public schools only.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Figure 5. Average scores and confidence intervals in TIMSS eighth-grade science, by education system: 2011



[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.
NOTE: Results for all education systems include public and private schools. Results are not shown for education systems that scored below 400 (Ghana and Morocco).
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

What is the margin of error for the scores?

Each score has a margin of error associated with it that is expressed in terms of a standard error. The size of the standard errors can be influenced by survey design factors and, therefore, vary across states and education systems. The lines or "tails" above and below each boxed score in the graphic represent a confidence interval, which indicates the range of the boxed score with a 95 percent level of confidence. At this level of confidence, a score's confidence interval equals plus or minus 1.96 times the standard error around the score. The standard errors for U.S. state scores in science ranged from 2.8 to 7.3, while the standard errors for education system scores ranged from 2.0 to 6.3 (see appendix **tables A-7** and **A-8**). Find more information about standard errors in the Linking Study section of this report.

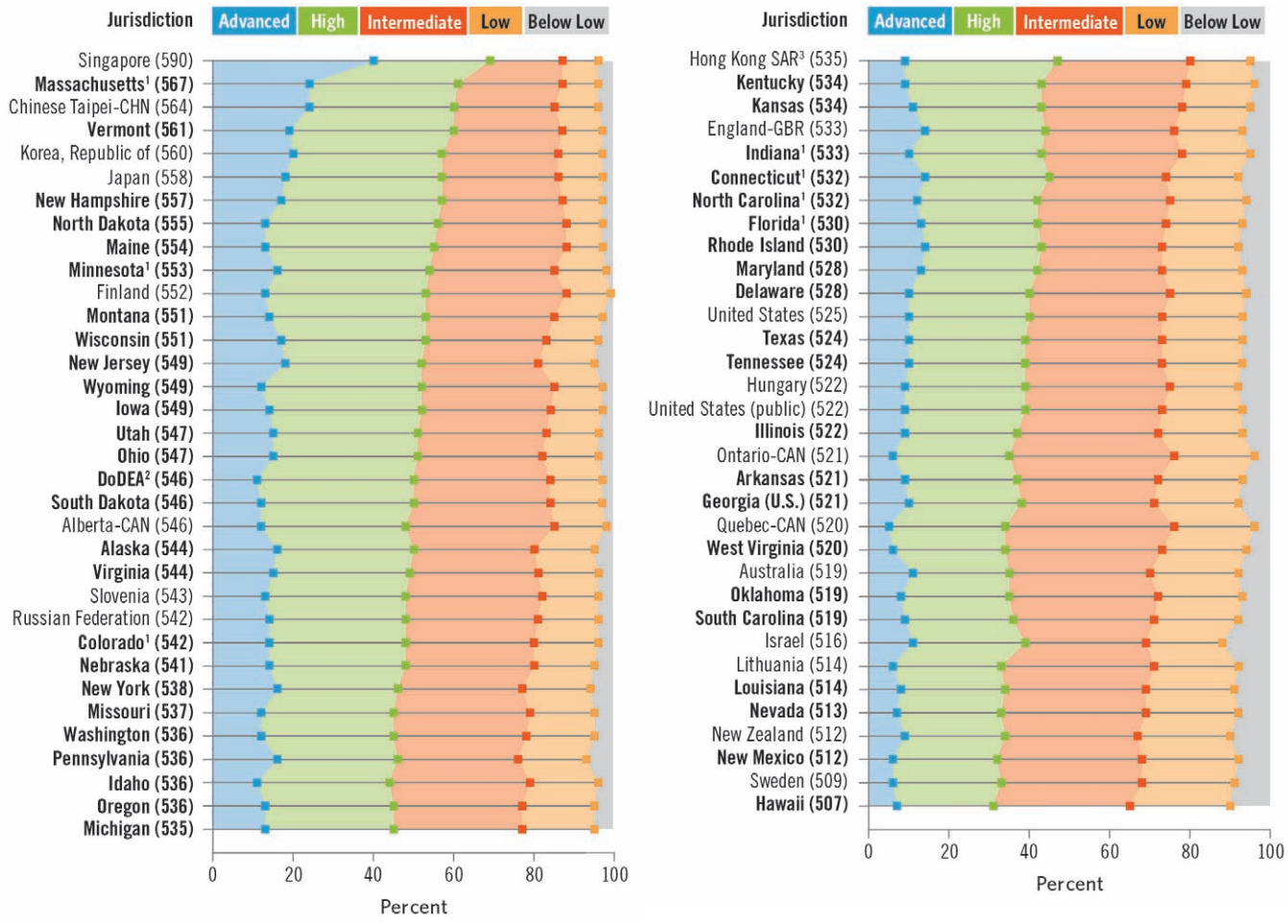
It should be noted that numerous differences between the NAEP and TIMSS administrations, assessment contents, and program policies could contribute to the sources of error around predicted TIMSS scores. Therefore, predicted TIMSS scores should not be interpreted as actual TIMSS scores.

How does student performance in states compare internationally in science?

Average scores for 90 percent of the states and 40 percent of the participating education systems were higher than the TIMSS average (**figure 6-A**). Massachusetts and Vermont scored higher than the TIMSS average, the High benchmark, and scores for 43 participating education systems. Average scores for Arizona and California were not significantly different from the TIMSS average (**figure 6-B**). The District of Columbia, although the lowest scoring state, scored higher than 14 education systems (**figure 6-C**). Singapore was the only education system that scored higher than all 52 states.

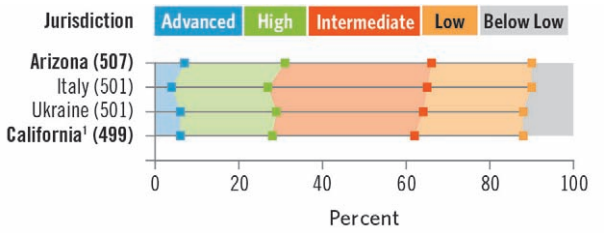
TIMSS also reports the percentages of students reaching each of the four international benchmarks. All states and most participating education systems had some students scoring at the High and Advanced benchmarks. At the Advanced level in science, students apply knowledge and understanding of scientific processes and relationships and show some knowledge of the process of scientific inquiry. The percentage of students demonstrating these skills in Massachusetts (24 percent) was higher than percentages in all but three participating education systems—Chinese Taipei-CHN, the Republic of Korea, and Singapore. In states that scored higher than the TIMSS average, the percentages of students scoring at or above the High benchmark ranged from 31 percent in Hawaii to 61 percent in Massachusetts. In the education systems that scored higher than the TIMSS average, the percentages of students scoring at or above the High benchmark ranged from 33 percent in Lithuania and Sweden to 69 percent in Singapore. See appendix **tables A-11** and **A-12** for benchmark percentages and standard errors.

Figure 6-A. Benchmark-level results in TIMSS eighth-grade science for students with average scores higher than the TIMSS average, by jurisdiction: 2011



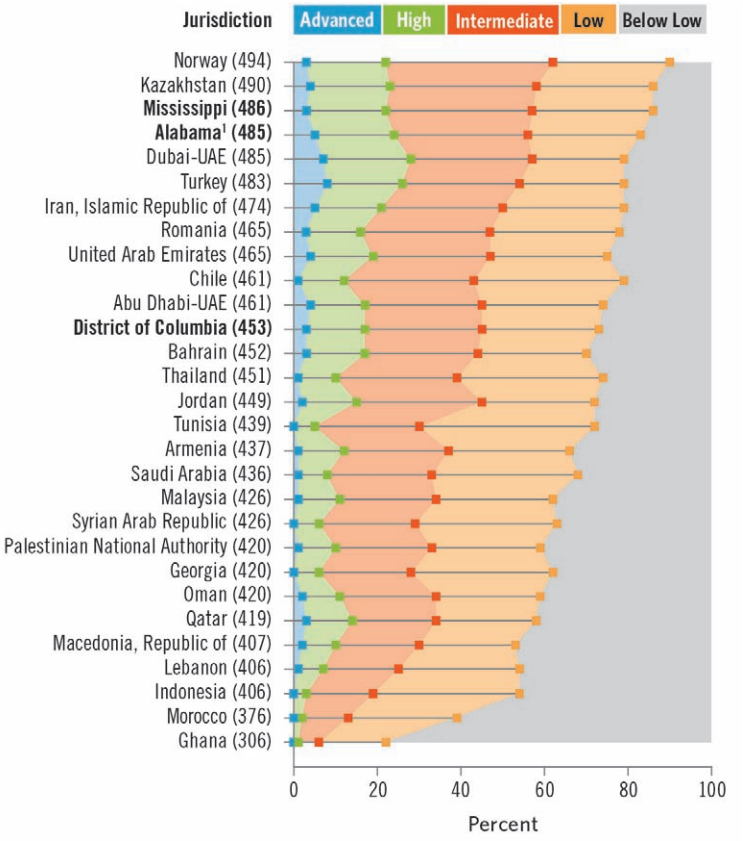
See notes at end of figure 6-C.

Figure 6-B. Benchmark-level results in TIMSS eighth-grade science for students with average scores not significantly different from the TIMSS average, by jurisdiction: 2011



See notes at end of figure 6-C.

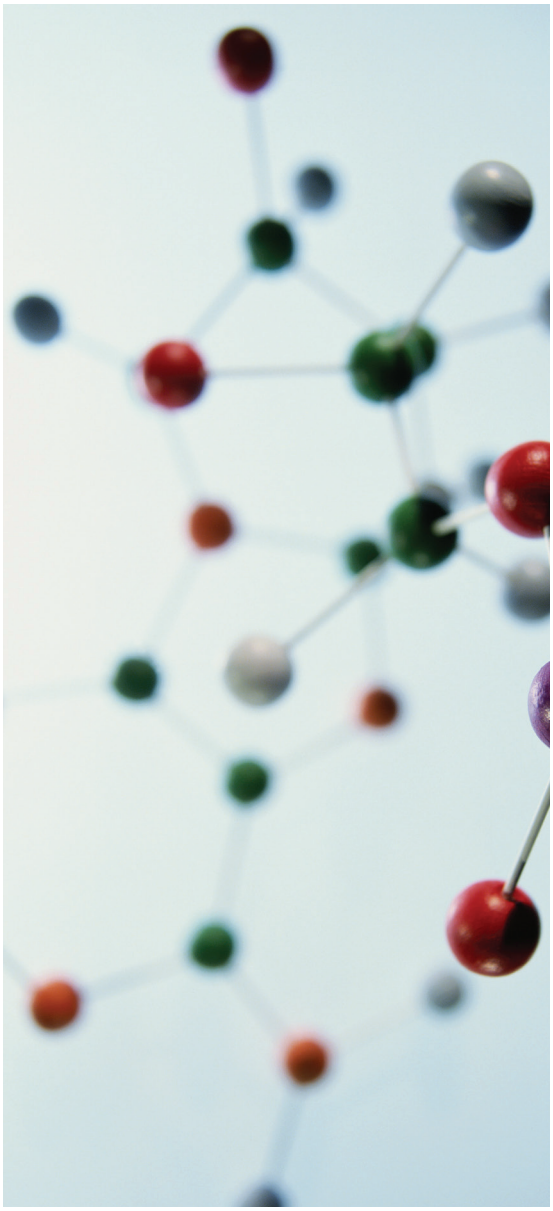
Figure 6-C. Benchmark-level results in TIMSS eighth-grade science for students with average scores lower than the TIMSS average, by jurisdiction: 2011



[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
[3] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Average scores appear in parentheses. Jurisdictions are ordered based on unrounded average scores. Results for validation states and education systems are based on actual results from the TIMSS science assessment, while the results for other U.S. states are predicted results. In addition, the results for all U.S. states and United States (public) include public schools only. Results for education systems include public and private schools.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

How to Read the Graphics

In Vermont (figure 6-A), 19 percent of students scored at the Advanced benchmark, and 60 percent of the students scored at or above the High benchmark. In Mississippi (the first state in figure 6-C), 3 percent of students scored at the Advanced benchmark, and over one-fifth of the students scored at or above the High benchmark.



TIMSS International Benchmarks for Achievement in Science at Grade 8

Presented below are brief descriptions of what eighth-graders should know and be able to do at the Low, Intermediate, High, and Advanced benchmarks in science. TIMSS benchmarks are cumulative; therefore, student performance at the High benchmark includes the competencies associated with the Low and Intermediate benchmarks. Find extensive descriptions of what students should know and be able to do at each benchmark in the *TIMSS 2011 International Results in Science* report.

ADVANCED INTERNATIONAL BENCHMARK

625

Students apply knowledge and understanding of scientific processes and relationships and show some knowledge of the process of scientific inquiry.

Students communicate their understanding of characteristics and life processes of organisms, reproduction and development, ecosystems and organisms' interactions with the environment, and factors relating to human health. They demonstrate understanding of properties of light and relationships among physical properties of materials, apply and communicate their understanding of electricity and energy in practical contexts, and demonstrate an understanding of magnetic and gravitational forces and motion. Students communicate their understanding of the solar system and of Earth's structure, physical characteristics, resources, processes, cycles, and history. They have a beginning ability to interpret results in the context of a simple experiment, reason and draw conclusions from descriptions and diagrams, and evaluate and support an argument.

HIGH INTERNATIONAL BENCHMARK

550

Students apply their knowledge and understanding of the sciences to explain phenomena in everyday and abstract contexts.

Students demonstrate some understanding of plant and animal structure, life processes, life cycles, and reproduction. They also demonstrate some understanding of ecosystems and organisms' interactions with their environment, including understanding of human responses to outside conditions and activities. Students demonstrate understanding of some properties of matter, electricity and energy, and magnetic and gravitational forces and motion. They show some knowledge of the solar system, and of Earth's physical characteristics, processes, and resources. Students demonstrate elementary knowledge and skills related to scientific inquiry. They compare, contrast, and make simple inferences, and provide brief descriptive responses combining knowledge of science concepts with information from both everyday and abstract contexts.

INTERMEDIATE INTERNATIONAL BENCHMARK

475

Students have basic knowledge and understanding of practical situations in the sciences.

Students recognize some basic information related to characteristics of living things, their reproduction and life cycles, and their interactions with the environment, and show some understanding of human biology and health. They also show some knowledge of properties of matter and light, electricity and energy, and forces and motion. Students know some basic facts about the solar system and show an initial understanding of Earth's physical characteristics and resources. They demonstrate ability to interpret information in pictorial diagrams and apply factual knowledge to practical situations.

LOW INTERNATIONAL BENCHMARK

400

Students show some elementary knowledge of life, physical, and earth sciences.

Students demonstrate knowledge of some simple facts related to human health, ecosystems, and the behavioral and physical characteristics of animals. They also demonstrate some basic knowledge of energy and the physical properties of matter. Students interpret simple diagrams, complete simple tables, and provide short written responses to questions requiring factual information.

NAEP-TIMSS Linking Study

The 2011 NAEP-TIMSS linking study allowed NCES to evaluate multiple linking methodologies. This publication reports predicted scores that are based on the statistical moderation approach for the 43 states that did not participate in TIMSS at the state level. The following sections provide a brief description of the linking study samples and methodologies. Details on the design employed in the study and the analyses conducted to evaluate the various methodologies will be available in the forthcoming *NAEP-TIMSS Linking Study: Technical Report* (NCES 2014–461).

Assessment Samples

To evaluate various linking methodologies, multiple samples of students were assessed during the NAEP testing window (January–March) as well as the TIMSS testing window (April–June).

- Students assessed in NAEP mathematics or science during the 2011 NAEP testing window (2011 NAEP national sample).
- Students assessed during the 2011 NAEP testing window with NAEP-like braided booklets containing both NAEP and TIMSS test questions (braided booklet samples in 2011 NAEP testing window).
- Students in the United States assessed in TIMSS mathematics and science during the 2011 TIMSS testing window (2011 TIMSS U.S. national sample).
- Students in the United States assessed during the 2011 TIMSS testing window with TIMSS-like braided booklets containing both NAEP and TIMSS test questions (braided booklet sample in 2011 TIMSS testing window).

All NAEP and TIMSS 2011 mathematics and science test questions at grade 8 were included in the NAEP-like and TIMSS-like braided booklets.

Samples assessed during NAEP testing

In 2011, eighth-grade public school students from all 50 states, the District of Columbia, and the Department of Defense schools were sampled and participated in the NAEP mathematics and science assessments. The NAEP national samples were then composed of all the state samples of public school students, as well as a national sample of private school students. A nationally representative sample of 175,200 eighth-graders from 7,610 schools participated in the NAEP mathematics assessment, and 122,000 eighth-graders from 7,290 schools participated in the NAEP science assessment.

Braided booklets—a set of special booklets containing one block of NAEP and one block of TIMSS test questions—were administered to an additional national public schools sample of randomly selected students, about 5,700 students from 3,710 schools for mathematics and 6,000 students from 3,760 schools for science.

Samples assessed during TIMSS testing

A total of 10,500 eighth-graders selected from randomly sampled classrooms in 500 U.S. public and private schools participated in the TIMSS assessment. The TIMSS U.S. sample did not have a state component similar to NAEP.

In addition to the TIMSS U.S. national sample, nine U.S. states—Alabama, California, Colorado, Connecticut, Florida, Indiana, Massachusetts, Minnesota, and North Carolina—participated in 2011 TIMSS at the state level. These states were given the

opportunity to compare the mathematics and science achievement of their students directly against the TIMSS education systems by receiving actual TIMSS scores. In the linking study, the nine states served as "validation states" where their actual TIMSS scores were used to check the accuracy of their predicted results. About 1,700 to 2,600 public school students from each of the nine validation states—approximately 19,600 in total—were selected to participate in the TIMSS assessment.

Furthermore, another set of braided booklets was administered to an additional nationally representative sample of 10,400 U.S. students from 510 public and private schools. These braided booklets contained either one block of NAEP mathematics with two blocks of TIMSS mathematics and one block of TIMSS science, or one block of NAEP science with two blocks of TIMSS science and one block of TIMSS mathematics. More details on the design of braided booklets will be available in the forthcoming technical report.

Accommodations and Exclusions

Accommodations and exclusions in NAEP

NAEP allows accommodations (e.g., extra testing time or individual rather than group administration) so that more students with disabilities (SD) and English language learners (ELL) can participate in the assessment. This additional participation helps ensure that NAEP results accurately reflect the educational performance of all students in the target population. For the U.S. states that participated in the 2011 eighth-grade NAEP assessments, the exclusion rates ranged from 1 to 10 percent in mathematics and from 1 to 3 percent in science. For the nine states that also participated in 2011 TIMSS, the exclusion rates for NAEP participation ranged from 1 to 4 percent in mathematics and from 1 to 3 percent in science. Exclusions in NAEP could occur at the school level, with entire schools being excluded. The NAEP sampling frame excluded ungraded schools, special-education-only schools, and hospital schools, as well as schools serving prisons and juvenile correctional institutions. See appendix **table A-1** for NAEP exclusion rates by subject and state.

Exclusions in TIMSS

Unlike NAEP, TIMSS does not provide testing accommodations for SD and ELL students. The International Association for the Evaluation of Educational Achievement (IEA), however, requires that the student exclusion rate not exceed more than 5 percent of the national desired target population (Foy, Joncas, and Zuhlke 2009).[2]

Exclusions in TIMSS could occur at the school level, with entire schools being excluded, or within schools with specific students or entire classrooms excluded. Schools could be excluded that

- are geographically inaccessible;
- are of extremely small size;
- offer a curriculum or school structure radically different from the mainstream educational system; or
- provide instruction only to students in the excluded categories as defined under "within-school exclusions," such as schools for the blind.

Within the schools that are selected to participate, students may be excluded because of intellectual or functional disability, or the inability to read or speak the language(s) of the test (e.g., ELL students in the United States).

Seven percent of eighth-graders were excluded in the U.S. national sample of 2011 TIMSS. Therefore, the U.S. results at grade 8 carry a coverage annotation for not meeting the IEA standard inclusion rate of 95 percent. Among the nine validation states, only three states—Alabama, Colorado, and Minnesota—met the IEA inclusion rate standard. Appendix **table A-2** summarizes information on the TIMSS exclusion rates in the nine U.S. states and the education systems that participated in the 2011 TIMSS assessment. It should be noted that there is one exclusion rate for each state or education system in TIMSS because the same sampled students were assessed in both mathematics and science.

[2] Foy, P., Joncas, M., and Zuhlke, O. (2009). *TIMSS 2011 School Sampling Manual*. Unpublished manuscript, Chestnut Hill, MA: Boston College.

Linking Methodologies

The process by which NAEP results are reported on the TIMSS scale is referred to as *statistical linking*. Mislevy (1992)[3] and Linn (1993)[4] proposed a type of taxonomy in categorizing the linking methodologies into four forms—equating, calibration, projection, and moderation. Linking NAEP and TIMSS is an effort to link assessments based on different frameworks. It is clear that equating is not a feasible approach (see Kolen and Brennan [2004][5] for the assumptions required for equating). The other three linking methods—moderation, projection, and calibration—can be applied in linking NAEP and TIMSS.

Statistical moderation aligns score distributions such that scores on one assessment are adjusted to match certain characteristics of the score distribution on the other assessment. In this study, moderation linking was accomplished by adjusting NAEP scores so that the adjusted score distribution for the nation's public school students who participated in 2011 NAEP had the same mean and variance as the score distribution for the public school students in the 2011 TIMSS U.S. national sample. This allowed NAEP results to be reported on the TIMSS scale.

Neither NAEP nor TIMSS provides student-level scores. Rather, both assessments provide five plausible values for individual students, each resulting in unbiased estimates of the mean and the standard deviation of the proficiency distribution overall and of the student groups. For this reason, moderation linking function parameters were estimated five times by pairing each set of estimates of the NAEP mean and standard deviation with one set of estimates of the TIMSS mean and standard deviation. The final values of the moderation linking function parameter estimates were the average of the five values. To predict the mean TIMSS scores and the percentages of students reaching each TIMSS benchmark (Advanced, High, Intermediate, and Low) for each state, the moderation linking function was applied to individual state NAEP score distributions. The moderation method did not assume that the two assessments measured exactly the same construct. However, the linking results were dependent upon having two samples—one from each assessment—to align the score distributions. Thus, the more NAEP and TIMSS vary in content, format, or context, the more likely the moderation-based linking results would differ markedly if statistical moderation was carried out with different samples of students.

Statistical projection involves developing a function to project performance on one assessment based on the performance on the other assessment. In this study, the braided booklet samples were used to determine the projection function. Two separate projection functions were developed for each subject—one using the braided booklet samples collected during the NAEP testing window and one using the braided booklet sample collected during the TIMSS testing window. The projection function from the NAEP window braided booklet samples was used to compare results among the three linking methods examined in the study. Similar to the statistical moderation method, the statistical projection method did not assume that the two assessments to be linked measured exactly the same construct. More information on the projection functions and the adjustment applied to the overall projected TIMSS score distribution will be in the forthcoming technical report.

Calibration linking, as discussed in Kolen and Brennan (2004, page 430), is a type of linking used when the two assessments are based on

1. the same framework, but different test specifications and different statistical characteristics, or
2. different frameworks and different test specifications, but the frameworks are viewed as sharing common features and/or uses.

In this study, calibration was accomplished by applying the item-response theory method to calibrate NAEP items directly onto the TIMSS score scale that was established using students' responses to TIMSS items. Data collected from the 2011 NAEP sample, the 2011 TIMSS sample, and the two braided booklet samples were all used in the calibration linking. With NAEP items calibrated onto the TIMSS scale, it was possible to predict TIMSS scores for students who took only NAEP items.

The three linking methods discussed above were all applied to predict likely TIMSS scores for each of the states based on their NAEP results. For each linking

[3] Mislevy, R.J. (1992). *Linking educational assessments: Concepts, Issues, Methods, and Prospects*. Princeton, NJ: Policy Information Center, Educational Testing Service.
[4] Linn, R.L. (1993). Linking results of distinct assessments. *Applied Measurement in Education, 6,* 83-102.
[5] Kolen, M.J., and Brennan, R.L. (2004). *Test Equating, Scaling, and Linking*. New York, NY: Springer.

method, the accuracy of the predicted TIMSS scores was evaluated by comparing predicted TIMSS results to the actual results for the nine 2011 validation states and results for national student groups (gender and race/ethnicity) as well. All three linking methods yielded comparable predicted state TIMSS results and national TIMSS results by student groups. The difference between predicted and actual TIMSS results was not statistically significant for any of the national gender or racial/ethnic groups across all linking methods. Details regarding those comparisons will be provided in the forthcoming technical report.

Once it was determined that all three methods of linking yielded essentially the same results, it was decided that one method should be chosen to provide estimates for this report. Statistical moderation was selected by NCES because it was the simplest method requiring the estimation of the fewest parameters (i.e., the means and standard deviations of the U.S. national public school samples for NAEP and TIMSS). The method could also be applied to the extant national samples of NAEP and TIMSS and did not require the use of the separate braided booklet samples that were required for the calibration and projection methods of linking. This means NCES has the option of conducting future NAEP-TIMSS linking studies using statistical moderation without the time and expense of braided booklet samples.

However, for the validation states, some differences were observed between their linkage-based predicted TIMSS scores and their actual TIMSS scores. To reduce the observed differences, a two-stage adjustment procedure was applied in addition to the statistical moderation linking procedures.

The first stage of the procedure was intended to adjust the predicted TIMSS means for all states to account for differences in population coverage between the NAEP and TIMSS state samples that resulted from the two programs' different exclusion and accommodations policies. Each state's NAEP accommodation rate was used to adjust the predicted state TIMSS mean closer to what might have been observed if the NAEP target population was more similar to that of TIMSS. The adjustment function was a linear regression function derived from the nine validation states that participated in both NAEP and TIMSS at the state level. The same adjustment function was then applied to those states where the NAEP accommodation rate was available.

In the second stage, a function was derived to model the relationship between the actual TIMSS scores for the nine validation states and their predicted TIMSS scores after the adjustment for NAEP accommodation rates. This function was used as the second adjustment factor that was applied to all states' predicted TIMSS means.

The predicted state TIMSS results presented in this report are, therefore, estimated from the statistical moderation linking that incorporated the two-stage adjustment procedure. More information on the linking methodologies and the additional adjustment procedures will be provided in the study's forthcoming technical report.

Appendix **tables A-3** and **A-4** present both actual and predicted TIMSS means and benchmark percentages for the nine validation states.

Interpreting Statistical Significance

Comparisons between predicted state results from the 2011 NAEP-TIMSS linking study and education systems (that have actual TIMSS scores) consider both the size of the differences and the standard errors of the two statistics being compared. The size of the standard errors is influenced by many factors, such as the degree of uncertainty associated with statistics estimated from a sample, and the degree of uncertainty related to the linking function. There were other sources of error associated with the predicted TIMSS scores that were not taken into account. These include the uncertainty associated with the adjustment function derived in the first stage of the two-stage adjustment procedure to account for the differences in exclusion and accommodation policies between NAEP and TIMSS.

When an estimate has a large standard error, a numerical difference that seems large may not be statistically significant. Differences of the same magnitude may or may not be statistically significant depending upon the size of the standard errors of the estimates. Only statistically significant differences (at a level of .05) are discussed as higher or lower in this report. No statistical adjustments to account for multiple comparisons were used.

APPENDIX

Table A-1. Percentage of eighth-grade public school students identified as students with disabilities and/or English language learners excluded and assessed in NAEP mathematics and science, as a percentage of all students, by state: 2011

State	Mathematics					Science				
			Assessed					Assessed		
	Identified	Excluded	Total	Without accommodations	With accommodations	Identified	Excluded	Total	Without accommodations	With accommodations
United States (public)	**18**	**3**	**15**	**5**	**10**	**18**	**2**	**16**	**5**	**11**
Alabama	12	1	11	7	4	12	1	11	7	4
Alaska	21	3	18	4	14	21	1	20	4	16
Arizona	12	1	11	2	9	12	1	11	2	9
Arkansas	16	1	14	3	12	16	1	15	3	12
California	23	1	22	15	7	23	2	22	14	8
Colorado	16	1	15	5	10	16	1	15	5	10
Connecticut	16	1	15	2	12	16	1	15	2	13
Delaware	16	3	13	2	11	16	2	14	2	12
District of Columbia	21	4	17	2	15	21	1	20	2	18
DoDEA[1]	14	3	11	3	8	14	1	13	3	10
Florida	19	2	17	1	16	19	1	17	1	16
Georgia	12	3	9	2	7	12	2	10	2	8
Hawaii	20	2	18	7	11	20	2	18	7	11
Idaho	12	1	10	3	7	12	1	10	4	7
Illinois	17	2	15	3	12	17	1	16	3	12
Indiana	17	3	14	2	12	17	1	16	3	13
Iowa	17	1	16	2	14	17	1	16	2	14
Kansas	18	1	16	7	9	18	1	16	7	9
Kentucky	13	3	10	2	8	13	3	10	2	8
Louisiana	15	1	14	1	13	15	1	14	1	13
Maine	20	2	18	4	14	20	2	18	4	14
Maryland	14	6	8	1	7	14	2	12	1	11
Massachusetts	22	4	18	3	15	22	3	19	3	16
Michigan	14	4	11	3	8	14	3	12	3	8
Minnesota	17	2	15	6	9	17	2	15	7	8
Mississippi	8	1	7	1	6	8	1	7	1	6
Missouri	14	1	12	2	10	14	1	13	3	10
Montana	13	2	12	2	9	13	2	12	3	9
Nebraska	16	4	13	4	9	16	1	15	3	12
Nevada	18	3	15	6	9	18	1	17	6	11
New Hampshire	20	2	18	4	14	20	2	18	5	13
New Jersey	19	4	15	1	14	19	1	18	1	17
New Mexico	22	2	20	10	10	22	2	20	10	10
New York	20	1	19	#	18	20	1	19	#	18
North Carolina	18	2	16	3	12	18	2	16	4	12
North Dakota	16	4	11	3	9	16	3	13	2	10
Ohio	16	5	11	1	10	16	2	14	2	12
Oklahoma	18	10	8	4	4	18	3	15	5	10
Oregon	18	1	16	6	11	18	2	16	6	10
Pennsylvania	17	2	15	2	13	17	1	16	2	15
Rhode Island	19	1	18	4	13	19	1	19	4	14
South Carolina	15	4	11	4	8	15	1	14	5	9
South Dakota	13	2	11	4	7	13	1	11	3	8
Tennessee	13	4	9	1	8	13	1	12	1	10
Texas	18	5	13	8	5	18	2	16	8	8
Utah	14	3	11	3	8	14	2	12	3	9
Vermont	20	1	18	4	15	20	1	18	4	14
Virginia	18	3	15	6	9	18	3	15	5	10
Washington	16	2	14	4	10	16	2	14	5	10
West Virginia	14	2	12	3	9	14	2	12	3	9
Wisconsin	18	2	16	2	14	18	2	16	3	14
Wyoming	14	1	13	2	11	14	1	13	2	11

Rounds to zero.

[1] Department of Defense Education Activity (overseas and domestic schools).

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics and Science Assessments.

Table A-2. Exclusion rates in TIMSS assessments at grade 8, by education system/validation state: 2011

Education system/validation state	Exclusion rate
Abu Dhabi-UAE	2
Alabama-USA[1]	5
Alberta-CAN	7
Armenia	2
Australia	3
Bahrain	2
California-USA[1]	6
Chile	3
Chinese Taipei-CHN	1
Colorado-USA[1]	4
Connecticut-USA[1]	9
Dubai-UAE	4
England-GBR	2
Finland	3
Florida-USA[1]	7
Georgia	5
Ghana	1
Hong Kong SAR[2]	5
Hungary	4
Indiana-USA[1]	6
Indonesia	3
Iran, Islamic Republic of	2
Israel	23
Italy	5
Japan	3
Jordan	#
Kazakhstan	5
Korea, Republic of	2
Lebanon	1
Lithuania	5
Macedonia, Republic of	3
Malaysia	#
Massachusetts-USA[1]	8
Minnesota-USA[1]	4
Morocco	#
New Zealand	3
North Carolina-USA[1]	11
Norway	2
Oman	1
Ontario-CAN	6
Palestinian National Authority	2
Qatar	5
Quebec-CAN	5
Romania	1
Russian Federation	6
Saudi Arabia	1
Singapore	6
Slovenia	2
Sweden	5
Syrian Arab Republic	2
Thailand	2
Tunisia	#
Turkey	2
Ukraine	3
United Arab Emirates	3
United States	7

Rounds to zero.

[1] Validation state.

[2] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.

NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. The results for validation states include public schools only.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-3. Average scores, TIMSS benchmark results, and standard errors in TIMSS eighth-grade mathematics, by validation state and type of result: 2011

Validation state and type of result	Average score	Standard error	Percentage of students reaching TIMSS benchmarks							
			At Advanced	Standard error	At or above High	Standard error	At or above Intermediate	Standard error	At or above Low	Standard error
Alabama										
Actual	466	5.9	2	0.8	15	2.5	46	3.1	79	2.2
Predicted	469	3.8	2	0.8	15	2.3	48	2.7	82	1.8
California										
Actual	493	4.9	5	0.9	24	2.5	59	2.8	87	1.7
Predicted	486	3.5	5	1.0	23	2.2	56	2.2	85	1.5
Colorado										
Actual	518	4.9	8	1.1	35	2.7	71	2.5	93	1.1
Predicted	530*	3.4	11	1.8	41	2.8	75	2.0	94	0.8
Connecticut										
Actual	518	4.8	10	1.3	37	2.9	69	2.5	91	1.4
Predicted	526	3.3	10	1.5	39	2.7	74	2.1	94*	0.9
Florida										
Actual	513	6.4	8	1.6	31	3.2	68	3.3	94	1.3
Predicted	518	3.0	8	1.3	34	2.7	71	2.2	93	0.9
Indiana										
Actual	522	5.1	7	1.2	35	3.3	74	2.3	95	1.0
Predicted	522	3.2	7	0.9	36	2.2	74	2.1	95	1.1
Massachusetts										
Actual	561	5.3	19	3.0	57	3.2	88	1.4	98	0.3
Predicted	556	3.1	19	2.0	56	2.7	85	1.7	97	0.5
Minnesota										
Actual	545	4.6	13	2.3	49	2.8	83	1.9	97	0.7
Predicted	533*	3.2	12	1.9	43	2.8	77*	1.8	95*	0.7
North Carolina										
Actual	537	6.8	14	2.6	44	3.6	78	2.5	95	1.3
Predicted	525	3.2	10	1.4	39	2.5	73	2.0	94	0.9

* Significantly different ($p < .05$) from actual results.

NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. The results for validation states include public schools only.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-4. Average scores, TIMSS benchmark results, and standard errors in TIMSS eighth-grade science, by validation state and type of result: 2011

Validation state and type of result	Average score	Standard error	Percentage of students reaching TIMSS benchmarks							
			At Advanced	Standard error	At or above High	Standard error	At or above Intermediate	Standard error	At or above Low	Standard error
Alabama										
Actual	485	6.2	5	1.0	24	2.7	56	3.5	83	1.9
Predicted	488	4.1	4	1.5	23	2.7	58	2.5	85	1.5
California										
Actual	499	4.6	6	0.7	28	1.9	62	2.5	88	1.6
Predicted	496	3.9	7	1.5	28	2.5	61	2.2	86	1.5
Colorado										
Actual	542	4.4	14	1.6	48	2.6	80	2.0	96	0.7
Predicted	547	3.8	16	2.5	51	3.2	81	1.9	96	0.6
Connecticut										
Actual	532	4.6	14	1.5	45	2.5	74	2.0	92	1.3
Predicted	539	3.6	15	2.0	47	2.8	78	1.9	95	0.8
Florida										
Actual	530	7.3	13	2.0	42	3.5	74	3.6	93	1.5
Predicted	533	3.6	13	1.8	44	2.7	75	1.9	94	0.7
Indiana										
Actual	533	4.8	10	1.4	43	2.9	78	2.1	95	0.9
Predicted	536	3.2	12	1.7	45	2.7	78	2.1	95	1.0
Massachusetts										
Actual	567	5.1	24	2.6	61	2.8	87	1.5	96	0.7
Predicted	561	3.6	23	2.4	59	2.8	84	1.7	96	0.6
Minnesota										
Actual	553	4.6	16	1.9	54	2.6	85	2.0	98	0.7
Predicted	544	3.4	15	2.3	49	2.9	81	1.7	96*	0.5
North Carolina										
Actual	532	6.3	12	2.2	42	3.2	75	3.0	94	1.4
Predicted	522	3.5	10	1.6	38	2.6	72	2.1	93	1.0

* Significantly different ($p < .05$) from actual results.

NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. The results for validation states include public schools only.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-5. Average scores and standard errors in TIMSS eighth-grade mathematics, by state: 2011

State	Average score	Standard error
United States (public)	**507**	**2.6**
Alabama[1]	466	5.9
Alaska	524	3.0
Arizona	502	3.5
Arkansas	509	3.2
California[1]	493	4.9
Colorado[1]	518	4.9
Connecticut[1]	518	4.8
Delaware	515	2.9
District of Columbia	481	3.1
DoDEA[2]	517	3.0
Florida[1]	513	6.4
Georgia	497	3.3
Hawaii	504	2.9
Idaho	513	3.0
Illinois	517	3.3
Indiana[1]	522	5.1
Iowa	527	3.1
Kansas	524	3.1
Kentucky	505	3.1
Louisiana	500	3.5
Maine	535	3.0
Maryland	514	3.5
Massachusetts[1]	561	5.3
Michigan	502	3.8
Minnesota[1]	545	4.6
Mississippi	476	3.8
Missouri	512	3.4
Montana	531	2.9
Nebraska	511	3.0
Nevada	500	3.1
New Hampshire	541	2.9
New Jersey	545	3.5
New Mexico	496	3.1
New York	529	3.1
North Carolina[1]	537	6.8
North Dakota	528	2.8
Ohio	523	3.3
Oklahoma	491	3.3
Oregon	513	3.3
Pennsylvania	527	3.4
Rhode Island	521	2.7
South Carolina	504	3.3
South Dakota	521	2.8
Tennessee	490	3.5
Texas	515	3.2
Utah	510	3.0
Vermont	547	3.0
Virginia	523	3.4
Washington	523	3.2
West Virginia	492	3.0
Wisconsin	535	3.2
Wyoming	524	2.8

[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for the United States and the validation states are based on actual results from the TIMSS mathematics assessment, while results for all other states are predicted results. The results for all states and the United States include public schools only.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-6. Average scores and standard errors in TIMSS eighth-grade mathematics, by education system: 2011

Education system	Average score	Standard error
Abu Dhabi-UAE	449	3.7
Alberta-CAN	505	2.6
Armenia	467	2.7
Australia	505	5.1
Bahrain	409	2.0
Chile	416	2.6
Chinese Taipei-CHN	609	3.2
Dubai-UAE	478	2.1
England-GBR	507	5.5
Finland	514	2.5
Georgia	431	3.8
Ghana	331	4.3
Hong Kong SAR[1]	586	3.8
Hungary	505	3.5
Indonesia	386	4.3
Iran, Islamic Republic of	415	4.3
Israel	516	4.1
Italy	498	2.4
Japan	570	2.6
Jordan	406	3.7
Kazakhstan	487	4.0
Korea, Republic of	613	2.9
Lebanon	449	3.7
Lithuania	502	2.5
Macedonia, Republic of	426	5.2
Malaysia	440	5.4
Morocco	371	2.0
New Zealand	488	5.5
Norway	475	2.4
Oman	366	2.8
Ontario-CAN	512	2.5
Palestinian National Authority	404	3.5
Qatar	410	3.1
Quebec-CAN	532	2.3
Romania	458	4.0
Russian Federation	539	3.6
Saudi Arabia	394	4.6
Singapore	611	3.8
Slovenia	505	2.2
Sweden	484	1.9
Syrian Arab Republic	380	4.5
Thailand	427	4.3
Tunisia	425	2.8
Turkey	452	3.9
Ukraine	479	3.9
United Arab Emirates	456	2.1
United States	509	2.6

[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.

NOTE: Results for the education systems include public and private schools.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-7. Average scores and standard errors in TIMSS eighth-grade science, by state: 2011

State	Average score	Standard error
United States (public)	**522**	**2.5**
Alabama[1]	485	6.2
Alaska	544	3.0
Arizona	507	3.8
Arkansas	521	3.5
California[1]	499	4.6
Colorado[1]	542	4.4
Connecticut[1]	532	4.6
Delaware	528	2.9
District of Columbia	453	4.1
DoDEA[2]	546	3.2
Florida[1]	530	7.3
Georgia	521	4.0
Hawaii	507	3.0
Idaho	536	3.0
Illinois	522	3.4
Indiana[1]	533	4.8
Iowa	549	3.1
Kansas	534	3.1
Kentucky	534	3.1
Louisiana	514	4.5
Maine	554	2.8
Maryland	528	3.6
Massachusetts[1]	567	5.1
Michigan	535	3.3
Minnesota[1]	553	4.6
Mississippi	486	4.0
Missouri	537	3.6
Montana	551	3.1
Nebraska	541	3.0
Nevada	513	3.1
New Hampshire	557	3.0
New Jersey	549	3.7
New Mexico	512	3.1
New York	538	3.4
North Carolina[1]	532	6.3
North Dakota	555	3.1
Ohio	547	3.3
Oklahoma	519	3.5
Oregon	536	3.3
Pennsylvania	536	3.9
Rhode Island	530	2.9
South Carolina	519	3.3
South Dakota	546	2.8
Tennessee	524	3.4
Texas	524	3.4
Utah	547	3.1
Vermont	561	3.2
Virginia	544	3.4
Washington	536	3.3
West Virginia	520	3.3
Wisconsin	551	3.5
Wyoming	549	2.8

[1] Validation state.
[2] Department of Defense Education Activity (overseas and domestic schools).
NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for the United States and the validation states are based on actual results from the TIMSS science assessment, while results for all other states are predicted results. The results for all states and the United States include public schools only.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-8. Average scores and standard errors in TIMSS eighth-grade science, by education system: 2011

Education system	Average score	Standard error
Abu Dhabi-UAE	461	4.0
Alberta-CAN	546	2.4
Armenia	437	3.1
Australia	519	4.8
Bahrain	452	2.0
Chile	461	2.5
Chinese Taipei-CHN	564	2.3
Dubai-UAE	485	2.5
England-GBR	533	4.9
Finland	552	2.5
Georgia	420	3.0
Ghana	306	5.2
Hong Kong SAR[1]	535	3.4
Hungary	522	3.1
Indonesia	406	4.5
Iran, Islamic Republic of	474	4.0
Israel	516	4.0
Italy	501	2.5
Japan	558	2.4
Jordan	449	4.0
Kazakhstan	490	4.3
Korea, Republic of	560	2.0
Lebanon	406	4.9
Lithuania	514	2.6
Macedonia, Republic of	407	5.4
Malaysia	426	6.3
Morocco	376	2.2
New Zealand	512	4.6
Norway	494	2.6
Oman	420	3.2
Ontario-CAN	521	2.5
Palestinian National Authority	420	3.2
Qatar	419	3.4
Quebec-CAN	520	2.5
Romania	465	3.5
Russian Federation	542	3.2
Saudi Arabia	436	3.9
Singapore	590	4.3
Slovenia	543	2.7
Sweden	509	2.5
Syrian Arab Republic	426	3.9
Thailand	451	3.9
Tunisia	439	2.5
Turkey	483	3.4
Ukraine	501	3.4
United Arab Emirates	465	2.4
United States	525	2.6

[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.

NOTE: Results for the education systems include public and private schools.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-9. TIMSS benchmark results and standard errors in TIMSS eighth-grade mathematics, by state: 2011

State	Percentage of students reaching TIMSS benchmarks							
	At Advanced	Standard error	At or above High	Standard error	At or above Intermediate	Standard error	At or above Low	Standard error
United States (public)	**6**	**0.7**	**29**	**1.5**	**67**	**1.3**	**92**	**0.7**
Alabama[1]	2	0.8	15	2.5	46	3.1	79	2.2
Alaska	11	1.3	39	2.4	72	2.0	93	1.1
Arizona	7	1.3	29	2.4	63	2.2	89	1.3
Arkansas	6	1.0	29	2.4	67	2.3	92	1.2
California[1]	5	0.9	24	2.5	59	2.8	87	1.7
Colorado[1]	8	1.1	35	2.7	71	2.5	93	1.1
Connecticut[1]	10	1.3	37	2.9	69	2.5	91	1.4
Delaware	7	1.1	32	2.4	70	2.1	93	1.0
District of Columbia	5	0.7	21	1.6	54	2.0	83	1.8
DoDEA[2]	5	1.3	31	2.9	73	2.2	95	0.7
Florida[1]	8	1.6	31	3.2	68	3.3	94	1.3
Georgia	4	1.0	24	2.4	61	2.2	90	1.2
Hawaii	7	1.1	29	2.1	64	2.0	90	1.2
Idaho	7	1.3	31	2.5	69	2.0	93	0.8
Illinois	8	1.3	34	2.5	70	2.2	93	1.0
Indiana[1]	7	1.2	35	3.3	74	2.3	95	1.0
Iowa	9	1.3	39	2.5	75	2.1	95	0.9
Kansas	7	1.4	36	2.7	74	2.0	95	0.7
Kentucky	5	1.1	27	2.4	65	2.2	92	1.0
Louisiana	4	0.8	24	2.3	63	2.6	91	1.5
Maine	12	1.5	44	2.5	78	1.9	95	0.8
Maryland	9	1.7	34	2.6	68	2.1	91	1.0
Massachusetts[1]	19	3.0	57	3.2	88	1.4	98	0.3
Michigan	5	1.3	26	2.8	63	2.6	91	1.3
Minnesota[1]	13	2.3	49	2.8	83	1.9	97	0.7
Mississippi	2	0.7	15	2.3	51	2.8	85	1.8
Missouri	6	1.3	31	2.6	68	2.3	92	1.1
Montana	11	1.7	41	2.6	76	1.8	95	0.7
Nebraska	6	1.2	30	2.5	68	2.1	93	1.0
Nevada	5	1.0	26	2.2	62	2.1	90	1.2
New Hampshire	13	1.6	47	2.6	80	1.8	96	0.7
New Jersey	16	2.0	50	2.8	80	2.0	96	0.8
New Mexico	3	0.8	22	2.1	61	2.3	90	1.3
New York	10	1.1	40	2.3	75	2.1	95	1.1
North Carolina[1]	14	2.6	44	3.6	78	2.5	95	1.3
North Dakota	7	1.5	38	2.8	77	1.9	96	0.6
Ohio	8	1.5	36	2.8	74	2.1	95	0.8
Oklahoma	3	1.0	20	2.5	59	2.4	90	1.1
Oregon	7	1.3	32	2.5	69	2.2	92	1.1
Pennsylvania	11	1.5	40	2.6	73	2.1	93	1.0
Rhode Island	9	1.2	37	2.3	72	1.9	93	1.0
South Carolina	6	1.2	27	2.5	64	2.2	91	1.1
South Dakota	7	1.4	35	2.6	74	1.9	95	0.6
Tennessee	4	0.9	21	2.3	58	2.4	88	1.4
Texas	6	1.5	31	2.8	71	2.0	94	0.7
Utah	6	1.2	30	2.4	67	2.0	92	1.0
Vermont	16	1.8	51	2.7	81	1.8	96	0.7
Virginia	10	1.7	38	2.8	73	2.1	94	0.9
Washington	11	1.6	38	2.5	72	1.9	93	0.9
West Virginia	3	0.7	21	2.1	59	2.3	89	1.3
Wisconsin	12	1.5	43	2.6	77	2.0	95	0.8
Wyoming	7	1.3	36	2.7	75	2.1	95	0.7

[1] Validation state.

[2] Department of Defense Education Activity (overseas and domestic schools).

NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for the United States and the validation states are based on actual results from the TIMSS mathematics assessment, while results for all other states are predicted results. The results for all states and the United States include public schools only.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Mathematics Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-10. TIMSS benchmark results and standard errors in TIMSS eighth-grade mathematics, by education system: 2011

Education system	Percentage of students reaching TIMSS benchmarks							
	At Advanced	Standard error	At or above High	Standard error	At or above Intermediate	Standard error	At or above Low	Standard error
Abu Dhabi-UAE	2	0.5	12	1.2	39	1.8	71	1.5
Alberta-CAN	3	0.5	24	1.3	69	1.6	95	0.7
Armenia	3	0.4	18	0.9	49	1.4	76	1.2
Australia	9	1.7	29	2.6	63	2.4	89	1.1
Bahrain	1	0.2	8	0.7	26	0.7	53	0.8
Chile	1	0.2	5	0.6	23	1.1	57	1.6
Chinese Taipei-CHN	49	1.5	73	1.0	88	0.7	96	0.4
Dubai-UAE	5	0.7	23	1.2	53	1.0	79	0.8
England-GBR	8	1.4	32	2.9	65	2.7	88	1.6
Finland	4	0.5	30	1.5	73	1.5	96	0.6
Georgia	3	0.3	13	1.0	36	1.5	62	1.6
Ghana	#	†	1	0.2	5	0.8	21	1.8
Hong Kong SAR[1]	34	2.0	71	1.7	89	1.4	97	0.8
Hungary	8	0.7	32	1.4	65	1.6	88	1.2
Indonesia	#	†	2	0.5	15	1.2	43	2.1
Iran, Islamic Republic of	2	0.5	8	1.1	26	1.6	55	1.8
Israel	12	1.2	40	1.7	68	1.8	87	1.2
Italy	3	0.5	24	1.1	64	1.4	90	1.1
Japan	27	1.3	61	1.3	87	0.7	97	0.3
Jordan	#	†	6	0.5	26	1.2	55	1.7
Kazakhstan	3	0.7	23	1.8	57	2.1	85	1.3
Korea, Republic of	47	1.6	77	0.9	93	0.6	99	0.2
Lebanon	1	0.2	9	1.0	38	2.2	73	1.9
Lithuania	5	0.6	29	1.3	64	1.4	90	0.7
Macedonia, Republic of	3	0.6	12	1.3	35	1.9	61	1.9
Malaysia	2	0.4	12	1.5	36	2.4	65	2.5
Morocco	#	†	2	0.2	12	0.5	36	1.0
New Zealand	5	0.8	24	2.6	57	2.8	84	1.6
Norway	1	0.2	12	0.9	51	1.6	87	1.3
Oman	#	†	4	0.3	16	0.6	39	1.1
Ontario-CAN	4	0.6	31	1.4	71	1.4	94	0.7
Palestinian National Authority	1	0.3	7	0.7	25	1.3	52	1.5
Qatar	2	0.3	10	0.8	29	1.2	54	1.4
Quebec-CAN	6	0.6	40	1.8	82	1.3	98	0.4
Romania	5	0.8	19	1.3	44	1.7	71	1.5
Russian Federation	14	1.2	47	2.0	78	1.4	95	0.7
Saudi Arabia	1	0.2	5	0.8	20	1.7	47	2.0
Singapore	48	2.0	78	1.8	92	1.1	99	0.3
Slovenia	4	0.4	27	1.2	67	1.4	93	0.7
Sweden	1	0.3	16	0.9	57	1.1	89	0.7
Syrian Arab Republic	#	†	3	0.5	17	1.4	43	1.9
Thailand	2	0.4	8	1.3	28	1.9	62	2.1
Tunisia	#	†	5	0.9	25	1.4	61	1.3
Turkey	7	0.9	20	1.2	40	1.5	67	1.3
Ukraine	5	0.6	22	1.6	53	2.0	81	1.4
United Arab Emirates	2	0.2	14	0.7	42	1.1	73	0.9
United States	7	0.8	30	1.4	68	1.3	92	0.7

† Not applicable. Standard error of the estimate cannot be accurately determined.
# Rounds to zero.
[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.
NOTE: Results for the education systems include public and private schools.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-11. TIMSS benchmark results and standard errors in TIMSS eighth-grade science, by state: 2011

State	Percentage of students reaching TIMSS benchmarks							
	At Advanced	Standard error	At or above High	Standard error	At or above Intermediate	Standard error	At or above Low	Standard error
United States (public)	**9**	**0.7**	**39**	**1.4**	**73**	**1.1**	**93**	**0.6**
Alabama[1]	5	1.0	24	2.7	56	3.5	83	1.9
Alaska	16	1.8	50	2.6	80	1.8	95	0.7
Arizona	7	1.5	31	2.7	66	2.3	90	1.3
Arkansas	9	1.6	37	2.7	72	2.1	93	1.0
California[1]	6	0.7	28	1.9	62	2.5	88	1.6
Colorado[1]	14	1.6	48	2.6	80	2.0	96	0.7
Connecticut[1]	14	1.5	45	2.5	74	2.0	92	1.3
Delaware	10	1.5	40	2.5	75	1.9	94	0.8
District of Columbia	3	0.6	17	1.4	45	1.9	73	2.0
DoDEA[2]	11	2.2	50	3.3	84	1.7	97	0.4
Florida[1]	13	2.0	42	3.5	74	3.6	93	1.5
Georgia	10	2.0	38	3.0	71	2.3	92	1.1
Hawaii	7	1.3	31	2.2	65	2.0	90	1.2
Idaho	11	2.0	44	2.8	79	1.6	96	0.5
Illinois	9	1.5	37	2.6	72	2.0	93	1.0
Indiana[1]	10	1.4	43	2.9	78	2.1	95	0.9
Iowa	14	1.9	52	2.9	84	1.7	97	0.5
Kansas	11	1.9	43	2.8	78	1.8	95	0.6
Kentucky	9	1.8	43	2.9	79	1.7	96	0.5
Louisiana	8	1.7	34	3.2	69	2.8	91	1.5
Maine	13	1.9	55	3.1	88	1.5	97	0.3
Maryland	13	1.9	42	2.7	73	2.0	93	1.0
Massachusetts[1]	24	2.6	61	2.8	87	1.5	96	0.7
Michigan	13	2.1	45	2.8	77	1.8	95	0.7
Minnesota[1]	16	1.9	54	2.6	85	2.0	98	0.7
Mississippi	3	1.2	22	2.6	57	2.5	86	1.6
Missouri	12	2.1	45	3.1	79	2.0	95	0.7
Montana	14	2.3	53	3.0	85	1.5	97	0.3
Nebraska	14	1.9	48	2.7	80	1.7	95	0.6
Nevada	7	1.3	33	2.4	69	2.0	92	1.1
New Hampshire	17	2.2	57	3.0	87	1.5	97	0.3
New Jersey	18	2.1	52	2.9	81	2.0	95	0.8
New Mexico	6	1.3	32	2.4	68	2.0	92	1.0
New York	16	1.6	46	2.4	77	1.9	94	1.0
North Carolina[1]	12	2.2	42	3.2	75	3.0	94	1.4
North Dakota	13	2.3	56	3.2	88	1.4	97	0.2
Ohio	15	2.1	51	2.9	82	1.8	96	0.6
Oklahoma	8	1.6	35	2.8	72	2.2	93	1.0
Oregon	13	1.9	45	2.7	77	1.8	95	0.7
Pennsylvania	16	2.0	46	2.8	76	2.1	93	1.0
Rhode Island	14	1.6	43	2.3	73	1.8	92	1.0
South Carolina	9	1.6	36	2.6	71	2.0	92	1.0
South Dakota	12	2.1	50	2.9	84	1.4	97	0.3
Tennessee	10	1.7	39	2.7	73	2.0	93	0.9
Texas	10	1.9	39	2.7	73	1.9	93	0.8
Utah	15	2.2	51	2.8	83	1.6	96	0.4
Vermont	19	2.4	60	3.0	87	1.6	97	0.4
Virginia	15	2.2	49	2.9	81	1.7	96	0.6
Washington	12	2.0	45	2.8	78	1.8	95	0.6
West Virginia	6	1.5	34	2.8	73	2.1	94	0.8
Wisconsin	17	2.2	53	2.9	83	1.8	96	0.6
Wyoming	12	2.0	52	3.0	85	1.6	97	0.3

[1] Validation state.

[2] Department of Defense Education Activity (overseas and domestic schools).

NOTE: Validation states are those U.S. states that participated in the 2011 TIMSS assessment at the state level. Results for the United States and the validation states are based on actual results from the TIMSS science assessment, while results for all other states are predicted results. The results for all states and the United States include public schools only.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment; and International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

Table A-12. TIMSS benchmark results and standard errors in TIMSS eighth-grade science, by education system: 2011

Education system	Percentage of students reaching TIMSS benchmarks							
	At Advanced	Standard error	At or above High	Standard error	At or above Intermediate	Standard error	At or above Low	Standard error
Abu Dhabi-UAE	4	0.7	17	1.5	45	1.9	74	1.5
Alberta-CAN	12	0.9	48	1.5	85	1.1	98	0.4
Armenia	1	0.2	12	0.8	37	1.5	66	1.3
Australia	11	1.6	35	2.5	70	2.0	92	0.8
Bahrain	3	0.3	17	0.7	44	1.0	70	0.7
Chile	1	0.2	12	0.9	43	1.4	79	1.5
Chinese Taipei-CHN	24	1.4	60	1.2	85	0.8	96	0.4
Dubai-UAE	7	0.7	28	1.0	57	1.3	79	1.0
England-GBR	14	1.5	44	2.6	76	2.3	93	1.2
Finland	13	1.2	53	1.7	88	1.0	99	0.3
Georgia	#	†	6	0.6	28	1.5	62	1.5
Ghana	#	†	1	0.2	6	0.8	22	1.7
Hong Kong SAR[1]	9	1.1	47	1.8	80	1.7	95	1.0
Hungary	9	0.8	39	1.5	75	1.4	92	0.8
Indonesia	#	†	3	0.4	19	1.4	54	2.3
Iran, Islamic Republic of	5	0.7	21	1.3	50	2.0	79	1.5
Israel	11	1.1	39	1.7	69	1.7	88	1.1
Italy	4	0.5	27	1.4	65	1.4	90	1.1
Japan	18	1.1	57	1.3	86	0.9	97	0.4
Jordan	2	0.3	15	1.0	45	1.5	72	1.5
Kazakhstan	4	0.6	23	1.9	58	2.5	86	1.2
Korea, Republic of	20	0.9	57	1.1	86	0.7	97	0.4
Lebanon	1	0.2	7	0.8	25	2.0	54	2.3
Lithuania	6	0.7	33	1.4	71	1.3	92	0.6
Macedonia, Republic of	2	0.4	10	1.0	30	1.7	53	2.0
Malaysia	1	0.4	11	1.4	34	2.4	62	2.6
Morocco	#	†	2	0.2	13	0.7	39	1.0
New Zealand	9	1.0	34	2.2	67	2.2	90	1.2
Norway	3	0.4	22	1.2	62	1.4	90	1.1
Oman	2	0.2	11	0.5	34	1.0	59	1.3
Ontario-CAN	6	0.7	35	1.5	76	1.3	96	0.6
Palestinian National Authority	1	0.2	10	0.8	33	1.3	59	1.3
Qatar	3	0.5	14	1.1	34	1.4	58	1.2
Quebec-CAN	5	0.6	34	1.6	76	1.4	96	0.7
Romania	3	0.5	16	1.3	47	1.5	78	1.5
Russian Federation	14	1.1	48	1.8	81	1.2	96	0.7
Saudi Arabia	1	0.2	8	0.8	33	2.0	68	1.8
Singapore	40	1.7	69	2.0	87	1.6	96	0.7
Slovenia	13	0.8	48	1.4	82	1.2	96	0.5
Sweden	6	0.5	33	1.3	68	1.4	91	0.7
Syrian Arab Republic	#	†	6	0.8	29	1.8	63	1.9
Thailand	1	0.5	10	1.3	39	2.1	74	1.7
Tunisia	#	†	5	0.7	30	1.4	72	1.3
Turkey	8	0.9	26	1.4	54	1.4	79	1.0
Ukraine	6	0.8	29	1.7	64	1.6	88	1.1
United Arab Emirates	4	0.4	19	0.8	47	1.1	75	0.9
United States	10	0.7	40	1.3	73	1.1	93	0.7

† Not applicable. Standard error of the estimate cannot be accurately determined.
# Rounds to zero.
[1] Hong Kong SAR is a Special Administrative Region (SAR) of the People's Republic of China.
NOTE: Results for the education systems include public and private schools.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011.

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