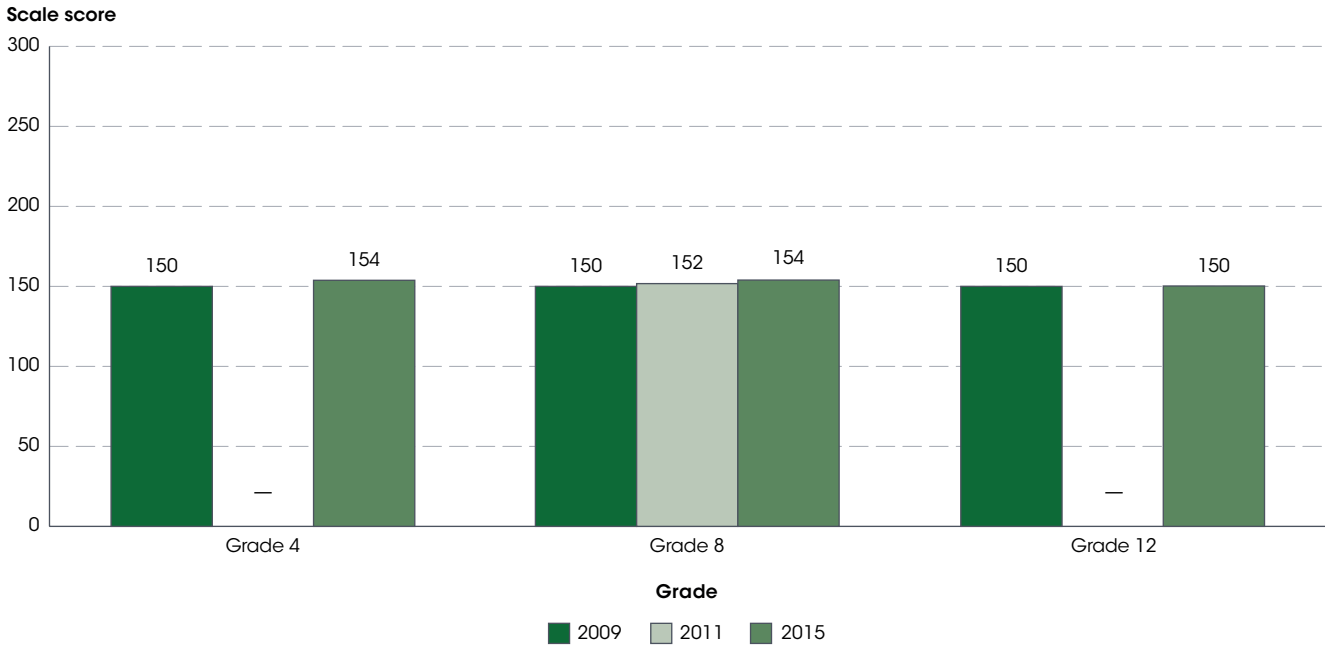
Science Performance

The percentage of 4th-grade students scoring at or above the Proficient *level was higher in 2015 (38 percent) than in 2009 (34 percent), according to data from the National Assessment of Educational Progress. In addition, the percentage of 8th-grade students scoring at or above the* Proficient *level was higher in 2015 (34 percent) than in 2009 (30 percent). The percentage of 12th-grade students scoring at or above the* Proficient *level in 2015 (22 percent) was not measurably different from the percentage in 2009.*

The National Assessment of Educational Progress (NAEP) assesses student performance in science at grades 4, 8, and 12 in both public and private schools across the nation. The NAEP science assessment was designed to measure students' knowledge of three content areas: physical science, life science, and Earth and space sciences. NAEP science scores range from 0 to 300 for all three grades. NAEP achievement levels define what students should know and be able to do: *Basic* indicates partial mastery of fundamental skills, and *Proficient* indicates solid academic performance and competency over challenging subject matter. The most recent science assessments were conducted in 2015 for grades 4, 8, and 12. Prior to 2015, grades 4 and 12 were last assessed in 2009 while grade 8 was assessed in 2011 and 2009.[1]

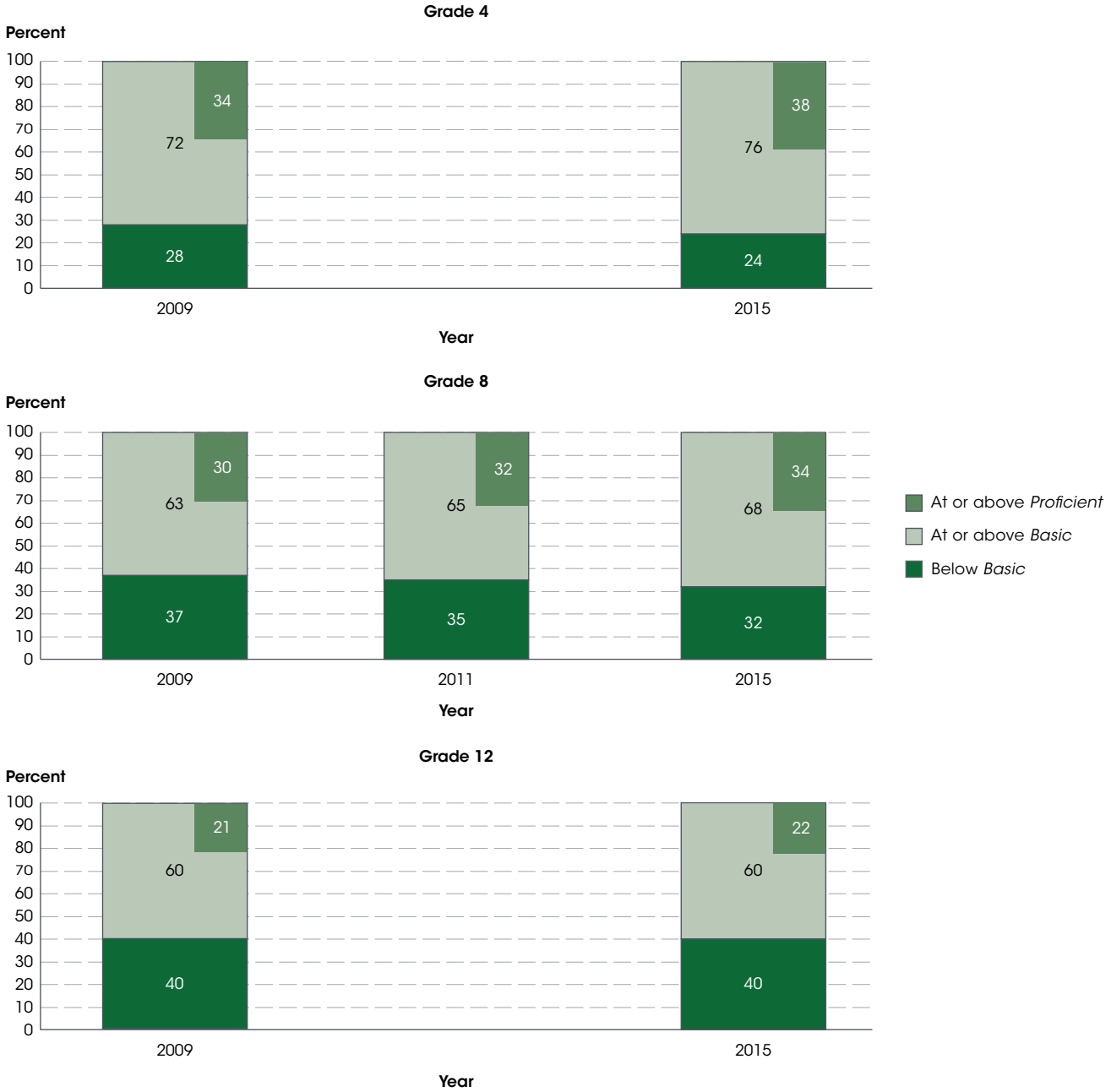
Figure 1. Average National Assessment of Educational Progress (NAEP) science scale scores of 4th-, 8th-, and 12th-grade students: 2009, 2011, and 2015



— Not available.
NOTE: Includes public and private schools. Scale ranges from 0 to 300 for all grades, but scores cannot be compared across grades. Assessment was not conducted for grades 4 and 12 in 2011.
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009, 2011, and 2015 Science Assessment, NAEP Data Explorer. See *Digest of Education Statistics 2016*, table 223.10.

In 2015, the average 4th-grade science score (154) was higher than the score in 2009 (150). The average 8th-grade science score in 2015 (154) was higher than the scores in both 2009 (150) and 2011 (152). The average 12th-grade science score in 2015 (150) was not measurably different from the score in 2009.

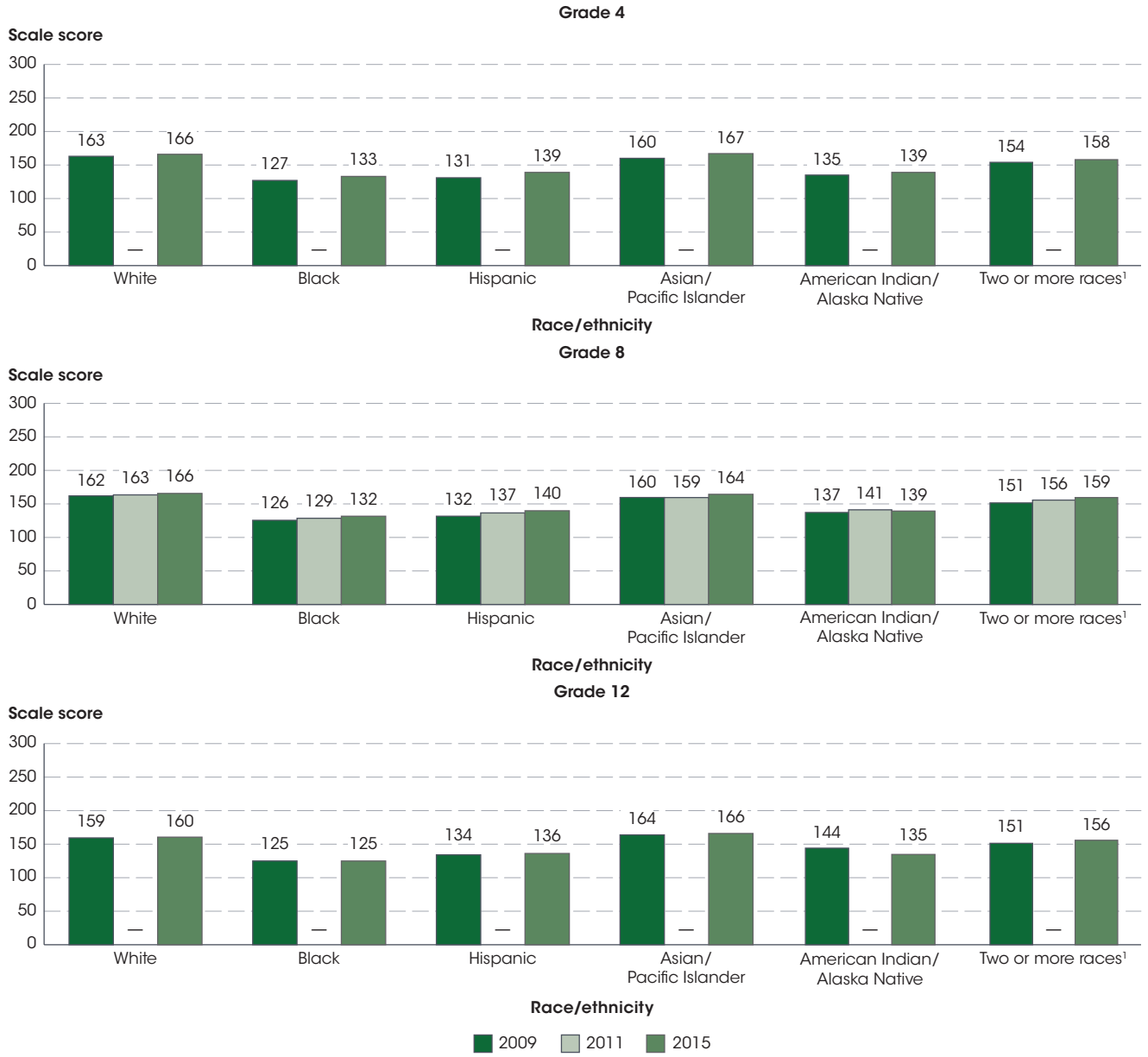
Figure 2. Percentage distribution of 4th-, 8th-, and 12th-grade students across National Assessment of Educational Progress (NAEP) science achievement levels: 2009, 2011, and 2015



NOTE: Includes public and private schools. Achievement levels define what students should know and be able to do: *Basic* indicates partial mastery of fundamental skills, and *Proficient* indicates solid academic performance and competency over challenging subject matter. Assessment was not conducted for grades 4 and 12 in 2011. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009, 2011, and 2015 Science Assessment, NAEP Data Explorer. See *Digest of Education Statistics 2016*, table 223.10.

In 2015, about 76 percent of 4th-grade students performed at or above the *Basic* achievement level in science, and 38 percent performed at or above the *Proficient* level. These percentages were higher than the corresponding 2009 percentages for at or above *Basic* (72 percent) and at or above *Proficient* (34 percent). Among 8th-grade students in 2015, about 68 percent performed at or above *Basic* in science, and 34 percent performed at or above *Proficient*. The percentage performing at or above *Basic* was higher in 2015 than in both 2009 (63 percent) and 2011 (65 percent), and the percentage performing at or above *Proficient* was also higher in 2015 than in 2009 (30 percent) and 2011 (32 percent). The percentages of 12th-grade students in 2015 performing at or above *Basic* (60 percent) and at or above *Proficient* (22 percent) were not measurably different from the corresponding percentages in 2009.

Figure 3. Average National Assessment of Educational Progress (NAEP) science scale scores of 4th-, 8th-, and 12th-grade students, by race/ethnicity: 2009, 2011, and 2015



— Not available.
[1] In 2009, students in the "Two or more races" category were categorized as "Unclassified."
NOTE: Includes public and private schools. Scale ranges from 0 to 300 for all grades, but scores cannot be compared across grades. Assessment was not conducted for grades 4 and 12 in 2011. Race categories exclude persons of Hispanic ethnicity.
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009, 2011, and 2015 Science Assessment, NAEP Data Explorer. See *Digest of Education Statistics 2016*, table 223.10.

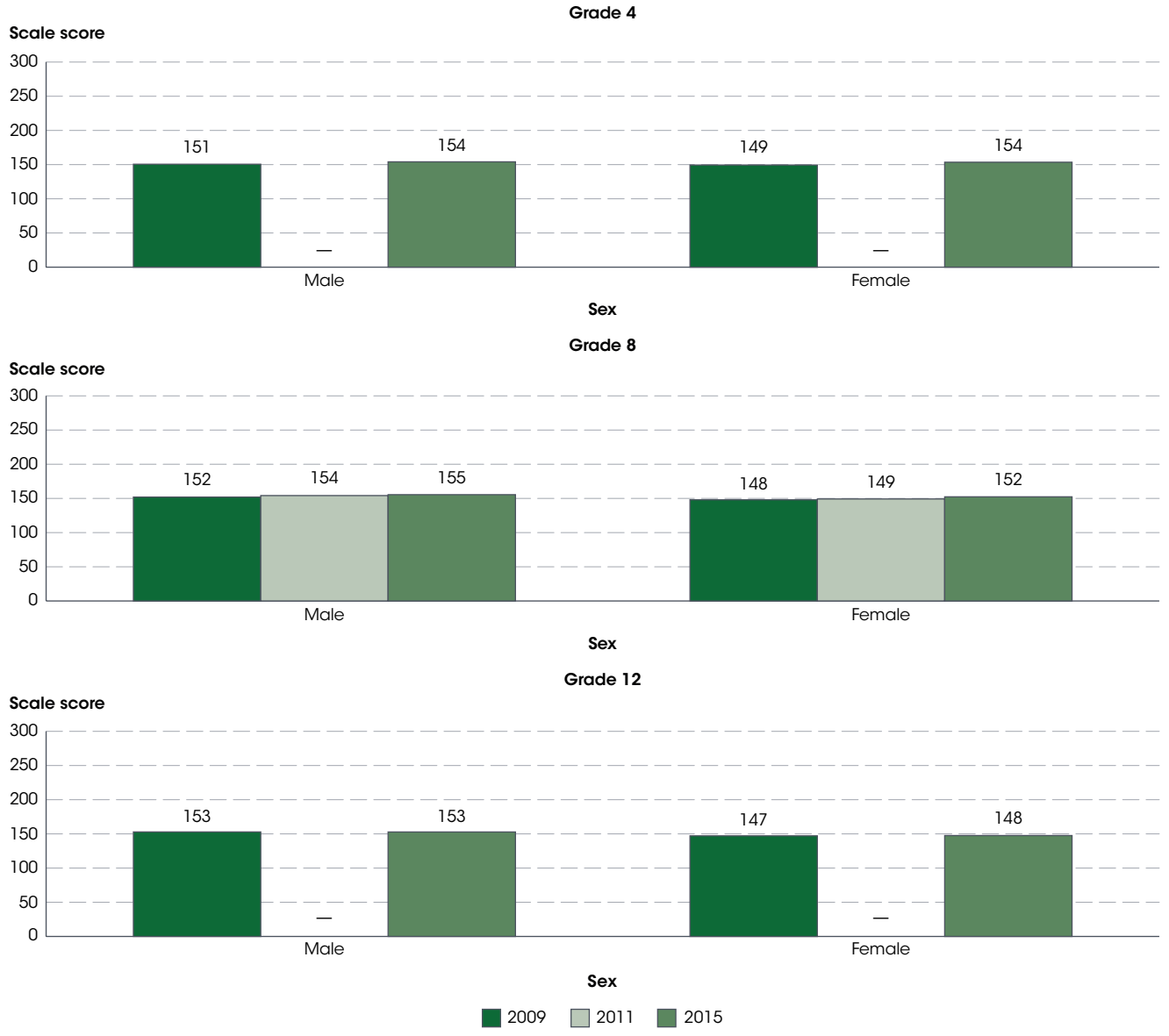
At grade 4, the average scores for Asian/Pacific Islander students (167), White students (166), students of Two or more races[2] (158), Hispanic students (139), American Indian/Alaska Native students (139), and Black students (133) in 2015 were higher than the corresponding scores in 2009. Starting in 2011, separate data for Asian and Pacific Islander students were collected. In 2015, the first year that data for these students were available at grade 4, the average score was 169 for Asian students and 143 for Pacific Islander students.

At grade 8, the average scores for White (166), Asian/Pacific Islander (164), Hispanic (140), and Black students (132) in 2015 were higher than the corresponding scores in 2009 and in 2011. The 2015 average score for students of Two or more races (159) was higher than the corresponding score in 2009 but was not measurably different from the score in 2011. The 2015 average score for American Indian/Alaska Native students (139) was not measurably different from the scores in 2009 and 2011. The 2015 average score for Asian students (166) was higher than the score in 2011, while the 2015 average score for Pacific Islander students (138) was not measurably different from the score in 2011.

At grade 12, the average 2015 science scores for Asian/Pacific Islander students (166), White students (160), students of Two or more races (156), Hispanic students (136), American Indian/Alaska Native students (135), and Black students (125) were not measurably different from the corresponding scores in 2009. The 2015 average score for Asian students was 167, while the average score for Pacific Islander students is unavailable because reporting standards were not met.

While the average science scores for White 4th- and 8th-grade students remained higher than those of their Black and Hispanic peers in 2015, racial/ethnic achievement gaps in 2015 were smaller than in 2009. At grade 4, the White-Black achievement gap was 36 points in 2009 and 33 points in 2015, and the White-Hispanic achievement gap was 32 points in 2009 and 27 points in 2015. At grade 8, the White-Black achievement gap in 2009 (36 points) was larger than in 2015 (34 points), and the White-Hispanic achievement gap was 30 points in 2009 and 26 points in 2015. However, these 2015 achievement gaps at grade 8 were not measurably different from the corresponding gaps in 2011. Additionally, while the average science scores for White 12th-grade students remained higher than those of their Black and Hispanic peers in 2015, these racial/ethnic achievement gaps did not measurably change between 2009 and 2015. At grade 12, the White-Black achievement gap (36 points) and the White-Hispanic gap (24 points) in 2015 were not measurably different from the corresponding gaps in 2009.

Figure 4. Average National Assessment of Educational Progress (NAEP) science scale scores of 4th-, 8th-, and 12th-grade students, by sex: 2009, 2011, and 2015



— Not available.
NOTE: Includes public and private schools. Scale ranges from 0 to 300 for all grades, but scores cannot be compared across grades. Assessment was not conducted for grades 4 and 12 in 2011.
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009, 2011, and 2015 Science Assessment, NAEP Data Explorer. See *Digest of Education Statistics 2016*, table 223.10.

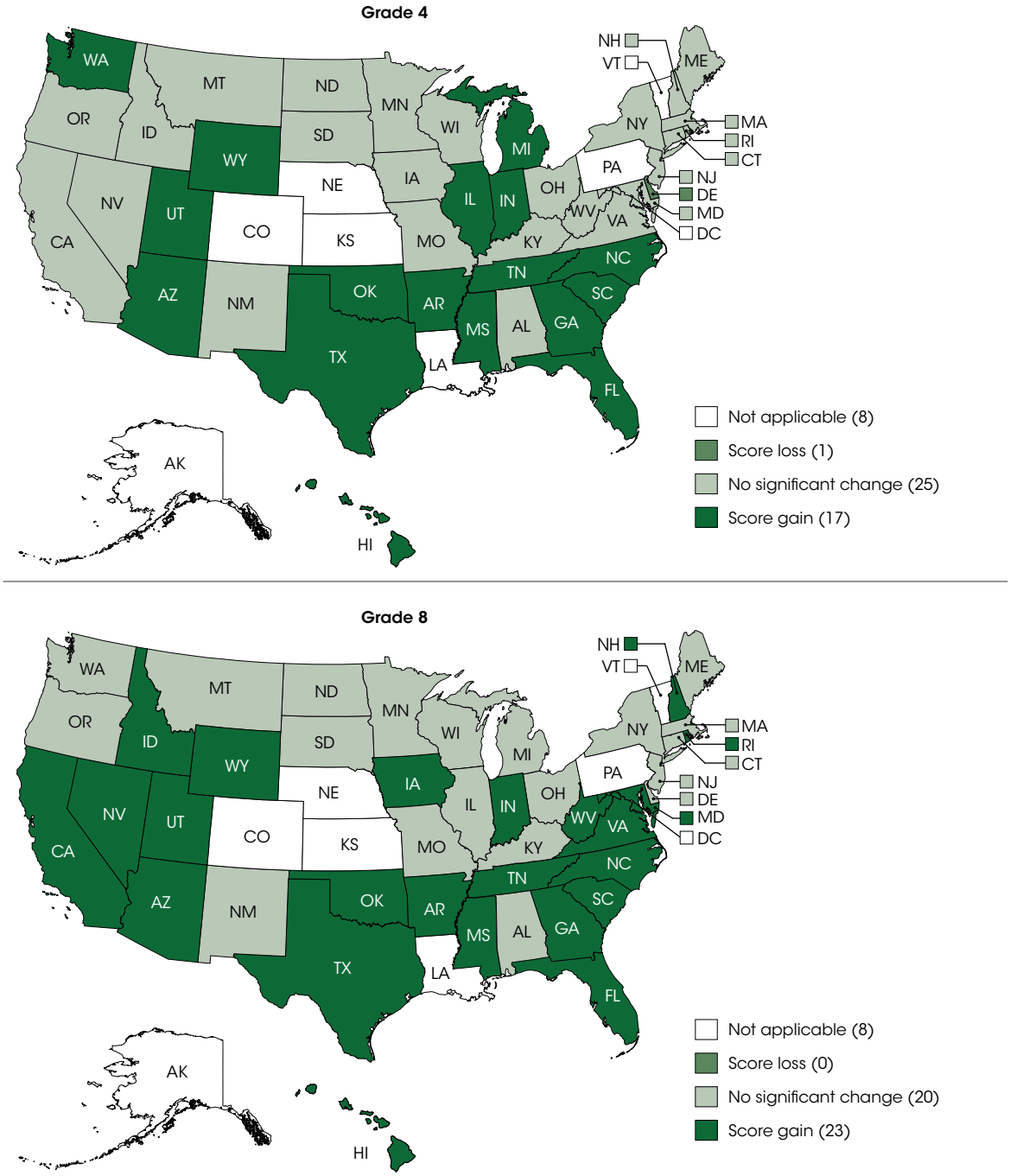
The average science score for male 4th-grade students in 2015 (154) was higher than the score in 2009 (151). The average score for female 4th-grade students was also higher in 2015 (154) than in 2009 (149). While there was a 1-point gap between male and female 4th-grade students in 2009, there was no measurable gender gap in 2015. The average science score for male 8th-grade students in 2015 (155) was higher than the scores in 2009 (152) and 2011 (154). Similarly, for female 8th-grade students, the average score in 2015 (152) was higher than the scores in 2009 (148) and 2011 (149). In 2015, 2011, and 2009, the average science score for male 8th-grade students was higher than that of their female peers. The 3-point score gap between male and female 8th-graders in 2015 was smaller than the gap in 2011 (5 points) but not measurably different from the gap in 2009. Average science scores in 2015 for 12th-grade male (153) and female (148) students were not measurably different from the corresponding scores in 2009. In addition, the 5-point gender gap among 12th-grade students in 2015 was not measurably different from the gap in 2009.

Since 2009, the average science scores for English language learner (ELL) 4th- and 8th-grade students were lower than their non-ELL peers' scores. At grade 4, the achievement gap between non-ELL and ELL students was larger in 2009 (39 points) than in 2015 (36 points). At grade 8, the 2015 achievement gap (46 points) was not measurably different from the gaps in 2009 and 2011. At grade 12, the average scores for non-ELL students in 2015 (152) and 2009 (151) were higher than their ELL peers' scores in those years (105 and 104, respectively). The 47-point achievement gap between non-ELL and ELL 12th-grade students in 2015 was not measurably different from the gap in 2009.

In 2015, the average science score for 4th-grade students in high-poverty schools (134) was lower than the average scores for 4th-grade students in mid-high poverty schools (151), mid-low poverty schools (161), and low-poverty schools (172).[3] At grade 8, the average 2015 science score for students in high-poverty schools (134) was lower than the average scores for students in mid-high poverty schools (150), mid-low poverty schools (161), and low-poverty schools (170). At grade 4, the 2015 achievement gap between students at high-poverty schools and low-poverty schools (38 points) was lower than the gap in 2009 (41 points). At grade 8, the 2015 achievement gap (36 points) was lower than the gap in 2009 (41 points) but was not measurably different from the gap in 2011. At grade 12 in 2015, the average science score for students in high-poverty schools (126) was lower than the average scores for those in mid-high poverty schools (143), mid-low poverty schools (154), and low-poverty schools (165). The achievement gap between students at high-poverty schools and low-poverty schools was 39 points in 2015, which was not measurably different from the gap in 2009.

NAEP results also permit state-level comparisons of the science performance of 4th- and 8th-grade students in public schools. Forty-six states[4] participated in the NAEP science assessment in 2015, and average scores varied across the states for both grades. At grade 4, the national public school average score was 153, and state average scores ranged from 140 to 165. Twenty-two states had average scores that were higher than the national average, 15 states had average scores that were not measurably different from the national average, and 9 states had average scores that were lower than the national average. At grade 8, the 2015 national public school average score was also 153, and state average scores ranged from 140 to 166. Twenty-six states had average scores that were higher than the national average, 6 states had average scores that were not measurably different from the national average, and 14 states had scores that were lower than the national average.

Figure 5. Change in average National Assessment of Educational Progress (NAEP) science scale scores of 4th- and 8th-grade public school students, by state: 2009 and 2015



NOTE: Scale ranges from 0 to 300 for all grades, but scores cannot be compared across grades. "Gain" is defined as a significant increase from 2009 to 2015, "no change" is defined as no significant change from 2009 to 2015, and "loss" is defined as a significant decrease from 2009 to 2015.
SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 and 2015 Science Assessment, NAEP Data Explorer. See *Digest of Education Statistics 2016*, table 223.20.

Forty-three states participated in the NAEP science assessment in both 2009 and 2015 at grades 4 and 8.[5] The average science score for 4th-grade public school students across the nation was higher in 2015 (153) than in 2009 (149). Seventeen states had average 4th-grade scores that were also higher in 2015 than in 2009, while 25 states had average scores in 2015 that were not measurably different from their average scores in 2009. Delaware's average score for 4th-grade students was lower in 2015 (150) than in 2009 (153). The national public school average science score for 8th-grade students was also higher in 2015 (153) than in 2009 (149). Similarly, 23 states had higher average 8th-grade scores in 2015 than in 2009, while average scores for the remaining 20 states in 2015 were not measurably different from their scores in 2009. During this time, no state experienced a score loss at the 8th-grade level.

Endnotes:

[1] In 2009, a new science framework was introduced at all grade levels. A variety of factors made it necessary to create a new framework: the publication of *National Science Education Standards* (1996) and *Benchmarks for Scientific Literacy* (1993), advances in both science and cognitive research, the growth in national and international science assessments, advances in innovative assessment approaches, and the need to incorporate accommodations so that the widest possible range of students can be fairly assessed. Consequently, the science results in 2009 and subsequent years cannot be compared to previous assessments, and a new trend line was established beginning in 2009.

[2] In 2009, students in the "Two or more races" category were categorized as "Unclassified."

[3] High-poverty schools are defined as schools where 76 percent or more of students are eligible for free or reduced-price lunch (FRPL). Mid-high poverty schools are schools where 51 to 75 percent of students are eligible for FRPL, and mid-low poverty schools are schools where 26 to 50 percent of students are eligible for FRPL. Low-poverty schools are defined as schools where 25 percent or less of students are eligible for FRPL.

[4] In 2015, Alaska, Colorado, the District of Columbia, Louisiana, and Pennsylvania did not participate or did not meet the minimum participation guidelines for reporting at grades 4 and 8.

[5] 2009 NAEP science assessment results are not available for Alaska, the District of Columbia, Kansas, Nebraska, and Vermont, and 2015 results are not available for Alaska, Colorado, the District of Columbia, Louisiana, and Pennsylvania. States either did not participate or did not meet the minimum participation guidelines for reporting.

Reference tables: *Digest of Education Statistics 2016*, tables 223.10 and 223.20

Related indicators and resources: International Comparisons: Reading, Mathematics, and Science Literacy of 15-Year-Old Students; International Comparisons: U.S. 4th-, 8th-, and 12th-Graders' Mathematics and Science Achievement; Mathematics Performance; Reading Performance; Technology and Engineering Literacy [*web-only*]

Glossary: Achievement gap; Achievement levels, NAEP; English language learners (ELL); Public school or institution; Racial/ethnic group