STATS IN BRIEF
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Gender Differences in Science, Technology, Engineering, and Mathematics (STEM) Interest, Credits Earned, and NAEP Performance in the 12th Grade

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As technical and scientific

innovation continue to drive the global economy, educators, policymakers, and scientists seek to promote students' interest and achievement in the STEM fields to maintain the nation's competitive position (National Academy of Sciences 2006; National Science Board 2007; President's Council of Advisors on Science and Technology 2012). Many researchers have studied differences in male and female students' attitudes toward and performance in STEM courses and assessments. While some research shows that gaps in male and female performance on STEM-related assessments have narrowed or even closed (Lindberg et al. 2010), other research continues to report gender differences in student affective dispositions (i.e., interest) toward mathematics and science, as well as differences in student performance in mathematics and science, especially in math-intensive science fields (Ceci et al. 2014; White House Council on Women and Girls 2011). This Statistics in Brief describes high school graduates' attitudes toward STEM courses (specifically, mathematics and science), credits earned in STEM fields, and performance on the National Assessment of Educational Progress (NAEP) mathematics and science assessments in 2009.

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High School STEM Courses

STEM fields[1] include mathematics; the natural sciences, including the physical sciences and biological/agricultural sciences; engineering/engineering technologies; and computer/information sciences. The STEM courses examined in this brief fall into three broad categories:

1. *Advanced mathematics:* Includes algebra II, other advanced mathematics courses, precalculus/analysis, and calculus. The "other advanced" mathematics courses are trigonometry, statistics/probability, algebra III, analytic geometry, International Baccalaureate (IB) mathematics, and discrete mathematics.

2. *Advanced science and engineering:* Engineering courses include academic courses in which students apply mathematics and science skills and concepts to engineering problems as well as a few specialized courses (e.g., survey/mapping sciences and metallurgy). Advanced science courses include advanced biology, chemistry, physics, and advanced environmental/earth sciences. "Advanced biology" courses include Advanced Placement (AP)/IB biology, physiology, anatomy, and genetics. "Advanced environmental/earth sciences" courses include AP/IB environmental science, college preparatory earth science, and various geology courses.

3. *STEM-related technical:* Includes computer/information science, engineering/science technologies, and health science/technologies. Engineering/science technology courses refer to courses that focus on technical tasks used in engineering and science occupations, such as instrumentation or equipment maintenance. Computer/information science includes computer programming, logic, algorithms, and systems administration but does not include courses that instruct students in using software (e.g., processing). Health science/technologies include an array of courses associated with occupations in the allied health fields.

Throughout the brief, reported findings related to specific STEM courses are grouped into these three categories.

[1] The classification of the STEM categories and the associated courses is consistent with previously published analyses of the NAEP HSTS (Laird, Alt, and Wu 2009; Nord et al. 2011).

DATA SOURCES AND ANALYTIC SAMPLE

This brief uses data from two sources to investigate the research questions. The first is the 2009 NAEP High School Transcript Study (HSTS), conducted in conjunction with the 2009 NAEP assessment administration. The HSTS is designed to collect information about high school graduates' coursetaking patterns, credits earned, GPA, NAEP mathematics and science performance, and student information such as gender, race/ethnicity, and parent education level. The HSTS also collects information on the schools that these graduates attended. Exploration of the HSTS data allows for a deeper examination of STEM fields at the coursetaking level. Consistent with previously published analyses of the HSTS (Laird, Alt, and Wu 2009; Nord et al. 2011), the current analysis limits the analytic sample to high school graduates who earned regular or honors diplomas and excludes those who received a special education diploma, certificate of completion (or attendance), and students who did not graduate or had less than 3 years of transcript data.[2]

Data for this brief also come from the 2009 NAEP Grade 12 Mathematics and Science Student Questionnaires, which collected information from students on their classroom experiences and educational support. The questionnaire items used in this brief asked students about their interest in mathematics and science, which is measured by students' rating of the extent to which they agreed or disagreed with the following statements: "I like mathematics," "Mathematics is one of my favorite subjects," "I like science," and "Science is one of my favorite subjects." The estimates reported in the brief combine the agree and strongly agree response categories to produce an indicator of high school graduates who have an interest in mathematics or science. The findings reported constitute an illustrative rather than exhaustive list of significant results of the study. Comparisons highlighted in the text are statistically significant at the $p < .05$ level to ensure that differences are larger than might be expected due to sampling variation; no adjustments were made for multiple comparisons. For further details on the analytic sample, NAEP questionnaires, or study methods, see **Technical Notes** toward the end of this brief.

[2] The HSTS is restricted to high school graduates and contains no information about dropouts, who may differ in certain characteristics from graduates.

STUDY QUESTIONS

1 Among 2009 high school graduates, how does interest in mathematics and science differ by gender?

2 Among 2009 high school graduates, how does earning credit in STEM courses differ by gender?

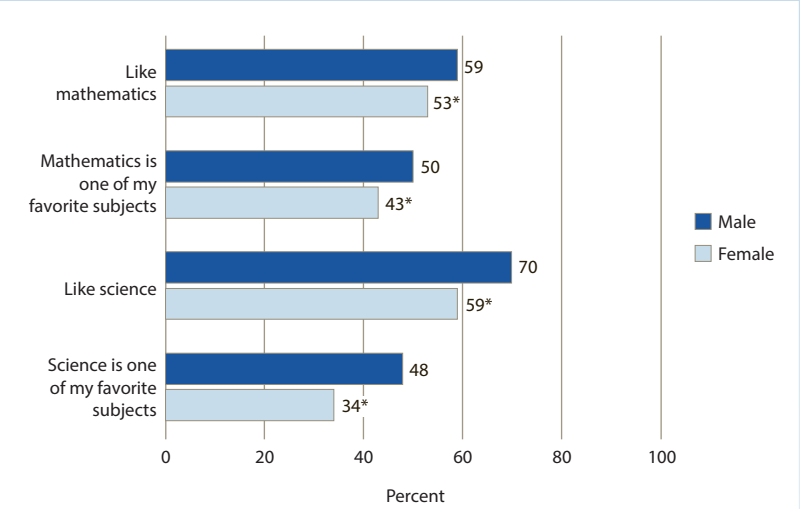
3 Among 2009 high school graduates, how do the NAEP mathematics and science scale scores of students who earned credits in STEM courses differ by gender?

KEY FINDINGS

- In 2009, compared to males, lower percentages of female high school graduates reported that they liked mathematics or science and that mathematics or science was one of their favorite subjects (figure 1, page 4).
- Compared to males, higher percentages of female 2009 high school graduates took algebra II, precalculus, advanced biology, chemistry, and health science/ technology courses (table 1, page 7).
- Generally, among 2009 high school graduates who had earned credits in specific mathematics and science courses, males had higher average NAEP mathematics and NAEP science scale scores than females (figures 4–6, pages 8–10).

FIGURE 1.

Percent of high school graduates who reported interest in mathematics and science, by gender: 2009



* Significantly different from males at the $p < .05$ level.

NOTE: Respondents were asked to indicate how much they disagree or agree with the following statements: "I like mathematics/science" and "Mathematics/science is one of my favorite subjects." Respondents could answer: "Strongly disagree," "Disagree," "Agree," or "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "like mathematics/science" and "mathematics/science is one of my favorite subjects."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

1 Among 2009 high school graduates, how does interest in mathematics and science differ by gender?

In general, a higher percentage of male than female high school graduates expressed interest in mathematics, and the same was true for interest in science. As shown in figure 1 (page 4), in 2009, a higher percentage of males than females reported that they liked mathematics (59 vs. 53 percent). In addition, 50 percent of male high school graduates said that mathematics was one of their favorite subjects, compared to 43 percent of female high school graduates. Similarly, in 2009, higher percentages of males reported that they liked science or that science was a favorite subject.[3]

The general pattern of higher percentages of males than females reporting interest in mathematics and science is evident among some additional subgroups of high school graduates. For example, in 2009, among racial/ethnic groups, higher percentages of male graduates reported that they liked mathematics or science and that mathematics or science was a favorite subject, compared to female graduates (figures 2 and 3, page 6). Compared to White female graduates, a higher percentage of White male graduates in 2009 reported that they liked mathematics or science by 4 and 10 percentage points, respectively, and a higher percentage of White males reported that mathematics or science was a favorite subject by 6 and 14 percentage points, respectively. Higher percentages of Black male graduates in 2009 reported that they liked mathematics or science (by 9 and 13 percentage points, respectively) and having mathematics or science as a favorite subject (by 11 and 12 percentage points, respectively) than their female counterparts.

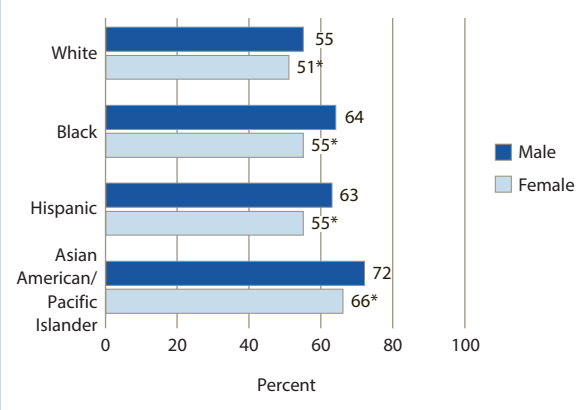
Among Hispanic graduates in 2009, the same pattern emerged: the percentages of male graduates who reported that they liked mathematics or science were higher than the corresponding percentages of female graduates by 8 and 16 percentage points, respectively, and the percentages of male graduates who reported that mathematics or science was a favorite subject were higher by 12 and 15 percentage points, respectively. Compared to female Asian American/Pacific Islander graduates in 2009, a higher percentage of male Asian American/Pacific Islander graduates reported that they liked mathematics (by 7 percentage points), that mathematics was a favorite subject (by 10 percentage points), and that science was as favorite subject (by 10 percentage points).[4]

[3] The questionnaire items used to gather data on respondents' mathematics and science interest do not measure interest in specific mathematics or science subjects or sub-disciplines. However, other research has shown that gender differences in STEM engagement are not uniform across mathematics and science subject topic areas (Ceci et al. 2014). Sub-discipline-specific gender differences should be considered when interpreting gender differences in the broader categories of mathematics and science presented in this brief.

[4] Differences were calculated using unrounded numbers.

FIGURE 2a.

Percent of high school graduates who reported that they agree or strongly agree that they like mathematics, by race/ethnicity and gender: 2009



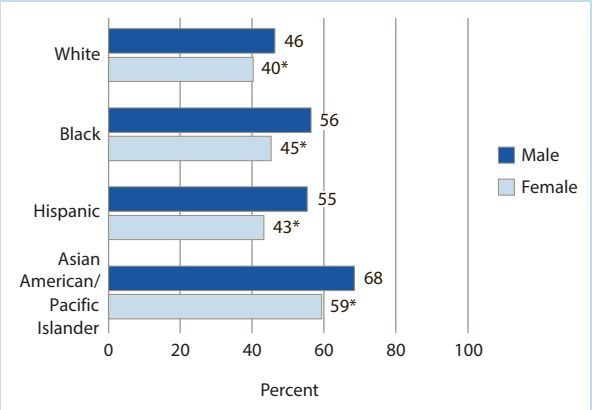
* Significantly different from males at the $p < .05$ level.

NOTE: Race categories exclude persons of Hispanic origin. Asian American/Pacific Islander includes Native Hawaiian. American Indian/Alaska Native and those classified as other are not included because sample sizes are insufficient to permit a reliable estimate. Respondents were asked to indicate how much they disagree or agree with the following statement: "I like mathematics." Respondents could answer: "Strongly disagree," "Disagree," "Agree," "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "like mathematics."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

FIGURE 2b.

Percent of high school graduates who reported that they agree or strongly agree that mathematics is one of their favorite subjects, by race/ethnicity and gender: 2009



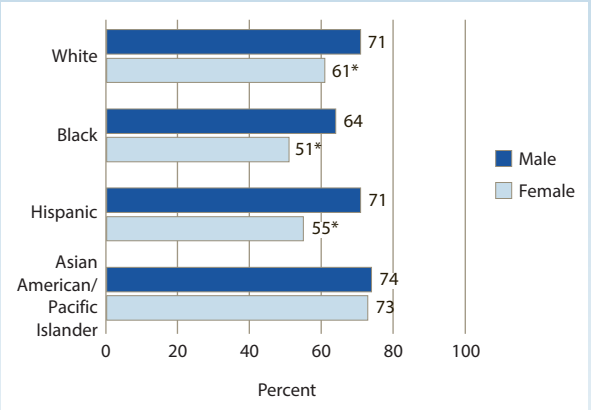
* Significantly different from males at the $p < .05$ level.

NOTE: Race categories exclude persons of Hispanic origin. Asian American/Pacific Islander includes Native Hawaiian. American Indian/Alaska Native and those classified as other are not included because sample sizes are insufficient to permit a reliable estimate. Respondents were asked to indicate how much they disagree or agree with the following statement: "Mathematics is one of my favorite subjects." Respondents could answer: ""Strongly disagree," "Disagree," "Agree," "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "mathematics is one of my favorite subjects."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

FIGURE 3a.

Percent of high school graduates who reported that they agree or strongly agree that they like science, by race/ethnicity and gender: 2009



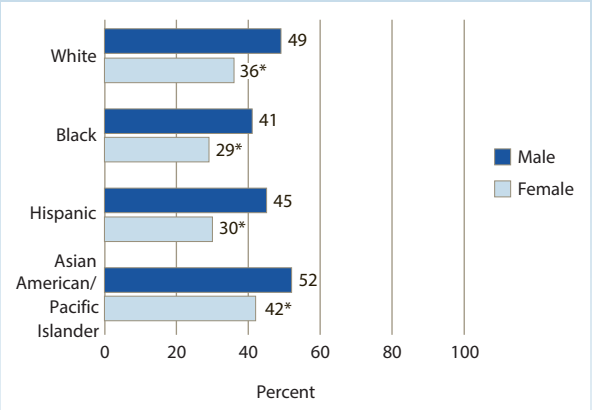
* Significantly different from males at the $p < .05$ level.

NOTE: Race categories exclude persons of Hispanic origin. Asian American/Pacific Islander includes Native Hawaiian. American Indian/Alaska Native and those classified as other are not included because sample sizes are insufficient to permit a reliable estimate. Respondents were asked to indicate how much they disagree or agree with the following statement: "I like science." Respondents could answer: "Strongly disagree," "Disagree," "Agree," "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "like science."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

FIGURE 3b.

Percent of high school graduates who reported that they agree or strongly agree that science is one of their favorite subjects, by race/ethnicity and gender: 2009



* Significantly different from males at the $p < .05$ level.

NOTE: Race categories exclude persons of Hispanic origin. Asian American/Pacific Islander includes Native Hawaiian. American Indian/Alaska Native and those classified as other are not included because sample sizes are insufficient to permit a reliable estimate. Respondents were asked to indicate how much they disagree or agree with the following statement: "Science is one of my favorite subjects." Respondents could answer: "Strongly disagree," "Disagree," "Agree," "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "science is one of my favorite subjects."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

2 Among 2009 high school graduates, how does earning credit in STEM courses differ by gender?

Variation existed in the percentages of male and female 2009 high school graduates who earned credits for STEM courses (table 1, page 7).[5] Compared to males, higher percentages of females earned credits in algebra II, precalculus, advanced biology, chemistry, and health science/technologies. However, higher percentages of males earned credits in physics, engineering, engineering/science technologies, and computer/information science.

Table 1. Percent of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM) courses, by gender and course: 2009

STEM course	Male	Female
Advanced mathematics		
Algebra II	73.5	77.7 *
Precalculus/analysis	33.9	36.7 *
Calculus	17.0	16.7
Other advanced[1]	29.4	30.3
Advanced science and engineering		
Advanced biology[2]	39.4	49.9 *
Chemistry	66.7	72.4 *
Physics	41.5	35.9 *
Advanced environmental/earth sciences[3]	10.8	10.7
Engineering	5.6	1.1 *
STEM-related technical		
Engineering/science technologies[4]	10.4	2.0 *
Health science/technologies	5.5	12.8 *
Computer/information science	24.0	13.8 *

* Significantly different from males at the $p < .05$ level.

[1] "Other advanced" courses include trigonometry, statistics/probability, algebra III, analytic geometry, International Baccalaureate (IB) mathematics, and discrete mathematics.

[2] "Advanced biology" courses include Advanced Placement (AP)/IB biology, physiology, anatomy, and genetics.

[3] "Advanced environmental/earth sciences" courses include AP/IB environmental science, college preparatory earth science, and various geology courses.

[4] "Engineering/science technologies" courses focus on instrumentation, equipment maintenance, and other technical tasks conducted in engineering and science-related occupations.

NOTE: Students may have earned credits in more than one STEM course.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009.

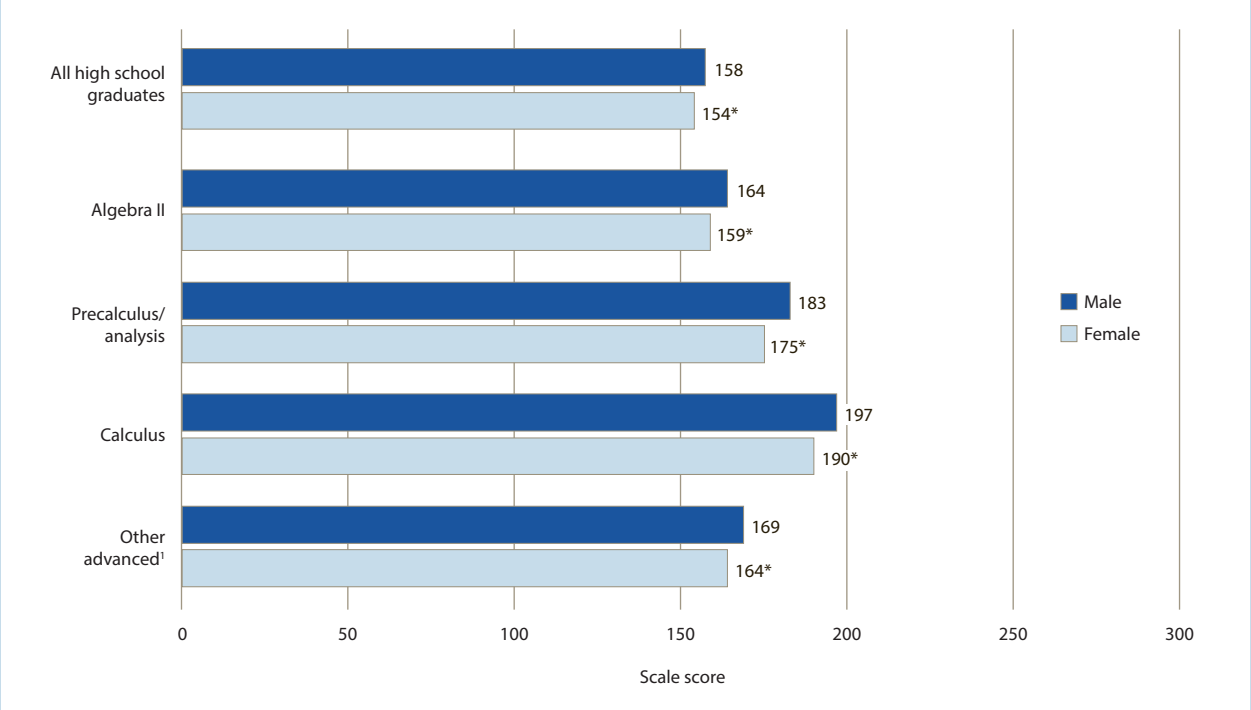
[5] This brief does not investigate the availability of STEM courses.

3 Among 2009 high school graduates, how do the NAEP mathematics and science scale scores of students who earned credits in STEM courses differ by gender?

In 2009, compared to females, male high school graduates had higher average NAEP mathematics and NAEP science scale scores. Consistent with the overall pattern of higher average NAEP scores among male graduates, males who earned credits in specific advanced mathematics and advanced science courses generally had higher average NAEP mathematics and NAEP science scale scores, respectively, than their female counterparts. Specifically, in 2009, male high school graduates' NAEP mathematics and NAEP science scale scores were higher among students who took algebra II, precalculus, calculus, other advanced math, advanced biology, chemistry, physics, health/science technologies, and computer/information science. The exceptions to the identified pattern were for advanced environmental/earth science, engineering, and engineering/science technologies, in which no measurable differences were found (figures 4, 5, and 6, pages 8, 9, and 10). Average

FIGURE 4.

National Assessment of Educational Progress (NAEP) average mathematics scale scores of high school graduates who earned credits in advanced mathematics courses, by course and gender: 2009



* Significantly different from males at the $p < .05$ level.

[1] "Other advanced" courses include trigonometry, statistics/probability, algebra III, analytic geometry, International Baccalaureate (IB) mathematics, and discrete mathematics.

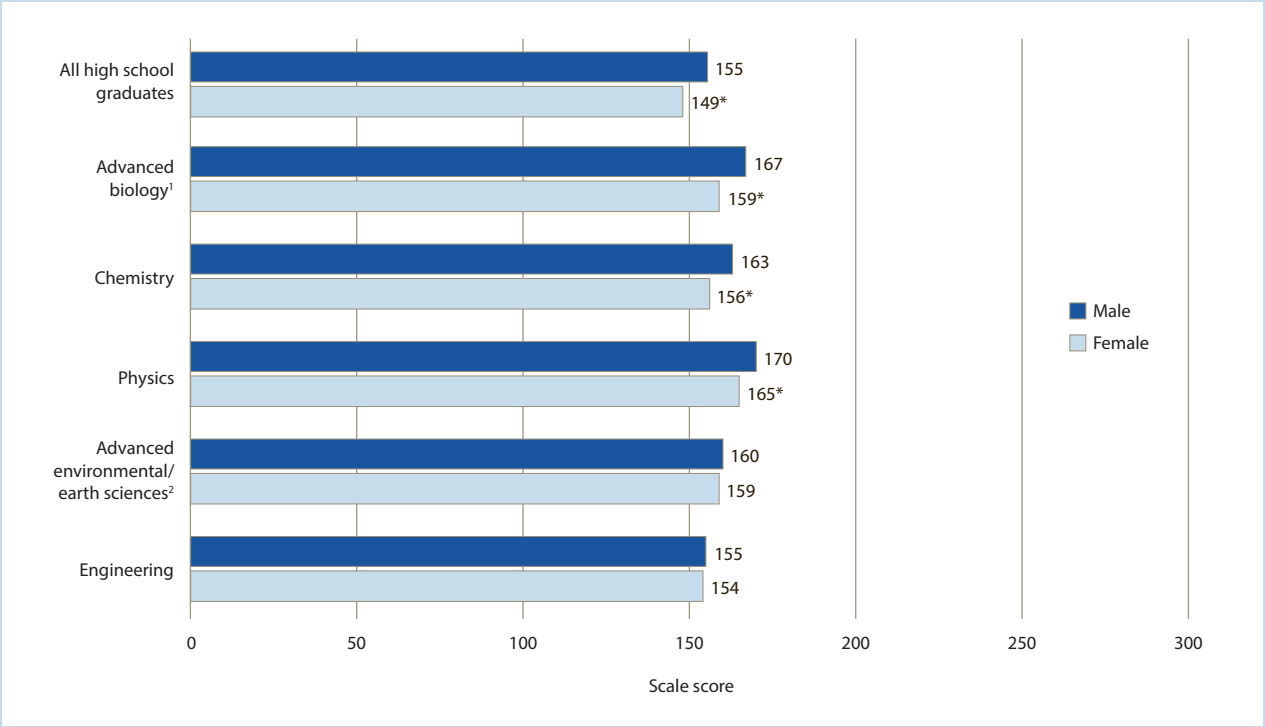
NOTE: The NAEP 12th-grade mathematics results are reported on a 0–300 scale. Students may have earned credits in more than one STEM course.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics Assessment.

NAEP scale scores in 2009 for students who earned credits in the STEM courses analyzed were lowest among students who earned credits in health science/technology (in mathematics, males scored 159 and females scored 148; in science, males scored 154 and females scored 140). Conversely, average NAEP scale scores in 2009 were highest among students who earned credits in calculus (in mathematics, males scored 197 and females scored 190; in science, males scored 189 and females scored 181 (tables A-4 and A-5, pages 20 and 21)).

FIGURE 5.

National Assessment of Educational Progress (NAEP) average science scale scores of high school graduates who earned credits in advanced science and engineering courses, by course and gender: 2009



* Significantly different from males at the $p < .05$ level.

[1] "Advanced biology" courses include Advanced Placement (AP)/International Baccalaureate (IB) biology, physiology, anatomy, and genetics.

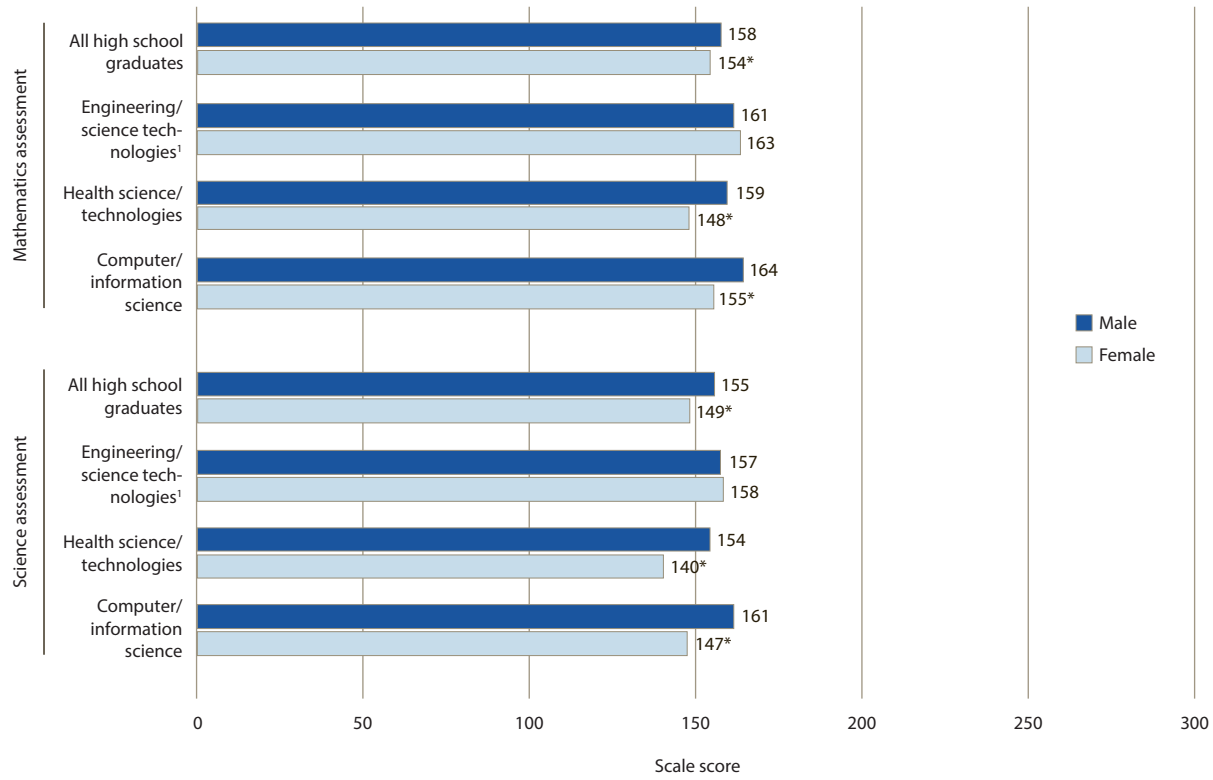
[2] "Advanced environmental/earth sciences" courses include AP/IB environmental science, college preparatory earth science, and various geology courses.

NOTE: The NAEP 12th-grade science results are reported on a 0–300 scale. Students may have earned credits in more than one STEM course.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Science Assessment.

FIGURE 6.

National Assessment of Educational Progress (NAEP) average mathematics and science scale scores of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM)-related technical courses, by course and gender: 2009



* Significantly different from males at the $p < .05$ level.

[1] "Engineering/science technologies" courses focus on instrumentation, equipment maintenance, and other technical tasks conducted in engineering and science-related occupations.

NOTE: The NAEP 12th-grade mathematics and science results are reported on a 0–300 scale. Because NAEP mathematics and science assessment scales are developed independently, mathematics and science scale scores cannot be compared across courses taken. Students may have earned credits in more than one STEM course.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

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http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015075

Readers of this brief may be interested in other NAEP and HSTS reports:

National Center for Education Statistics (2010). *The Nation's Report Card: Grade 12 Reading and Mathematics 2009 National and Pilot State Results* (NCES 2011-455). Institute of Education Sciences, U.S. Department of Education, Washington, DC.

National Center for Education Statistics (2011). *The Nation's Report Card: Science 2009* (NCES 2011-451). Institute of Education Sciences, U.S. Department of Education, Washington, DC.

National Center for Education Statistics (2012). *The Nation's Report Card: Science in Action: Hands-on and Interactive Computer Tasks From the 2009 Science Assessment* (NCES 2012-468). Institute of Education Sciences, U.S. Department of Education, Washington, DC.

Nord, C., Roey, S., Perkins, R., Lyons, M., Lemanski, N., Brown, J., and Schuknecht, J. (2011). *The Nation's Report Card: America's High School Graduates* (NCES 2011-462). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

To access and explore NAEP and HSTS data, please visit the NAEP Data Explorer at http://nces.ed.gov/nationsreportcard/naepdata/.

TECHNICAL NOTES

The 2009 National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS) was used in this brief to examine gender differences in interest in, credits earned, and performance in mathematics and sciences. The 2009 NAEP included mathematics and science assessments of a nationally representative sample at grade 12. The 2009 HSTS collected school transcripts from a nationally representative sample of around 38,000 transcripts (from over 41,000 students in the sample) representing approximately 3 million high school graduates. The NAEP 12th-grade mathematics and science results are reported on a scale of 0–300. Because NAEP scales are developed independently for each assessment, scales scores cannot be used to make comparisons across subjects. Further information about the NAEP mathematics and science assessments is available at http://nces.ed.gov/nationsreportcard/mathematics/ and http://nces.ed.gov/nationsreportcard/science/. Further details on the methodology for the 2009 HSTS are available at http://nces.ed.gov/nationsreportcard/hsts/, and more information on the NAEP Student Questionnaires can be found at http://nces.ed.gov/nationsreportcard/bgquest.aspx.

Target Population, Sampling, and Analytical Sample

The HSTS sample was designed to yield a nationally representative sample of all students in public and private schools in the United States who were enrolled in 12th grade in the 2008–09 school year and graduated in 2009. The target population for this brief is public and private high school graduates of the class of 2009. For public schools, the HSTS sample was a subset of the NAEP 2009 12th-grade public school sample selected for the 2009 NAEP mathematics and science assessment. The HSTS sample included every eligible sampled NAEP 2009 12th-grade public school that was contacted, whether or not the school participated in the main NAEP assessment. Over 80 percent of the participating HSTS students also participated in NAEP; however, not all of the students selected for the HSTS sample participated in the HSTS. Students excluded from the study included nongraduates and students with incomplete transcripts. More information on HSTS sampling can be found at http://nationsreportcard.gov/hsts_2009.

Consistent with previously published analyses of the HSTS data, the analyses for this brief include high school graduates with regular or honors diplomas, but exclude those who received a special education diploma or certificate of completion (or attendance) and students who did not graduate or had less than 3 years of transcript data. These criteria for inclusion were established to ensure that the transcripts were complete and valid. The analyses were also restricted to high school graduates with 16 or more earned Carnegie credits and a nonzero number of English Carnegie credits. Analyses linking coursetaking with NAEP assessment performance were conducted for graduates eligible for the HSTS who had also participated in the grade 12 NAEP mathematics and science assessments (approximately 30,000 of the graduates in the HSTS sample).

Student and School Participation Rates

To ensure unbiased samples, the National Center for Education Statistics (NCES) established participation rate standards for national studies that must be met in order for the results to be reported without a nonresponse bias analysis. Participation rates for the original sample needed to be at least 85 percent for schools and graduates. For public schools, the weighted graduate within-school response rate was about 99.3 percent while the school response rate was 94.8 percent. However, the private school response rate was 81.2 percent. Therefore, a nonresponse bias analysis was conducted on private schools to determine whether the school characteristics from nonresponding schools showed significant differences from the responding schools. The analysis of private schools included school type (i.e., Catholic, conservative Christian, Lutheran, nonreligious private, other private). Among private schools, significant differences were found in school type. Nonresponse weighting adjustments were used to correct for these differences. Although the differences found between

respondents and nonrespondents for private schools are small, it is unlikely that nonresponse weighting adjustments completely accounted for the differences (Nord et al. 2011).

Weighting

All estimates were weighted using either the HSTS sample weights or NAEP-linked weights to provide unbiased estimates of the national population. HSTS sample weights were designed for all aggregations that did not rely on NAEP-based data, and they encompassed all of the transcripts in the study. The NAEP-linked weights were designed for analyses involving NAEP assessment scores or NAEP-based data, such as student questionnaire data. Analyses in this brief relied up on background data, NAEP assessment data, and transcripts from graduates who participated in the mathematics or science assessment.

Variance Estimation and Nonsampling Error

Estimates based on the HSTS data are subject to sampling error because they were derived from a sample, rather than the whole population. Sampling error was measured by the sampling variance, which indicates how much the population estimate for a given statistic was likely to change if it had been based on another equivalent sample of individuals drawn in exactly the same manner as the actual sample. Since the HSTS used a complex sample design with two-stage sampling and unequal selection probabilities along with complex weighting procedures, standard textbook formulas could not be used for estimating variances. Instead, variances were estimated using jackknife replication methods (Krewski and Rao 1981). This estimation involved constructing a number of subsamples (replicates) from the full sample and computing the statistic of interest for each replicate. Measuring the variability among the replicates leads to an accurate estimate of variance for the full sample.

The HSTS estimates are subject to nonsampling errors as well as sampling errors. For example, errors due to electronic transcript transmission or human error during transcript coding lead to measurement error. Quality control procedures and processes are put in place during data collection and coding to minimize nonsampling error.

Interpreting Statistical Significance

All findings reported are descriptive and do not imply any causal relationship. All comparisons are based on *t* tests, statistical tests that consider both the estimated size of the difference and the standard error of the estimated difference. The following formula was used to compute the *t* statistic:

$$t = \frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2}}$$

where E_1 and E_2 are the estimates being compared and se_1 and se_2 are the corresponding standard errors of these estimates. When an estimated difference, such as the difference between average scores, has a large standard error, a numerical difference that seems large may not be statistically significant (i.e., a null hypothesis of no difference cannot be rejected with sufficient confidence). Differences of the same estimated size may be statistically significant in some cases but not others, depending on the size of standard errors involved. All differences cited are statistically significant at the $p < .05$ level. No adjustments were made for multiple comparisons. It is important to note that many of the variables examined in this report may be related to one another and to other variables not included in the analyses. The complex interactions and relationships among the variables were not fully explored and warrant more extensive analysis. Furthermore, the variables examined in this report are just a few of those that could be examined. Readers are cautioned not to draw causal inferences based on the results presented.

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APPENDIX A: DATA TABLES

Table A-1. Percentage distribution of high school graduates who reported interest in mathematics and science, by gender: 2009

Reported interest	Male	Female
Like mathematics	58.7	53.2 *
Do not like mathematics	41.3	46.8 *
Mathematics is one of my favorite subjects	50.4	42.6 *
Mathematics is not one of my favorite subjects	49.6	57.4 *
Like science	69.9	59.4 *
Do not like science	30.1	40.6 *
Science is one of my favorite subjects	47.6	34.2 *
Science is not one of my favorite subjects	52.4	65.8 *

* Significantly different from males at the $p < .05$ level.

NOTE: Respondents were asked to indicate how much they disagree or agree with the following statements: "I like mathematics/science" and "Mathematics/science is one of my favorite subjects." Respondents could answer: "Strongly disagree," "Disagree," "Agree," or "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "like mathematics/science" and "mathematics/sciences is one of my favorite subjects." The responses "Disagree "and "Strongly disagree" have been combined for estimates of "do not like mathematics/science" and "mathematics/science is not one of my favorite subjects."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

Table A-2. Percent of high school graduates who reported that they agree or strongly agree that they like mathematics and that mathematics is one of their favorite subjects, by gender and selected student characteristics: 2009

Student characteristics	Male	Female
Age[1]		
Below modal age		
Like mathematics	‡	‡
Mathematics is one of my favorite subjects	‡	‡
At modal age		
Like mathematics	60.6	53.3 *
Mathematics is one of my favorite subjects	52.8	42.8 *
Above modal age		
Like mathematics	55.4	52.7
Mathematics is one of my favorite subjects	46.5	42.0 *
Race/ethnicity[2]		
White		
Like mathematics	55.0	51.1 *
Mathematics is one of my favorite subjects	46.1	40.3 *
Black		
Like mathematics	64.2	54.7 *
Mathematics is one of my favorite subjects	56.4	45.1 *
Hispanic		
Like mathematics	63.2	54.7 *
Mathematics is one of my favorite subjects	55.2	43.1 *
Asian American/Pacific Islander		
Like mathematics	72.4	65.5 *
Mathematics is one of my favorite subjects	68.1	58.6 *
American Indian/Alaska Native		
Like mathematics	‡	‡
Mathematics is one of my favorite subjects	‡	‡
Other		
Like mathematics	‡	51.1
Mathematics is one of my favorite subjects	‡	‡
Parents' highest education level		
Did not finish high school		
Like mathematics	60.6	58.7
Mathematics is one of my favorite subjects	53.2	47.6
Graduated high school		
Like mathematics	54.8	50.8 *
Mathematics is one of my favorite subjects	47.0	41.2 *
Some education after high school		
Like mathematics	58.3	49.8 *
Mathematics is one of my favorite subjects	49.0	39.4 *
Graduated college		
Like mathematics	60.0	54.8 *
Mathematics is one of my favorite subjects	57.1	44.1 *

See notes at end of table.

Table A-2. Percent of high school graduates who reported that they agree or strongly agree that they like mathematics and that mathematics is one of their favorite subjects, by gender and selected student characteristics: 2009—Continued

Student characteristics	Male	Female
Disability status		
Students with disabilities		
Like mathematics	49.0	40.9 *
Mathematics is one of my favorite subjects	37.6	26.5 *
Students without disabilities		
Like mathematics	59.6	53.8 *
Mathematics is one of my favorite subjects	51.6	43.4 *
English language learner (ELL) status		
ELL		
Like mathematics	66.4	65.2
Mathematics is one of my favorite subjects	59.1	54.6
Non-ELL		
Like mathematics	58.5	53.0 *
Mathematics is one of my favorite subjects	50.2	42.4 *

‡ Reporting standards not met. Sample size insufficient to permit a reliable estimate.

* Significantly different from males at the $p < .05$ level.

[1] Modal age is 17 for grade 12.

[2] Race categories exclude persons of Hispanic origin. Asian American/Pacific Islander includes Native Hawaiian.

NOTE: Respondents were asked to indicate how much they disagree or agree with the following statements: "I like mathematics" and "Mathematics is one of my favorite subjects." Respondents could answer: "Strongly disagree," "Disagree," "Agree," "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "like mathematics" and "mathematics is one of my favorite subjects."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics Assessment.

Table A-3. Percent of high school graduates who reported that they agree or strongly agree that they like science and that science is one of their favorite subjects, by gender and selected student characteristics: 2009

Student characteristics	Male	Female
Age[1]		
Below modal age		
Like science	‡	‡
Science is one of my favorite subjects	‡	‡
At modal age		
Like science	70.7	60.6 *
Science is one of my favorite subjects	49.4	36.2 *
Above modal age		
Like science	68.4	56.9 *
Science is one of my favorite subjects	44.4	30.1 *
Race/ethnicity[2]		
White		
Like science	70.5	60.9 *
Science is one of my favorite subjects	49.4	35.7 *
Black		
Like science	63.9	50.8 *
Science is one of my favorite subjects	40.9	29.2 *
Hispanic		
Like science	71.0	55.0 *
Science is one of my favorite subjects	44.8	29.8 *
Asian American/Pacific Islander		
Like science	74.1	73.5
Science is one of my favorite subjects	51.8	41.9 *
American Indian/Alaska Native		
Like science	‡	‡
Science is one of my favorite subjects	‡	‡
Other		
Like science	‡	‡
Science is one of my favorite subjects	‡	‡
Parents' highest education level		
Did not finish high school		
Like science	66.1	53.1 *
Science is one of my favorite subjects	40.6	26.8 *
Graduated high school		
Like science	64.1	54.8 *
Science is one of my favorite subjects	41.5	27.7 *
Some education after high school		
Like science	66.0	60.1
Science is one of my favorite subjects	45.9	35.7 *
Graduated college		
Like science	74.8	62.5 *
Science is one of my favorite subjects	52.1	37.5 *

See notes at end of table.

Table A-3. Percent of high school graduates who reported that they agree or strongly agree that they like science and that science is one of their favorite subjects, by gender and selected student characteristics: 2009—Continued

Student characteristics	Male	Female
Disability status		
Students with disabilities		
Like science	59.1	60.2
Science is one of my favorite subjects	34.4	32.4
Students without disabilities		
Like science	71.1	59.4 *
Science is one of my favorite subjects	49.2	34.3 *
English language learner (ELL) status		
ELL		
Like science	‡	‡
Science is one of my favorite subjects	‡	‡
Non-ELL		
Like science	69.9	59.4 *
Science is one of my favorite subjects	47.9	34.0 *

‡ Reporting standards not met. Sample size insufficient to permit a reliable estimate.

* Significantly different from males at the $p < .05$ level.

[1] Modal age is 17 for grade 12.

[2] Race categories exclude persons of Hispanic origin. Asian American/Pacific Islander includes Native Hawaiian.

NOTE: Respondents were asked to indicate how much they disagree or agree with the following statements: "I like science" and "Science is one of my favorite subjects." Respondents could answer: "Strongly disagree," "Disagree," "Agree," "Strongly agree." The responses "Agree" and "Strongly agree" have been combined for estimates of "like science" and "science is one of my favorite subjects."

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Science Assessment.

Table A-4. NAEP average mathematics scale scores of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM) courses, by gender and course: 2009

STEM course	Mathematics assessment	
	Male	Female
Total	**158**	**154** *
Advanced mathematics		
Algebra II	164	159 *
Precalculus/analysis	183	175 *
Calculus	197	190 *
Other advanced[1]	169	164 *
Advanced science and engineering		
Advanced biology[2]	169	163 *
Chemistry	167	161 *
Physics	175	169 *
Advanced environmental/earth science[3]	163	158
Engineering	169	162
STEM-related technical		
Engineering/science technologies[4]	161	163
Health science/technology	159	148 *
Computer/information science	164	155 *

* Significantly different from males at the $p < .05$ level.

[1] "Other advanced" courses include trigonometry, statistics or probability, algebra III, analytic geometry, International Baccalaureate (IB) mathematics, and discrete math.

[2] "Advanced biology" courses include Advanced Placement (AP)/IB biology, physiology, anatomy, and genetics.

[3] "Advanced environmental/earth science" include AP/IB environmental science, college preparatory earth science, and various geology courses.

[4] "Engineering/science technologies" courses focus on instrumentation, equipment maintenance, and other technical tasks conducted in engineering and science-related occupations.

NOTE: The NAEP 12th-grade mathematics results are reported on a 0–300 scale. Students may have earned credits in more than one STEM course.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics Assessment.

Table A-5. NAEP average science scale scores of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM) courses, by gender and course: 2009

STEM course	Science assessment	
	Male	Female
Total	**155**	**149 ***
Advanced mathematics		
Algebra II	161	153 *
Precalculus/analysis	175	169 *
Calculus	189	181 *
Other advanced[1]	165	159 *
Advanced science and engineering		
Advanced biology[2]	167	159 *
Chemistry	163	156 *
Physics	170	165 *
Advanced environmental/earth science[3]	160	159
Engineering	155	154
STEM-related technical		
Engineering/science technologies[4]	157	158
Health science/technology	154	140 *
Computer/information science	161	147 *

* Significantly different from males at the $p < .05$ level.

[1] "Other advanced" courses include trigonometry, statistics or probability, algebra III, analytic geometry, International Baccalaureate (IB) mathematics, and discrete math.

[2] "Advanced biology" courses include Advanced Placement (AP)/IB biology, physiology, anatomy, and genetics.

[3] "Advanced environmental/earth science" include AP/IB environmental science, college preparatory earth science, and various geology courses.

[4] "Engineering/science technologies" courses focus on instrumentation, equipment maintenance, and other technical tasks conducted in engineering and science-related occupations.

NOTE: The NAEP 12th-grade science results are reported on a 0–300 scale. Students may have earned credits in more than one STEM course.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Science Assessment.

APPENDIX B: STANDARD ERROR TABLES

Table B-1. Standard errors for table 1: Percent of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM) courses, by gender and course: 2009

STEM course	Male	Female
Advanced mathematics		
Algebra II	1.08	0.90
Precalculus/analysis	1.01	0.88
Calculus	0.71	0.69
Other advanced	1.17	1.15
Advanced science and engineering		
Advanced biology	0.89	1.00
Chemistry	1.01	0.99
Physics	1.33	1.04
Advanced environmental/earth sciences	0.99	0.98
Engineering	0.57	0.15
STEM-related technical		
Engineering/science technologies	0.75	0.32
Health science/technologies	0.45	0.72
Computer/information science	0.96	0.77

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009.

Table B-2. Standard errors for table A-1: Percentage distribution of high school graduates who reported interest in mathematics and science, by gender: 2009

Reported interest	Male	Female
Like mathematics	0.66	0.58
Do not like mathematics	0.66	0.58
Mathematics is one of my favorite subjects	0.76	0.62
Mathematics is not one of my favorite subjects	0.76	0.62
Like science	1.28	1.08
Do not like science	1.28	1.08
Science is one of my favorite subjects	1.39	1.07
Science is not one of my favorite subjects	1.39	1.07

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics and Science Assessments.

Table B-3. Standard errors for table A-2: Percent of high school graduates who reported that they agree or strongly agree that they like mathematics and that mathematics is one of their favorite subjects, by gender and selected student characteristics: 2009

Student characteristics	Male	Female
Age		
Below modal age		
Like mathematics	†	†
Mathematics is one of my favorite subjects	†	†
At modal age		
Like mathematics	0.85	0.76
Mathematics is one of my favorite subjects	1.00	0.87
Above modal age		
Like mathematics	0.90	1.08
Mathematics is one of my favorite subjects	1.09	1.25
Race/ethnicity		
White		
Like mathematics	0.96	0.85
Mathematics is one of my favorite subjects	1.04	0.95
Black		
Like mathematics	1.55	1.25
Mathematics is one of my favorite subjects	1.89	1.31
Hispanic		
Like mathematics	1.15	1.44
Mathematics is one of my favorite subjects	1.33	1.35
Asian American/Pacific Islander		
Like mathematics	1.66	2.31
Mathematics is one of my favorite subjects	2.05	2.72
American Indian/Alaska Native		
Like mathematics	†	†
Mathematics is one of my favorite subjects	†	†
Other		
Like mathematics	†	5.26
Mathematics is one of my favorite subjects	†	†
Parents' highest education level		
Did not finish high school		
Like mathematics	2.11	1.88
Mathematics is one of my favorite subjects	2.36	2.02
Graduated high school		
Like mathematics	1.29	1.33
Mathematics is one of my favorite subjects	1.34	1.34
Some education after high school		
Like mathematics	1.16	1.08
Mathematics is one of my favorite subjects	1.33	1.06
Graduated college		
Like mathematics	0.80	0.78
Mathematics is one of my favorite subjects	0.89	0.93

See notes at end of table.

Table B-3. Standard errors for table A-2: Percent of high school graduates who reported that they agree or strongly agree that they like mathematics and that mathematics is one of their favorite subjects, by gender and selected student characteristics: 2009—Continued

Student characteristics	Male	Female
Disability status		
Students with disabilities		
Like mathematics	2.50	2.31
Mathematics is one of my favorite subjects	2.50	2.34
Students without disabilities		
Like mathematics	0.70	0.58
Mathematics is one of my favorite subjects	0.81	0.61
English language learner (ELL) status		
ELL		
Like mathematics	3.37	3.25
Mathematics is one of my favorite subjects	3.86	3.74
Non-ELL		
Like mathematics	0.69	0.59
Mathematics is one of my favorite subjects	0.80	0.62

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics Assessment.

Table B-4. Standard errors for table A-3: Percent of high school graduates who reported that they agree or strongly agree that they like science and that science is one of their favorite subjects, by gender and selected student characteristics: 2009

Student characteristics	Male	Female
Age		
Below modal age		
Like science	†	†
Science is one of my favorite subjects	†	†
At modal age		
Like science	1.79	1.49
Science is one of my favorite subjects	2.02	1.40
Above modal age		
Like science	2.02	2.37
Science is one of my favorite subjects	1.77	2.04
Race/ethnicity		
White		
Like science	1.71	1.60
Science is one of my favorite subjects	1.95	1.59
Black		
Like science	2.67	2.63
Science is one of my favorite subjects	1.97	2.37
Hispanic		
Like science	2.23	1.95
Science is one of my favorite subjects	3.17	1.63
Asian American/Pacific Islander		
Like science	3.13	2.52
Science is one of my favorite subjects	3.48	3.40
American Indian/Alaska Native		
Like science	†	†
Science is one of my favorite subjects	†	†
Other		
Like science	†	†
Science is one of my favorite subjects	†	†
Parents' highest education level		
Did not finish high school		
Like science	3.51	2.49
Science is one of my favorite subjects	4.59	2.25
Graduated high school		
Like science	2.68	2.99
Science is one of my favorite subjects	2.67	2.01
Some education after high school		
Like science	2.99	1.97
Science is one of my favorite subjects	3.11	2.34
Graduated college		
Like science	1.83	1.48
Science is one of my favorite subjects	1.97	1.45

See notes at end of table.

Table B-4. Standard errors for table A-3: Percent of high school graduates who reported that they agree or strongly agree that they like science and that science is one of their favorite subjects, by gender and selected student characteristics: 2009—Continued

Student characteristics	Male	Female
Disability status		
Students with disabilities		
Like science	4.85	5.88
Science is one of my favorite subjects	4.34	5.87
Students without disabilities		
Like science	1.27	1.10
Science is one of my favorite subjects	1.38	1.12
English language learner (ELL) status		
ELL		
Like science	†	†
Science is one of my favorite subjects	†	†
Non-ELL		
Like science	1.27	1.15
Science is one of my favorite subjects	1.40	1.08

† Not applicable.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Science Assessment.

Table B-5. Standard errors for table A-4: NAEP average mathematics scale scores of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM) courses, by gender and course: 2009

STEM course	Mathematics assessment	
	Male	Female
Total	**0.9**	**0.7**
Advanced mathematics		
Algebra II	0.8	0.7
Precalculus/analysis	1.0	0.9
Calculus	1.3	1.1
Other advanced	1.1	1.0
Advanced science and engineering		
Advanced biology	1.2	0.8
Chemistry	1.0	0.7
Physics	1.1	1.0
Advanced environmental/earth science	1.7	1.7
Engineering	2.4	4.9
STEM-related technical		
Engineering/science technologies	2.4	5.0
Health science/technology	2.9	1.7
Computer/information science	1.4	1.5

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Mathematics Assessment.

Table B-6. Standard errors for table A-5: NAEP average science scale scores of high school graduates who earned credits in science, technology, engineering, and mathematics (STEM) courses, by gender and course: 2009

STEM course	Science assessment	
	Male	Female
Total	**1.0**	**1.0**
Advanced mathematics		
Algebra II	1.1	1.0
Precalculus/analysis	1.3	1.3
Calculus	1.6	1.7
Other advanced	1.6	1.5
Advanced science and engineering		
Advanced biology	1.6	1.3
Chemistry	1.2	1.0
Physics	1.5	1.5
Advanced environmental/earth science	2.9	4.3
Engineering	9.0	5.2
STEM-related technical		
Engineering/science technologies	4.4	7.6
Health science/technology	5.0	2.5
Computer/information science	2.1	2.3

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, High School Transcript Study (HSTS), 2009; National Assessment of Educational Progress (NAEP), 2009 Science Assessment.