Technology and Engineering Literacy

Overall, 43 percent of 8th-grade students performed at or above the Proficient level on the National Assessment of Educational Progress Technology and Engineering Literacy assessment in 2014. The percentage of students scoring at or above the Proficient level was higher for White and Asian students (56 percent each) than for Black students (18 percent), Hispanic students (28 percent), Pacific Islander students (30 percent), and students of Two or more races (45 percent).

The National Assessment of Educational Progress (NAEP) Technology and Engineering Literacy (TEL) assessment measures whether students are able to apply technology and engineering skills to real-life situations. In the assessment framework, technology is defined as “any modification of the natural world done to fulfill human needs or desires,” and engineering is defined as “a systematic and often iterative approach to designing objects, processes, and systems to meet human needs and wants.”

The TEL assessment is designed to measure three content areas. The first, Technology and Society, involves the effects that technology has on society and on the natural world and the ethical questions that arise from those effects. The second content area, Design and Systems, covers the nature of technology, the engineering design process by which technologies are developed, and basic principles of dealing with everyday technologies such as maintenance and troubleshooting. The final content area, Information and Communication Technology, includes computers and software learning tools; networking systems and protocols; handheld digital devices; and other technologies for accessing, creating, and communicating information and for facilitating creative expression.1

The TEL assessment was administered in 2014 to 8th-grade students in both public and private schools across the nation. In addition to the assessment, TEL included a questionnaire on demographics and students’ experiences with technology and engineering, both inside and outside of school. The questionnaire covered student experiences related to each of the three content areas.

This indicator first describes students’ overall performance on the TEL assessment using scale scores2 and achievement levels. Next, the indicator describes differences in students’ technology and engineering experiences in school and outside of school, with respect to student and school characteristics. It also explores associations between students’ technology and engineering experiences and their TEL scores.
Figure 1. Average overall National Assessment of Educational Progress (NAEP) Technology and Engineering Literacy (TEL) scale scores of 8th-graders, by selected student and school characteristics: 2014

In 2014, the average overall TEL score for 8th-grade students was 150 points on a scale ranging from 0 to 300. Student achievement on the TEL assessment varied by student and school characteristics. For example, female students scored higher on average than male students (151 vs. 149). The average TEL score for White and Asian students (both at 160) was higher than the average scores for Black (128), Hispanic (138), Pacific Islander (142), and American Indian/Alaska Native students (146), and not measurably different from the average score for students of Two or more races (154). In addition, English language learners (ELL) had lower average scores (108) than non-ELL students (152). The average TEL score was highest for students whose parents graduated from college (159) and lowest for students whose parents did not finish high school (133). TEL scores also varied by school poverty status. The average TEL score was highest for students in low-poverty schools (167) and lowest for students in high-poverty schools (132).³
TEL achievement levels define what students should know and be able to do: Basic indicates partial mastery of fundamental skills, and Proficient indicates demonstrated competency over challenging subject matter. Overall, 83 percent of 8th-grade students performed at or above the Basic achievement level of the TEL assessment in 2014, with 43 percent performing at or above the Proficient level. The percentage of students scoring at or above Proficient was higher for White and Asian students (56 percent each) than for Black students (18 percent), Hispanic students (28 percent), Pacific Islander students (30 percent), and students of Two or more races (45 percent). The percentage of American Indian/Alaska Native students (42 percent) scoring at or above Proficient was not measurably different from that of any other racial/ethnic group. In addition, 45 percent of non-ELL students scored at or above the Proficient level, compared with 5 percent of ELL students.

The TEL questionnaire, administered in addition to the TEL assessment, included questions about 8th-grade students’ in-school and outside-school experiences in each of the three content areas. In the Technology and Society content area, students reported how frequently they learned about or discussed various topics in school and outside of school using the response options of “never,” “rarely,” “sometimes,” or “often.” More than two-thirds of 8th-graders reported sometimes or often learning about or discussing topics related to Technology and Society in school in 2014. For example, 43 percent of students reported sometimes and 28 percent reported often learning about or discussing the ways people work together to solve problems in their community or the world.
The percentage of students who reported learning about or discussing technology- and society-related topics in school varied by student and school characteristics. In general, higher percentages of female students than male students and higher percentages of Black students than White and Hispanic students reported often learning about or discussing technology- and society-related topics in school. For example, the percentage of students who reported they often learned about or discussed in school the ways people work together to solve problems in their community or the world was higher for female students (30 percent) than for male students (26 percent); and the percentage was higher for Black students (32 percent) than for Hispanic (28 percent) and White students (26 percent). In general, the percentages of students who reported often learning about or discussing various technology- and society-related topics in school were not measurably different by school poverty status.
Figure 3. Average overall National Assessment of Educational Progress (NAEP) Technology and Engineering Literacy (TEL) scale scores of 8th-graders, by frequency of learning about or discussing in school the ways people work together to solve problems in their community or the world: 2014

Students who reported sometimes or often learning about or discussing various technology- and society-related topics in school scored, on average, higher than those who reported rarely or never having such experiences. For example, the average overall TEL scores were 153 for 8th-grade students who reported that they often or sometimes learned about or discussed the ways people work together to solve problems in their community or the world, compared with 148 for those who reported they rarely had such an experience and 133 for those who reported that they never had such an experience.

NOTE: Scale ranges from 0 to 300. Includes public and private schools. Includes students tested with accommodations (10 percent of all 8th-graders); excludes only those students with disabilities and English language learners who were unable to be tested even with accommodations (1 percent of all 8th-graders).

In the Design and Systems content area, students were asked how frequently they performed or learned about various tasks or topics in school using the response options of “never,” “once or twice,” “three to five times,” or “more than five times.” For example, in 2014, about 37 percent of 8th-grade students reported that they figured out why something was not working in order to fix it more than five times outside of school, and 18 percent of 8th-grade students reported performing this task more than five times in school. Additionally, about 30 percent of 8th-grade students reported taking something apart in order to fix it or see how it works more than five times outside of school, and 12 percent reported doing so more than five times in school.
Figure 5. Average overall National Assessment of Educational Progress (NAEP) Technology and Engineering Literacy (TEL) scale scores of 8th-graders, by frequency of figuring out why something is not working in order to fix it outside of school: 2014

Students who reported performing various design- and systems-related activities more than five times outside of school in 2014 scored, on average, higher than those who reported never performing such activities. For example, the average overall TEL score was 160 for 8th-grade students who reported that they figured out why something was not working in order to fix it more than five times outside of school, compared with 137 for those who reported never performing such an activity.
In the Information and Communication Technology content area, students were asked how frequently they use a computer or other digital technology to perform activities, both related to school and not related to school, using the categories of “never/almost never,” “a few times a year,” “1–2 times a month,” “once or twice a week,” or “almost daily.” In 2014, about 28 percent of 8th-grade students reported that they used a computer or other digital technology to create, edit, or organize digital media at least once every week for school work, and 26 percent reported doing so at least once every week for activities not related to school work. About 16 percent reported creating a presentation at least once every week for school work, and 10 percent reported doing so at least once every week for activities not related to school work. Furthermore, about 16 percent of 8th-grade students reported creating a spreadsheet at least once every week for school work, and 9 percent reported performing this task at least once every week for activities unrelated to school work.
Figure 7. Percentage of 8th-graders who reported performing various information and communication technology tasks at least once every week for school work, by selected student and school characteristics: 2014

The percentage of 8th-grade students who reported using a computer or other digital technology to perform various activities for school work varied by student and school characteristics in 2014. However, the patterns of these differences were not consistent across these activities.

For example, 21 percent of students from high-poverty schools, compared to 14 percent of students from low-poverty schools, reported using digital technology to create a spreadsheet for school work at least once a week. On the other hand, a higher percentage of students from
low-poverty schools than from high-poverty schools reported using a computer to create, edit, or organize digital media for school work at least once a week (32 vs. 27 percent). The percentage of students who reported using digital technology to create a spreadsheet for school work at least once a week was not measurably different between 8th-graders whose parents graduated from college (16 percent) and those whose parents did not finish high school (19 percent). However, the percentage of 8th-graders who reported using digital technology to create, edit, or organize digital media for school work at least once a week was higher for students whose parents graduated from college than for students whose parents did not finish high school (32 percent vs. 23 percent), and the percentage of those who reported using digital technology to create a presentation for school work at least once a week was higher for students whose parents graduated from college than for students whose parents did not finish high school (18 vs. 15 percent).

Endnotes:
1 For details on the TEL assessment or its content areas, please refer to https://nces.ed.gov/nationsreportcard/tel/.
2 Results from the TEL assessment are available as an overall scale score and as separate scale scores for each of the three content areas. All analyses in this indicator use the overall scale score.
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. These categories were aggregated from the more detailed “percent eligible for National School Lunch Program” variable on the NAEP Data Explorer. For more discussion on using FRPL data as a proxy for poverty, see the NCES blog “Free or reduced price lunch: A proxy for poverty?” (http://nces.ed.gov/blogs/nces/post/free-or-reduced-price-lunch-a-proxy-for-poverty).

Reference tables: Digest of Education Statistics 2016, tables 224.70, 224.74a, 224.74b, 224.74c, 224.74d, and 224.74e

Related indicators and resources: Children’s Access to and Use of the Internet, Reading Performance, Mathematics Performance, Science Performance

Glossary: Achievement levels, NAEP; College; Educational attainment; English language learner (ELL); High school completer; Locale codes; Racial/ethnic group