

English Learners in Science, Technology, Engineering, and Mathematics (STEM)

A report from the National Academies of Sciences, Engineering, and Medicine (NAEM) found that U.S. school systems can do more to grant English learners (ELs) access to quality science, technology, engineering, and mathematics (STEM) education.¹ This infographic provides information about ELs' access to and representation in STEM courses and features data from the [Civil Rights Data Collection \(CRDC\)](#) and the [National Assessment of Education Progress \(NAEP\)](#).²

Importance of English Learner Participation in Algebra and Advanced Math

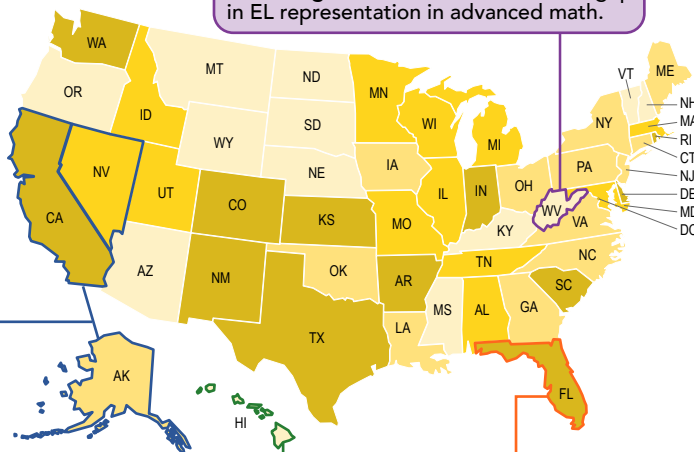
Research shows a strong connection between participation in algebra I and advanced math courses and post-secondary enrollment.³

- Students who take algebra I in grade eight are more likely to take challenging math courses in high school.
- Students who take algebra I in high school (particularly after grade nine) are less likely to enroll in a four-year college.
- Long-term ELs in grade eight or higher or students who spent more than six years as an EL before grade seven are more likely to repeat algebra I at least once, making it difficult to participate in higher-level math courses in upper grades.⁴

English Learners' Representation in Advanced Mathematics in Grade 8

In SY 2017–18 there was a nationwide disparity in EL enrollment in advanced mathematics in grade 8.

West Virginia showed a close-to-zero gap in EL representation in advanced math.



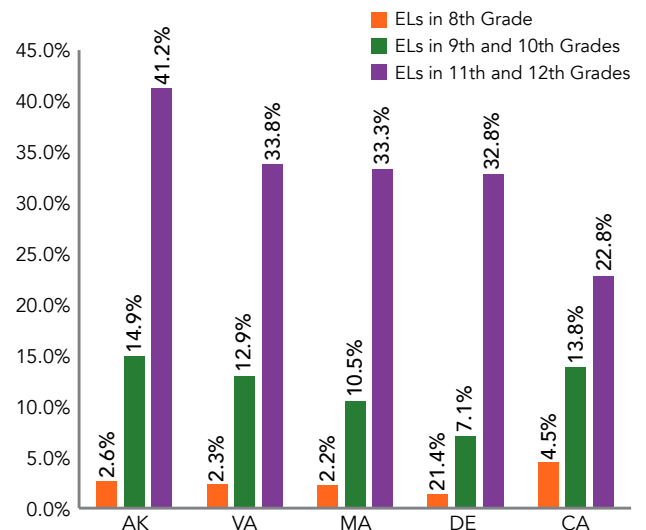
Following Hawaii, Nevada (9.3%), California (6.9%), and Alaska (5.9%) also had some of the widest gaps in the country.

Florida was the only state where representation of ELs in advanced math outnumbered their representation in the overall population.

The gap was the widest in Hawaii (22%), where ELs made up 22.8% of students in schools with advanced math, but only 0.8% of ELs took it.

■ Bottom Quartile (<1.1%)
■ Second Quartile (1.1%–1.39%)
■ Third Quartile (1.4%–3.2%)
■ Top Quartile (>3.2%)

English Learner Participation in Algebra I in Grades 8–12



ELs in grades 11–12 are more likely to be off-grade in math, as evidenced by high participation rates in algebra I, a class most students take between grades eight and 10. CRDC data for SY 2017–18 reveal that in Virginia, Massachusetts, and Delaware, approximately one in three students in algebra I in grades 11 and 12 were ELs. Not taking algebra I until the last two years of high school may disadvantage ELs in college applications and post-secondary options.

¹ National Academies of Sciences, Engineering, and Medicine. (2018). *English learners in STEM subjects: Transforming classrooms, schools, and lives*. The National Academies Press. <https://doi.org/10.17226/25182>. <https://www.nap.edu/catalog/25182/english-learners-in-stem-subjects-transforming-classrooms-schools-and-lives>

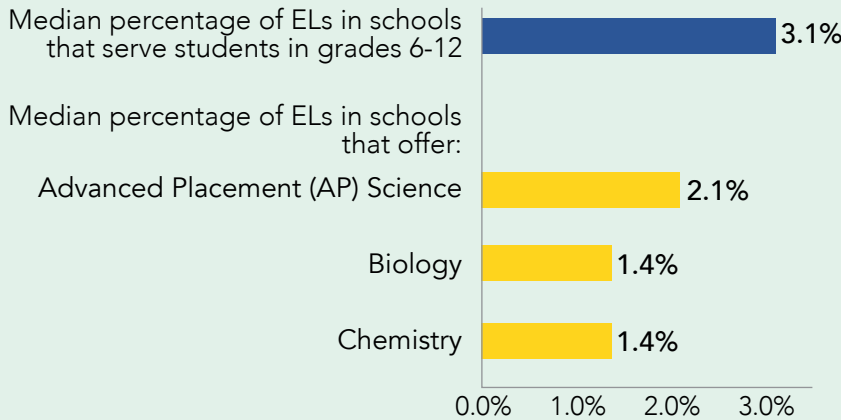
² Office for Civil Rights, Civil Rights Data Collection. (2021, June). *2017–18 state and national estimations*. U.S. Department of Education. <https://ocrdata.ed.gov/estimations/2017-2018>

³ LaFave, A. (2019). *Algebra I coursetaking and postsecondary enrollment*. Data point. NCES 2019-154. National Center for Education Statistics. https://eric.ed.gov/?q=Algebra+i&ff1=dtYSince_2012&id=ED595190; Lee, S. W., & Mao, X. (2020, July 21). Algebra by the eighth grade: The association between early study of Algebra I and students' academic success. *International Journal of Science and Mathematics Education*, 19(6), 1271–1289. <https://doi.org/10.1007/s10763-020-10116-3>

⁴ Jaquet, K., & Fong, A. B. (2017). *How do Algebra I course repetition rates vary among English learner students by length of time to reclassification as English proficient?* REL 2017-222. Regional Educational Laboratory West. <https://eric.ed.gov/?q=Reclassification&pg=6&id=ED572903>



English Learners' Representation in Schools That Offer Advanced Science Courses



ELs are underrepresented in schools that offer upper-level science courses. In schools that serve students in grades six–12, the median percentage of ELs is approximately 3%, whereas the median percentages of ELs in schools that offer higher-level science courses are much lower. This suggests that ELs are less likely to attend schools that offer these opportunities, and more likely to attend schools that do not.

How Can Educators Design Effective STEM Instruction for English Learners?

NASEM put forward five promising instructional strategies for effective STEM instruction for ELs.⁶

For more information on these practices, check out the NCELA Teaching Practice Briefs on [mathematics](#) and [science](#).

How Can Educators Design Effective STEM Instruction for English Learners?

The National Research & Development Center to Improve Education for Secondary English Learners identified three types of levers that can improve course access for ELs in secondary schools:

- State and district policies
- School and programmatic decisions
- School staffing⁷

Of the levers reviewed by the Center, **reclassification policies** and **course placement policies** had the strongest evidence base for improving course access. For more information, check out the Center's [full brief](#) on this topic.

State & District Policies

- Reclassification policies
- Curricular intensification policies
- Extended instructional time
- School composition

School & Programmatic Decisions

- Advanced course offerings
- College preparatory and enrichment programs
- Course placement policies
- Bilingual instruction programs
- Class and peer composition

School Staffing

- Teacher professional training and characteristics
- Counselor caseload

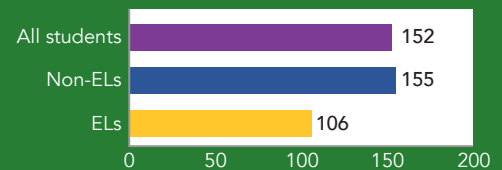


Importance of English Learner Performance on Technology and Engineering Literacy Assessments

In 2014, NAEP began administering the new technology and engineering literacy (TEL) assessment. The TEL assessment measures three content areas and three practices related to the ability to apply technology and engineering skills and knowledge to real-life scenarios.⁵ Achievement gaps on the TEL suggest that ELs may have fewer opportunities to learn and hone these skills, which can leave them unprepared for post-secondary and workforce opportunities.

English Learner Performance on Technology and Engineering Literacy Assessment in Grade 8

There was an achievement gap between ELs and non-ELs on the 2018 TEL assessment. On average, **ELs scored 49 points lower than non-ELs.**



Examples of TEL Content Areas and Practices

TEL content area:

- **Information and Communication Technology:** Software and systems used for accessing, creating, and communicating information.

TEL practice:

- **Developing Solutions and Achieving Goals:** Systematic use of technological knowledge, tools, and skills to solve problems and achieve goals presented in realistic contexts.

⁵ National Association of Educational Progress (The Nation's Report Card). (n.d). *NAEP technology & engineering literacy (TEL) report card*. U.S. Department of Education. <https://www.nationsreportcard.gov/tel/about/assessment-framework-design/?anchor=ca-practices-infographic>

⁶ National Academies of Sciences, Engineering, and Medicine. (2018). *English learners in STEM subjects: Transforming classrooms, schools, and lives*. (Some strategies have been lightly edited for clarity.) <https://doi.org/10.17226/25182>

⁷ Vazquez Cano, M., Umansky, I. M., & Thompson, K. D. (2021). *How state, district, and school levers can improve the course access of students classified as English learners in secondary schools*. WestEd. <https://www.elrdcenter.wested.org/improve-course-access-of-els>