



UNLOCKING LEARNING:

SCIENCE AS A LEVER FOR ENGLISH LEARNER EQUITY

State and District Recommendations and
Community Stakeholder Questions



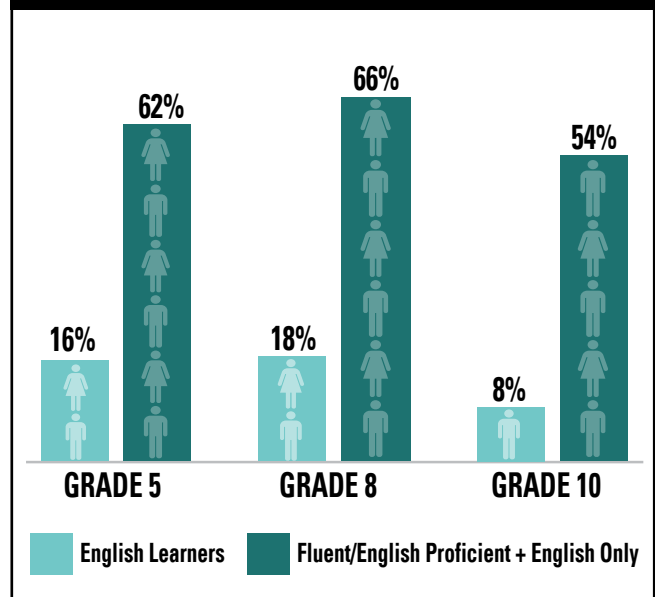
The Education Trust—West

ENGLISH LEARNERS FACE OPPORTUNITY AND ACHIEVEMENT GAPS IN SCIENCE

English learners in California consistently score below the general student population on science assessments, mirroring EL performance in other subjects. This is true on both state and national assessments.

- On the 2015 National Assessment of Educational Progress in science, fourth and eighth-grade EL students in California scored considerably lower than their English fluent counterparts. For example, only 3 percent of fourth-grade English learners in California performed at or above the proficient level, compared with 32 percent of fluent English speakers. Similarly, just 2 percent of eighth-grade ELs performed at or above the proficient level, compared with 27 percent of fluent English speakers.⁷ Moreover, California's English learners perform considerably below English learners in many other states—often in the bottom quartile nationally. It is important to note that the NAEP is administered in English only.
- On the California Standards Test (CST) in science, there are also worrisome patterns. A substantial majority of fluent English speakers — 62 percent in fifth grade, 66 percent in eighth grade, and 54 percent in 10th grade — scored proficient or advanced in 2016. But only 16 percent of fifth-grade, 18 percent

FIGURE 1: Percent of Students Scoring Proficient or Advanced on 2016 California Standards Test in Science



Source: California Department of Education, 2016 CAASPP CST Science Results

of eighth-grade and 8 percent of 10th-grade English learners scored proficient or advanced on the 2016 science CST.

The achievement data are just the tip of the iceberg. Underneath, other data point to seriously different opportunities to learn.

- By law, for example, ELs are generally assigned extra instructional minutes in English language arts as designated ELD time. Yet some students receive that additional instruction during other classes, such as science. The fact is, they should get both.
- Statewide, only 9 percent of ELs complete the 15 A-G courses required to be eligible for admission to a California State University (CSU) or University of California (UC) campus, compared with 43 percent of all students.⁸ In high school, English learners do not have the same access to rigorous science courses and are underrepresented in lab science classes and other college preparatory coursework.⁹
- In California, only 58 percent of high schools even offer chemistry, 51 percent offer physics, and 7 percent offer math courses titled advanced.¹⁰ Only 11 percent of ELs attend schools that offer the “advanced” math courses, and ELs are less likely than their non-EL peers to be enrolled in these courses when available.¹¹





SCIENCE EDUCATION IS A LEVER FOR ENGLISH LEARNER ACHIEVEMENT

Research points to the potential of science to increase students' academic performance in reading, writing, and science simultaneously.¹² In part, this is the result of weaving together language development skills with engaging science content. Instruction aligned to the performance expectations of the CA NGSS and CA ELD standards can provide English learner students with rigorous science learning when teachers scaffold lessons to encourage their participation. It can also change teacher perceptions of what ELs can do.

Research studies show that:

- Engaging science investigations can provide students with language practice and opportunities to develop academic vocabulary skills and make meaning from using evidence and interpreting scientific data. Inquiry-based science activities using collaborative peer-talk increase student motivation to use new language.¹³
- Science and engineering lessons motivate students to access prior knowledge, engage in problem solving, and develop new language skills simultaneously.
- Many key science vocabulary words are Spanish cognates, making the language more accessible to the majority of ELs who are Spanish speaking.¹⁴
- Scientific and engineering data are often presented in visual diagrams, graphs, charts, tables, and equations, providing opportunities for ELs to engage with

information in different ways to build conceptual understanding using evidence.

- Projects integrating ELD and science instruction in a sample of elementary schools raised teachers' expectations of what they believed their EL students could learn and produce.

As English language development researchers note, "Students do not need to wait until they learn English in order to engage in scientific thinking and complex scientific content."¹⁵

A NEW DIRECTION FOR TEACHING SCIENCE TO ENGLISH LEARNERS

Simultaneously implementing four new sets of standards — CCSS-Math, CCSS-English Language Arts, CA ELD Standards, and CA NGSS — is a Herculean task. That they are meant to be integrated makes it even tougher. Indeed, for effective integration of English language development and science education to take hold, teachers need:

- Curriculum aligned to the CA NGSS and CAELD standards;
- Instructional materials that provide coherence in approach and training to use those materials with English learners;
- Time for collaboration among teachers with science content expertise and teachers with English language instruction expertise;
- Professional learning, including both instructional strategies and content; and
- Standards-aligned, performance-based assessments that provide EL students the opportunities to demonstrate what they know.

State leaders could do a lot more to support teachers' transition to the new standards.

AS ENGLISH LANGUAGE DEVELOPMENT RESEARCHERS NOTE, "STUDENTS DO NOT NEED TO WAIT UNTIL THEY LEARN ENGLISH IN ORDER TO ENGAGE IN SCIENTIFIC THINKING AND COMPLEX SCIENTIFIC CONTENT."

DISTRICT RECOMMENDATIONS AND QUESTIONS FOR COMMUNITY STAKEHOLDERS TO ASK

Districts are just beginning to figure out how to weave together the implementation of the CA NGSS and CA ELD standards. Effective practices are still emerging. There is no one formula for effective science education for ELs, so districts need to do their own inquiry about how to best help their English learners achieve their potential as science learners. Here, we offer key recommendations for districts, and questions to guide districts and stakeholders to seek further understanding followed by a key action item. We follow this section with state level policy recommendations.

FUNDING: Use district LCFF investments and set LCAP goals to support science instruction with specific supports to increase opportunities for EL students.

- Are LCFF funds allocated to support CA NGSS-aligned science education for high-need students, including ELs?
- Does resource allocation advance equity for ELs? For example, do schools with greater concentrations of EL students have greater access to science specialists who have training in ELD strategies?

KEY ACTION: Include resources, training and staffing for CA NGSS and CA ELD integration in district LCAP.

ACCESS TO RIGOROUS COURSEWORK: Ensure English learners are provided a rigorous science education, including equitable instructional time, courses that lead to A-G completion, and linguistic supports to excel in college preparatory coursework.

- Do EL students in elementary, middle, and high schools in the district have the same access to science instruction (coursework and time) and science specialists as other students, regardless of the school they attend?
- How is science content integrated into designated ELD-ELA time?
- Are EL students enrolled in high school science courses that are A-G approved?
- Are linguistic supports provided so that EL students are supported to excel in college preparatory science courses?
- To what extent do the college and career science courses ELs take include the CA NGSS standards, which include three dimensions: core ideas, scientific and engineering practices, and crosscutting concepts?

KEY ACTION: Provide access and support for EL students to succeed in a rich array of A-G approved CA NGSS science courses.

CURRICULUM RESOURCES: Provide high-quality science curriculum materials that are genuinely aligned to CA NGSS and vetted to support English language development.

- Has curriculum been selected and purchased to support CA NGSS implementation and language development for EL students? If not, what criteria will the district use to adopt instructional materials?
- Does the district use coherent, high-quality curriculum and provide training for teachers to use this curriculum to integrate science and ELD instruction?

KEY ACTION: Select high-quality curriculum that integrates CA NGSS with ELD strategies.

FAMILY ENGAGEMENT: Engage families in the district process of implementing the ELD and science standards including implementation planning to expand multilingual learning opportunities.

- How does the district welcome families of English learners to learn about science and language development opportunities?
- Are families, particularly those of EL students, informed about the requirements for college preparatory science coursework and their students' progress toward A-G completion versus graduation requirements?
- How is the district providing increased multilingual learning opportunities with the newly passed Prop 58?

KEY ACTION: Ensure that families, particularly of EL students are welcomed and informed regarding standards implementation and access to multilingual learning opportunities.

PROFESSIONAL LEARNING AND BUILDING TEACHER CAPACITY: Invest in teacher capacity to support CA NGSS science learning for ELs and provide adequate time for high-quality professional learning for teachers and administrators.

- How much collaboration time are teachers provided with experts in ELD and science to engage in instructional planning?
- Does the district allocate funding to support the development of multilingual teachers' ability to teach science in students' home languages?
- Is professional learning focused to provide teachers and administrators with training on both the CA ELD and science standards to advance English language acquisition best practices using the three-dimensions of CA NGSS science?
- Does the district make an effort to attract and retain effective bilingual teachers and science teachers with significant EL teaching experience, drawing from local communities to maximize the likelihood of retention?

KEY ACTION: Invest in time for high quality CA ELD/CA NGSS science professional development for teachers and administrators.

PARTNERSHIPS: Develop district partnerships to support science education for EL students and training for teachers.

- Does the district partner with science institutions, universities, and businesses to train teachers and provide curriculum content to support CA NGSS science education and STEM career preparation for EL students?

KEY ACTION: Foster partnerships with science rich institutions to advance CA NGSS implementation.



THERE IS NO ONE FORMULA FOR EFFECTIVE SCIENCE EDUCATION FOR ELS, SO DISTRICTS NEED TO DO THEIR OWN INQUIRY ABOUT HOW TO BEST HELP THEIR ENGLISH LEARNERS ACHIEVE THEIR POTENTIAL AS SCIENCE LEARNERS.

STATE POLICY RECOMMENDATIONS

The state can advance science education and boost conditions for English learners to excel by doing the following:

1. STRENGTHEN TEACHER PREPARATION.

Preparation of science teachers needs to look radically different. This is particularly true at the high school level, which has traditionally siloed science education by biology, chemistry, and physics. The California Commission on Teacher Credentialing (CTC) should:

- a. Work swiftly to expedite the development of revised science teaching standards and science professional credentialing tests to ensure implementation of CA NGSS as early as possible; and
- b. Ensure that courses offered through teacher preparation programs, including those required for elementary teacher and administrator credentials, are updated to include preparation for the demands of CA NGSS and instructional strategies for the CA ELD standards.

2. MAKE SCIENCE CURRICULUM AND INSTRUCTIONAL MATERIALS BROADLY AVAILABLE.

Few schools have CA NGSS-aligned curriculum, even though educators need access to the best possible resources and materials for teaching CA NGSS. In addition, they need science materials that are integrated with CA ELD strategies. In the absence of state-approved resources, teachers often search online to find instructional materials or develop their own lessons.

These stop-gap solutions are not sufficient.

The California Department of Education (CDE) should:

- a. Disseminate a list of vetted, high-quality curriculum and instructional materials for integrated CA ELD/ CA NGSS science, including resources developed by science-rich institutions such as The Lawrence Hall of Science and The Exploratorium.
- b. More broadly disseminate the CA NGSS science curriculum framework, so that more educators have access to it; and
- c. Provide training on strategies for integrating the CA ELD standards with CA NGSS.

3. IMPROVE ASSESSMENT IN SCIENCE.

It is encouraging that the CDE is developing optional performance-based formative assessments designed to measure what students know and understand. In order to make these performance-based assessments more accessible, the CDE should develop a guide for teachers to use them, and it should also provide translations into key native languages to ensure EL access. The current plan also calls for performance tasks to be included in the summative CA NGSS assessments; these should be developed with supports for EL students in mind.

4. SUPPORT MULTILINGUAL/DUAL-LANGUAGE EDUCATION.

Dual-language proficiency is associated with improved academic outcomes overall, including more sustained academic growth. To promote multilingualism, the state can:

- a. Strengthen the bilingual teacher pipeline by providing funding to districts for teachers to get a bilingual credential (BCLAD); and
- b. Foster implementation of Prop. 58 by disseminating multilingual resources for science and other subject areas through the CDE's digital platform.

5. IMPROVE COLLEGE AND CAREER PREPARATION IN SCIENCE.

To meet the performance expectations of CA NGSS, students will need more rigorous science instruction and more time learning science. To get there, we need to reconsider our state graduation requirements and our expectations for rigorous, college-preparatory science coursework. Specifically, we recommend:

- a. When reviewing and approving science courses, the UC system must ensure that each course meaningfully prepares students for mastery of the CA NGSS standards. It is also important that high school teachers and instructional leaders design A-G approved courses that include the CA ELD standards.



- b. To advance CA NGSS implementation and EL achievement, state leaders should convene a meeting of district leaders with the UC and CSU regents to share approaches for developing curriculum and syllabi that meet A-G requirements and support EL college preparatory learning.
- c. Increase the current state graduation requirements in science to provide more opportunities for learning the performance expectations of CA NGSS.

6. ENSURE THAT STATE ACCOUNTABILITY SYSTEMS PROMOTE A FOCUS ON SCIENCE AND ENGLISH LEARNERS.

The California State Board of Education voted to include CA NGSS science assessment results, once available, in the “evaluation rubric,” the

dashboard that will serve as a centerpiece of the state’s new school accountability system. The SBE must follow through on this commitment as soon as results are available, starting in 2018-19, and it must use this data as part of its system of identifying schools and districts for support and assistance. When providing assistance to those identified schools and districts, county offices of education and the California Collaborative for Education Excellence should ensure that technical assistance experts have expertise on English learners’ needs and are attentive to CA NGSS and ELD implementation strategies.



OUR MISSION

The Education Trust-West works for the high academic achievement of all students at all levels, pre-K through college. We expose opportunity and achievement gaps that separate students of color and low-income students from other youth, and we identify and advocate for the strategies that will forever close those gaps.

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