



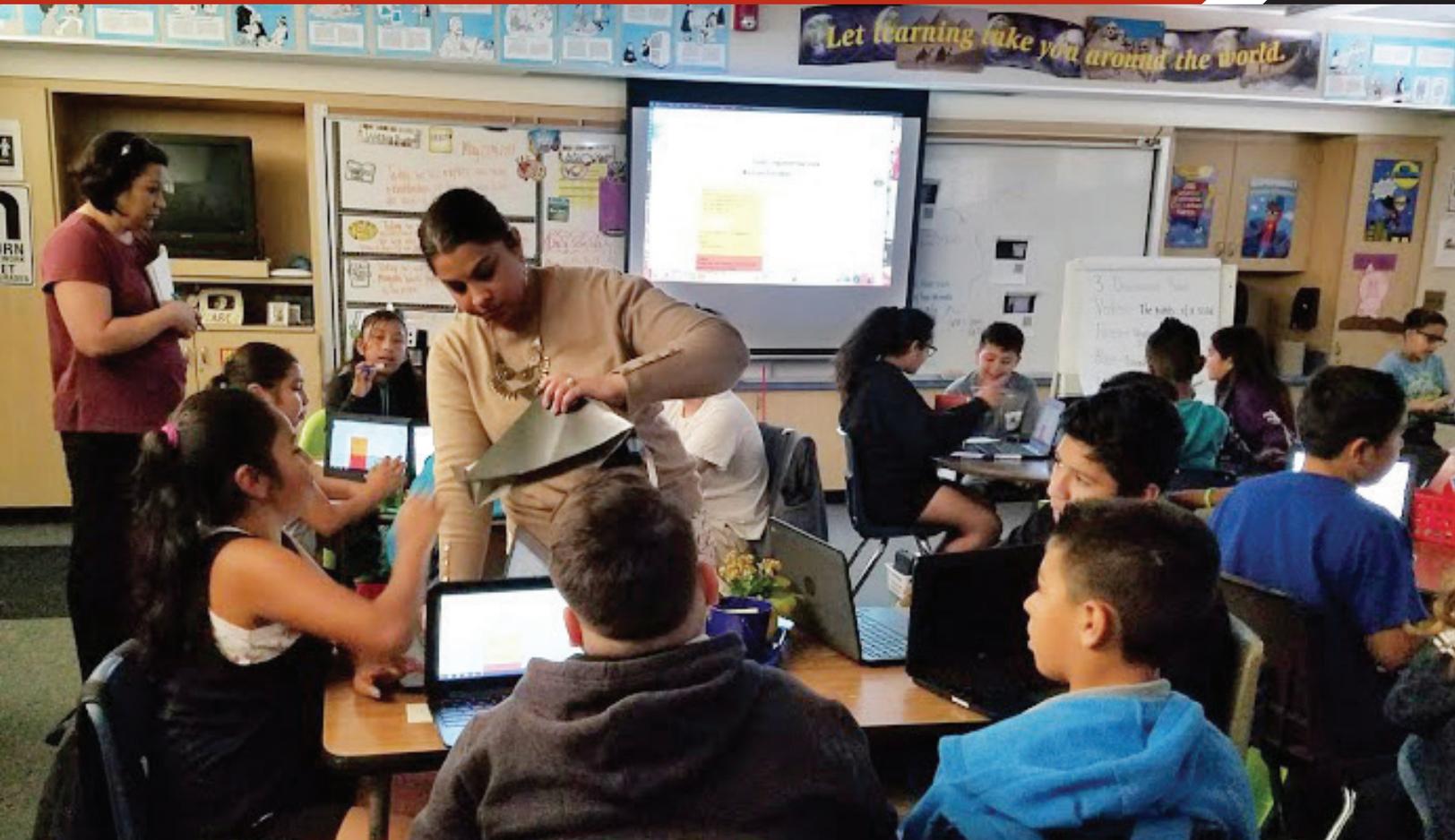
MARCH 2018



The Education Trust—West

UNLOCKING LEARNING II: MATH AS A LEVER FOR ENGLISH LEARNER EQUITY

UNLOCKING LEARNING II: MATH AS A LEVER FOR ENGLISH LEARNER EQUITY



The fifth-grade classroom at William Northrup Elementary School in Alhambra, California is buzzing with chatter. Students – 40% of whom are English learners – sit in groups of four as they work together to solve the problem that their teacher, Angela Giberti, has written on the board. “Rosa is training for a race and is running laps around a field. If the distance around the field is 300 yards, how many complete laps would she need to do to run at least two miles?”

AN EMPHASIS ON LANGUAGE AND DISCOURSE IN THE CLASSROOM HELPS ENGLISH LEARNERS TO CULTIVATE LANGUAGE PROFICIENCY AND MASTER MATH STANDARDS.

As the students are discussing their thoughts on how to solve the problem with their table mates, Ms. Giberti reminds the students to use the sentence frames that are posted on the wall to start their discussions: “*Why do you think...*,” “*I agree that...*” After a while she invites students to come up to the front of the class to explain verbally how they solved the problem and to show their calculations and drawings on the board. Three different students come up and show three different ways to solve the problem. After the students have shared their thinking, Ms. Giberti summarizes the different approaches, restating the students’ ideas with math terminology – “operation” and “conversion” – as students take notes in their notebooks.

While solving word problems in math is not new, the emphasis on students using language and discourse

▶ **WHILE SOLVING WORD PROBLEMS IN MATH IS NOT NEW, THE EMPHASIS ON STUDENTS USING LANGUAGE AND DISCOURSE TO EXPLAIN THEIR PROBLEM-SOLVING APPROACH IS ONE OF THE INSTRUCTIONAL SHIFTS REQUIRED BY THE COMMON CORE.**

to explain their problem-solving approach is one of the instructional shifts required by the Common Core. The Standards for Mathematical Practice call for students to “make sense of problems and persevere in solving them” as well as “construct viable arguments and critique the reasoning of others.”¹ When coupled with the deliberate integration of English language development with the math content, this is the kind of instruction that experts say English learners need to cultivate language proficiency and master the math standards.

Angela Giberti – in her 4th year of teaching – is part of a “Unit of Study” team which includes three teachers and a math instructional specialist. The team meets once a month to plan a standards-based lesson together with attention paid to the language demands of the lesson. They all teach the lesson (including the instructional specialist), observe each other teach (in person or on video), and meet to share insights, discuss the extent to which the lesson was accessible to English learners, and consider how the lesson could be improved. This approach appears promising: In 2017, English learners at Northrup met or exceeded the math standards on the common-core standardized test at nearly three times the rate of English learners in CA.

Author: Rachel Ruffalo, *Senior Practice Associate*



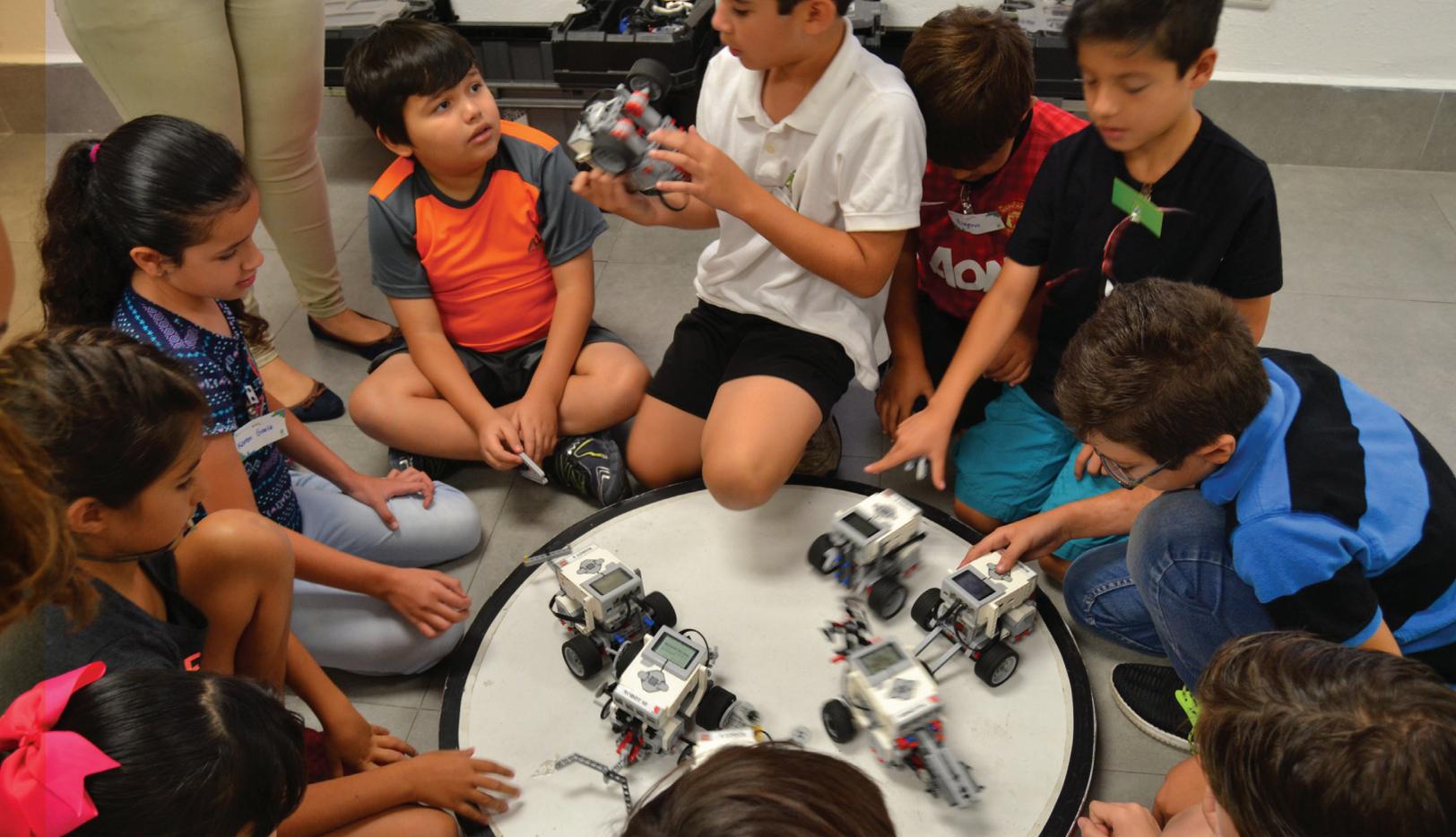
WHAT ARE THE STANDARDS FOR MATHEMATICAL PRACTICE?

While the Common Core State Standards outline what students should know and be able to do at a given grade level, the Standards for Mathematical Practice describe the learning behaviors all students are expected to demonstrate. The SMPs help to facilitate the integration of language – reading, writing, listening, and speaking – in math lessons, providing ELs with greater access to the math content while simultaneously reinforcing language development.

COMMON CORE STATE STANDARDS FOR MATHEMATICAL PRACTICE

- 1. Make sense of problems and persevere in solving them.***
- 2. Reason abstractly and quantitatively.***
- 3. Construct viable arguments and critique the reasoning of others.***
- 4. Model with mathematics.***
- 5. Use appropriate tools strategically.***
- 6. Attend to precision.***
- 7. Look for and make sense of structure.***
- 8. Look for and express regularity in repeated reasoning.***

Source: <http://www.corestandards.org/Math/Practice/>



INTRODUCTION

The Common Core State Standards establish the expectation that *all students* will be taught to the same high standards and held to the same rigorous goals, regardless of their zip code and home language. High-quality implementation of the standards is an important step in ensuring that all of California’s students are prepared for college and careers. But in order to fully realize this goal, practitioners and policymakers must ensure that the educational needs of English learners—who represent more than 1 in 5 students in California’s K-12 schools—are front and center in California’s

implementation of the standards, assessments, and accountability systems and not simply an afterthought.

Wide and persistent gaps in math achievement separate English learners from their English-proficient peers. The consequences of these gaps are severe and long lasting. Without a solid foundation in math, students are less likely to access and excel in college preparatory math and science classes in high school. And without high-level math classes in high school, students have fewer college and career opportunities,² especially in the STEAM (science, technology, engineering, arts, and math) fields that are increasingly in high demand in California. Indeed, these gaps threaten the very wellbeing of our state’s future, in terms of lost human and economic potential. The imperative is clear: **We must do more to ensure that English learners have equitable access to rigorous math learning opportunities and are supported to achieve at high levels.** This report, the second in The Education Trust–West’s *Unlocking Learning* series³, aims to illuminate the promising practices in math education that advance access, opportunity, and achievement for English learners in California.

In recent years, California has seen a confluence of

▶ PRACTITIONERS AND POLICYMAKERS MUST ENSURE THAT THE EDUCATIONAL NEEDS OF ENGLISH LEARNERS—WHO REPRESENT MORE THAN

1 IN 5 STUDENTS

IN CALIFORNIA’S K-12 SCHOOLS—ARE FRONT AND CENTER.

**WE MUST DO MORE TO ENSURE THAT ENGLISH LEARNERS HAVE
EQUITABLE ACCESS TO RIGOROUS MATH LEARNING OPPORTUNITIES
AND ARE SUPPORTED TO ACHIEVE AT HIGH LEVELS.**

major policy initiatives aimed at improving opportunities and outcomes for English learners. In 2012, California adopted English Language Development (ELD) Standards which are designed to be integrated into all core content area instruction. The next year, state leaders adopted the Local Control Funding Formula (LCFF), which provides additional funding to districts for each low-income student, English learner, and foster youth. LCFF requires districts to use the additional funding to increase and improve services for these students. In 2016, California voters overwhelmingly passed Proposition 58, which reversed nearly twenty years of primarily English-only instruction for English learners. And in 2017, the California Department of Education (CDE) adopted a new California English Learner Roadmap Policy to provide guidance to districts around welcoming and educating English learners through meaningful access to high-quality instruction and support systems.⁴

Despite this momentum, we know that well-intentioned policies that lack effective implementation are not sufficient to change the academic achievement trajectory for English learners – and teachers cannot do this work alone. State, county, district, and school leaders need to work together to prioritize the development of rich learning opportunities for English learners and support efforts that dramatically improve academic outcomes.

The good news is that this work is possible. We know achievement and opportunity gaps can be closed by implementing research-supported instructional practices designed for English learners and by providing teachers with the training, time, and support to transform their teaching. This report shines a light on how some schools and districts are doing just that. For each research-supported promising practice featured in this report, we provide examples from the field and share specific actions that districts and schools can take now to advance math learning for English learners. We conclude with an overview of opportunities and recommendations for state and local policymakers to support practitioners in ensuring English learners are prepared for college and career.



**WE KNOW ACHIEVEMENT AND OPPORTUNITY
GAPS CAN BE CLOSED BY IMPLEMENTING
RESEARCH-SUPPORTED INSTRUCTIONAL
PRACTICES DESIGNED FOR ENGLISH
LEARNERS AND BY PROVIDING TEACHERS
WITH THE TRAINING, TIME, AND SUPPORT TO
TRANSFORM THEIR TEACHING.**

HOW ARE ENGLISH LEARNERS DOING IN CALIFORNIA?

DEFINITIONS FOR LANGUAGE PROFICIENCY GROUPS

ENGLISH ONLY (EO)

A student whose primary home language is English.

INITIALLY FLUENT ENGLISH PROFICIENT (IFEP)

A student with a primary language other than English who met the criteria for English language proficiency upon initial enrollment in a U.S. public school.

RECLASSIFIED FLUENT ENGLISH PROFICIENT (RFEP)

A student who was previously an English learner but who has met certain standards for English proficiency.

FEP

Includes IFEP and RFEP

ENGLISH LEARNER (EL)

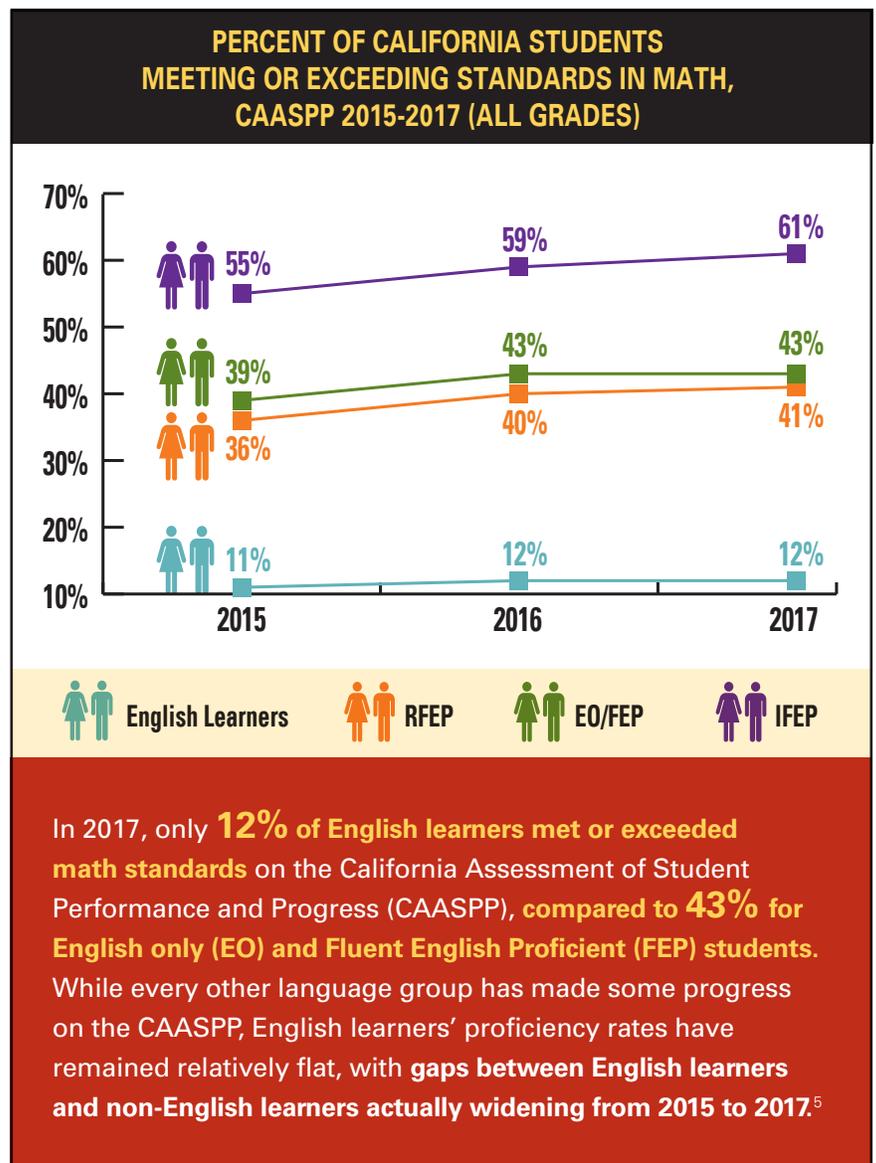
A student who speaks a primary language other than English and who lacks certain English language skills.

LONG-TERM ENGLISH LEARNER (LTEL)

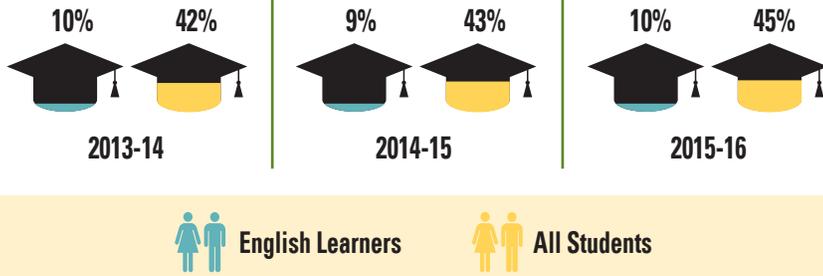
A student who has been an English learner for more than six years.

A note about the English learner (EL) classification and standardized test scores: By definition, ELs are likely to underperform on tests conducted in English. Therefore, analyzing progress for English learners is challenging as students who demonstrate English proficiency are reclassified as Fluent English-Proficient (RFEP) and are no longer included in the EL category. With this challenge in mind, we believe it is important for educators and policymakers to continue to monitor the progress of all language proficiency groups to better understand how to improve specific practices and policies aimed at closing achievement gaps.

The following data paint the picture of how California's English learners are doing in math:



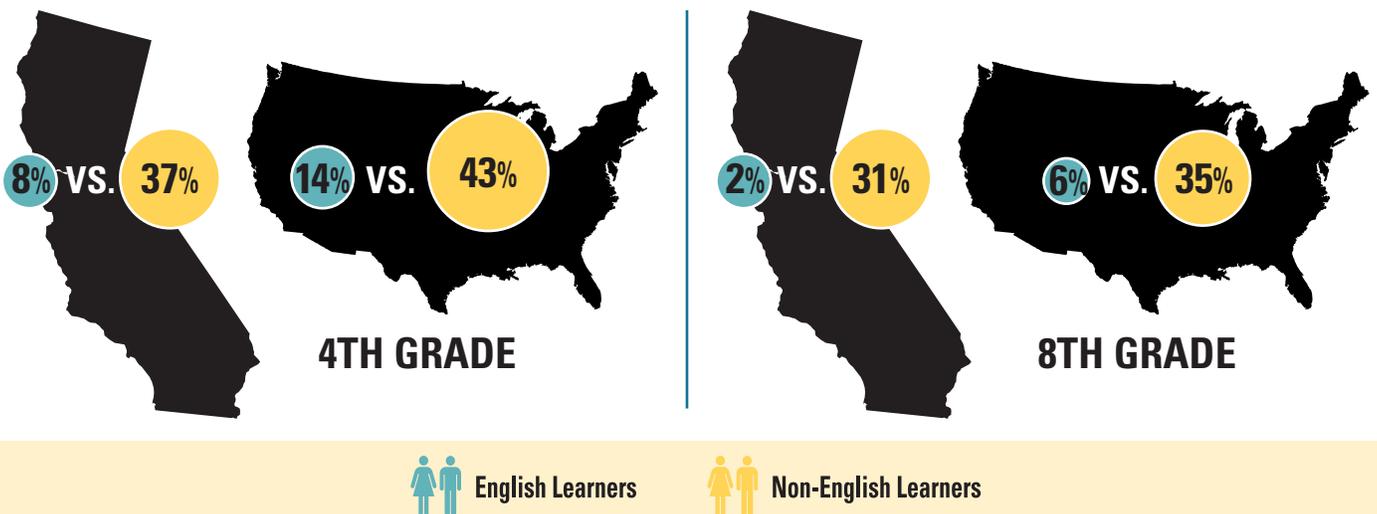
PERCENT OF CALIFORNIA 12TH GRADE GRADUATES COMPLETING A-G COURSES REQUIRED FOR U.C. AND/OR C.S.U. ENTRANCE



There are similarly large gaps in college readiness rates for English learners, with just **10% of EL high school graduates** completing the A-G course sequence required for UC/CSU admission compared to **45% of all students** statewide. This gap has grown by nearly 4 percentage points over the last three years.⁶

At the crucial juncture of 9th grade – where math course placement often predicts students' later college eligibility – California's **English learners are placed in remedial math courses at rates twice that of non-English learners** (5% compared to 2%) and are **placed in Geometry** – an advanced math course for 9th graders – **at less than a third of the rate of non-English learners.**⁷

PERCENT OF STUDENTS SCORING PROFICIENT OR BETTER ON NAEP 2015



The National Assessment of Educational Progress (NAEP) test scores allow for a national comparison of math achievement. Only **8% of California 4th grade English learners scored proficient or better**, compared to **37% of non-English learners**. Among **8th graders**, only **2% of ELs scored proficient**, compared to **31% of non-ELs**. These EL proficiency rates for California's English learners are about half that of the EL national average for 4th grade and a third of the EL national average for 8th grade.⁸

▶ TEACHER SPOTLIGHT

NICOLAS NGUYEN, MATH TEACHER AND DEPARTMENT CHAIR, SAN GABRIEL HIGH SCHOOL

Nicolas Nguyen recalls being a 12 year-old recent immigrant struggling to learn Algebra in a classroom with few supports for English learners. He recounts how difficult it was to understand the teacher’s technical terminology and how he felt reluctant to speak in class. Now, as a math teacher and department chair at **San Gabriel High School**, Nicolas says he holds these memories at the center of his instructional practice. He speaks of his firm belief in the importance of incorporating English language development within his math instruction and encourages his team of math teachers to focus on language in their classrooms. He describes the value of math discourse and facilitates math conversations in his class through structured discussions and group math tasks.

Teaching is a second career for Nicolas, who started out as an engineer. But after a stint as a substitute in a pre-Algebra class, Nicolas discovered his calling to be a math teacher. Now, ten years later, Nicolas enjoys the challenging and dynamic nature of his work. He particularly enjoys helping his students apply math concepts to real-world challenges – a central tenet of the Common Core. To support his colleagues, **Nicolas opens up his classroom to be a “lab classroom” for any teacher to visit at any time to observe his integration of language instruction within the math curriculum.**

Nicolas’ students express that he creates a welcoming and empowering learning environment – the kind he wishes he had when he was a student. They cite the small group discussions and Mr. Nguyen’s ability to explain complex topics in a comprehensible way as reasons why math is one of their favorite classes.

▶ CLASSROOM SPOTLIGHT

SUN EMPIRE ELEMENTARY SCHOOL IN KERMAN (FRESNO COUNTY)

Kary Garcia and her twenty-seven fourth grade students – **54 percent English Learners** – discuss last night’s homework problem at **Sun Empire Elementary School** in the small central valley town of Kerman. *“Ricardo has 27 candy bars. Griselda has one half the amount of candy that Ricardo has. How many candy bars do Ricardo and Griselda have together?”* Students know that the expectation for solving word problems includes writing an equation, drawing a picture, and writing out an explanation for how they got their answer. One student, Marcela, walks up to the board and explains her procedure to the class. Ms. Garcia asks, *“You said you would divide 2 by 27. Is that what you meant to say?”* Marcela replies, *“No, I meant 27 divided by 2.”* Another student raises his hand and asks, *“You said 27 divided by 2. Where did you get the 2 from?”* Marcela replies, *“The problem said Griselda had half the amount so I had to divide by 2.”*

This use of language and collaborative problem solving reflects what Ms. Garcia calls a “complete transformation” from her old way of teaching math and illustrates some of the methods called for in the Common Core State Standards in Mathematics and the CA English Language Development Standards. Before Common Core, Ms. Garcia’s math instruction was primarily focused on computation – teaching students how to solve math problems quickly. But since participating in Cognitively Guided Instruction (CGI) training, she now guides students to think aloud with each other to understand the math concepts and how they apply to the real world. (See page 15 for more about CGI).

PROMISING PRACTICES

There is no shortage of will to support English learners. Up and down the state, educators express a desire to advance equity in their schools and improve achievement for English learners. The problem is, they don't always have the time, resources, support, or skills they need to make systemic and instructional shifts that will improve outcomes for English learners. As our state develops its new system of supports, school districts, the county offices, the California Collaborative for Educational Excellence, and California Department of Education are each charged with addressing these capacity constraints. If well-coordinated and adequately resourced, these agencies have the potential to collect and share evidence-based best practices, facilitate peer-to-peer learning, and connect district and school leaders with external partners and experts who can support improvement.

Yet we also hear that district and school leaders are hungry for support now. The Common Core standards are no longer new, yet educators are still learning them, familiarizing themselves with new materials, and adjusting their instruction. We are in the fifth year of LCFF, yet district leaders are still adjusting to new budgeting practices, free from categorical constraints and compliance-driven accountability. With Prop 227 largely replaced by Prop 58, district leaders are assessing their options for expanding bilingual instruction. With these opportunities at hand, we sought to answer the question: **What does it take to close achievement and opportunity gaps for California's English learners in mathematics?**

We first sought to identify the most promising practices that educators and administrators can use to advance math learning for English learners. We reviewed academic and professional research and conducted interviews with experts in the fields of mathematics education and English language development. *(For more detail on the academic and professional literature supporting these practices, please see our Annotated Bibliography at www.edtrustwest.org.)*

Then, we used demographic and test score data to identify California schools and districts where English learners were doing particularly well in math.⁹



We interviewed leaders from those schools and visited many of them. During those visits, we observed classrooms, collected and analyzed artifacts, and conducted focus groups with district and site leaders, teachers, and students. We looked for research-based practices as well as other practices and policies that might be linked to higher achievement for ELs.

From this work, we zeroed in on four key practice areas that support math learning for ELs. Each is supported by the research, and for each we share examples of where they are being implemented in California schools and districts. They are:

- 1 Honor and leverage English learner students' backgrounds, cultures, and home languages, as assets for math learning**
- 2 Integrate English language development with math content instruction**
- 3 Offer sustained teacher professional learning opportunities to simultaneously support English language development and math achievement for English learners**
- 4 Ensure equitable access to rigorous academic coursework with appropriate supports**



For too long, many English learners – including long-term English learners – have endured physical and social isolation in schools where they are placed in separate classes or are excluded from the many activities and extracurricular programs that shape a school’s culture.¹⁰ Parents of English learners may face similar barriers when attempting to communicate with school personnel who are ill-equipped to communicate in parents’ native languages. These conditions can create environments where English learners and their families feel unwelcomed and their language and culture devalued.

LEVERAGE AND CELEBRATE MULTILINGUALISM

What Research and Experts Say

Since the passage of Prop 58 – which removed barriers to districts offering bilingual programs and instruction in students’ primary languages – districts across the state have plans to add and/or expand bilingual and dual immersion programs.¹¹ This is a promising development as research indicates that English learners who are enrolled in bilingual programs have better long-term outcomes – both linguistic and academic – than students served in English-immersion programs. While ELs in English-only programs may post better linguistic and academic outcomes initially, long-term data show that English learners taught using two languages catch up and in many cases outperform their peers in English-only classrooms over time on both these measures.¹² Bilingual programs not only lead to improved learning outcomes, they also celebrate multilingualism as a valuable asset, affirming students’ home languages and cultures. While bilingual instruction is beneficial for ELs,¹³ California faces a severe shortage of credentialed bilingual teachers.¹⁴ To fully realize the benefits of bilingual instruction, California will need to significantly boost its bilingual teacher pipeline.

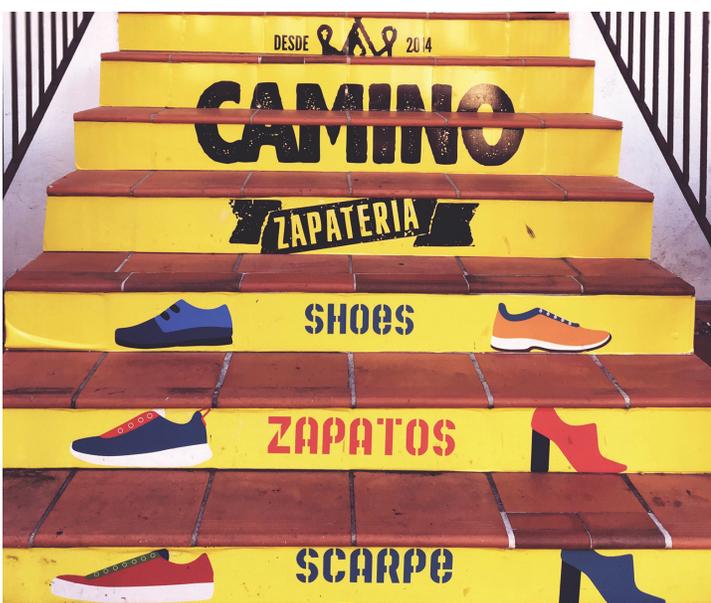
Where We See it in California

Westminster School District in Orange County recently started two dual-immersion programs – one in Vietnamese and one in Spanish. In the Vietnamese dual immersion program, the language of instruction in math alternates daily, so students are taught math in two languages, leveraging students’ home language skills. District leaders say these programs improve cross-cultural relationships and strengthen partnerships between schools and the families they serve. Westminster School District was recognized by the California School Board Association with the Golden Bell Award for increasing language acquisition through their Vietnamese Dual Immersion program.

CREATE A WELCOMING SCHOOL CULTURE BY UNDERSTANDING STUDENTS' EXPERIENCES AND NEEDS

What Research and Experts Say

A positive schoolwide culture is integral to advancing the high achievement of all students.¹⁵ Schools that are highly attuned to students' needs and strengths and demonstrate respect towards all cultures see higher graduation and college-going rates for their English learners.¹⁶ Successful schools apply an asset-based, social justice lens to mathematics education by leveraging students' existing knowledge and experiences as resources for teaching and learning.¹⁷ For example, they provide academic support in students' primary languages and structure opportunities for ELs to engage in rigorous mathematical discourse.¹⁸



Where We See it in California

At **Nogales High School** in Los Angeles County, ELD Program Specialist, Patricia Mendoza, in collaboration with school staff and students, produces welcome videos for students new to the United States in their primary languages. Fellow newcomer students help develop the content and record the messages, relaying what to expect at school and where to go for assistance. Newcomer students report that this welcoming environment has helped them feel comfortable asking for academic help. The school has also assigned a counselor dedicated to serving newcomer students.

At **San Gabriel High School** in Los Angeles County, teachers use Ivannia Soto's protocol for shadowing English learners¹⁹ to gain a greater understanding of the students' experiences in and outside of class for a full day. Shadowing teachers note what students are doing in their classes and the extent to which their teachers are engaging them with opportunities for discourse and collaboration. These experiences help "to hold a mirror up" to reflect how teacher practice and school policies impact English learners and the extent to which English learners have equitable access to rigorous courses. This process, along with an analysis of student courses and grades – disaggregated by language status – changed teachers' perceptions of English learners' academic capacities. As a result, district leaders decided to expand ELs' access to A-G and advanced math courses, while providing robust supports in and outside of the math classroom.

Actions districts can take to honor and leverage EL students' backgrounds, cultures, and home languages:

1. *Develop bilingual programs that leverage and value students' home languages while emphasizing the benefits of multilingualism for living and working in a global society.*
2. *Prioritize the recruitment and development of bilingual staff, classroom aides, and teachers to encourage EL family participation in classrooms and schools and to model the benefits of bilingualism.*
3. *Invite district and school faculty and staff to shadow English learners to understand the school experience from their perspective.*

The Common Core math standards -- adopted by California in 2010 -- ushered in a new era of math instruction, with a more rigorous, coherent, and focused approach to teaching and learning math. The content standards, along with the Standards for Mathematical Practice (see page 3), emphasize mathematical reasoning and conceptual complexity to better prepare our students for solving the complex challenges of the 21st Century.²⁰ The Common Core math standards require that teachers focus on oral and written language in order to help students engage in the cognitive rigor embedded in the standards.²¹ Along with the Common Core, districts have also been implementing the English Language Development standards, which are designed to be integrated within the content standards. These changes all require significant shifts in instruction.

Districts can support teachers and English learners by adopting or developing high-quality math teaching materials that integrate English language development into the core curriculum, rather than simply offering add-on interventions. In fact, the impact of instructional materials on student learning is among the most important levers that a district or school can influence.²² And although California is more than seven years into its implementation of the Common Core math standards, teachers throughout the state still report “having access to quality textbooks and instructional materials” as one of their top needs to effectively implement the standards.²³

INCORPORATE MATH LANGUAGE ROUTINES INTO CLASSROOM INSTRUCTION

What Research and Experts Say

The quality of classroom instruction is the single most important school factor to EL student learning.²⁴ And now more than ever, language is the vehicle for learning math content while the math classroom provides additional opportunity for language development. “You can’t learn math without language,” states Phil Daro, one of the authors of the Common Core math standards. “There is an old idea that you can work around the language, and just get to content. This isn’t true.”²⁵ Recognizing how language and math learning actually enhance and amplify one another is key to understanding how math instruction should be approached with students’ language needs at the center of every lesson.



Where We See it in California

To help teachers address the discipline-specific language demands in math, **Understanding Language (UL)** and the **Stanford Center for Assessment, Learning and Equity at Stanford University (SCALE)** created a framework and a set of mathematical language routines that can be used to support *all students* learning mathematics, but are particularly well-suited to meet the needs of English learners.²⁶ The eight math language routines provide teachers with robust, tangible guides for curriculum development, instruction, classroom routines, and formative assessment. To date, the UL/SCALE team has helped multiple school districts implement the language routines, with many more districts using the routines as part of a pilot program with **Illustrative Math** – an online source of free math content and lessons. The routines have been integrated into Illustrative Mathematics’ new middle school openly licensed curriculum.²⁷

DEVELOP LANGUAGE-RICH COLLABORATIVE MATH TASKS

What Research and Experts Say

A Common Core-aligned math classroom is alive with discussion and group collaboration, with attention paid to the process of making sense of math problems and not just to arriving at the correct answer. Structured collaborative language-rich tasks help to simultaneously advance math content learning and English language development²⁸ by prompting students to explain how they approached the solutions to math problems and asking clarifying questions of one another.²⁹

Leslie Hamburger, Co-Director of WestEd's Quality Teaching for English Learners program, cautions that discourse in the math classroom is "necessary, but not sufficient to effectively serve English learners." She coaches teachers and teacher leaders to intentionally craft and structure opportunities for students to engage in quality peer interactions and to think about the ways in which the language demands of each unit will likely be challenging to ELs.³⁰

Where We See it in California

Some California schools are developing language-rich collaborative math tasks. These multi-step, complex, real-world math tasks are designed to facilitate math discourse and collaborative problem solving, providing students with ample opportunity to practice using academic math language. These math tasks are a central feature of **San Francisco Unified School District's** teacher-created K-12 math curriculum. Each math unit of study includes four language-rich collaborative math tasks. The district engaged teachers, administrators, math and ELD specialists from within the district, as well as experts from outside the district, to develop the curriculum. In addition to the math tasks, the district has adopted and trained math teachers in pedagogies that are designed to encourage student discourse. James Ryan, STEM Executive Director for SFUSD, says that the structure of the learning activities and pedagogies are all designed with the needs of English learners at the forefront. SFUSD continues to refine its curriculum every year, based on student performance data, survey data, focus groups, and classroom observations.

Actions districts can take to integrate English language development with math instruction:

- 1. Establish the expectation that all teachers are language teachers and that English learners will have opportunities to actively practice academic uses of language – in reading, writing, listening, and speaking – in every class, every day.**
- 2. Equip math teachers with the tools and routines – such as the Math Language Routines – to bridge gaps in English proficiency and help ELs learn rigorous math concepts.**
- 3. Adopt or develop instructional materials – such as language-rich collaborative math tasks – that deliberately and effectively integrate English language development approaches within the core mathematics curriculum.**

For more tools and resources to support the integration of English language development with math, see *The Education Trust-West's Math Equity Toolkit* at www.edtrustwest.org.

PROMISING PRACTICE

3

OFFER SUSTAINED TEACHER PROFESSIONAL LEARNING OPPORTUNITIES TO SIMULTANEOUSLY SUPPORT ENGLISH LANGUAGE DEVELOPMENT AND MATH ACHIEVEMENT FOR ENGLISH LEARNERS.



To effectively implement the ELD and math standards, teachers must shift their instruction. This takes training and practice. Unfortunately, many teachers have not received the training necessary to make the complete shift in their teaching and to integrate language development and supports for English learners.³¹ In a recent survey of teachers throughout the state, nearly half reported that their professional development “did not or only minimally addressed” meeting the needs of English learners.³²

PROVIDE ELD TRAINING FOR EVERY TEACHER

What Research and Experts Say

While developing the language skills of ELs has traditionally been viewed as the responsibility of ELD teachers, all teachers – regardless of subject area – are teachers of language and English learners.³³ Thus, districts and county offices of education must dedicate time, money, and commitment to support *all* teachers to learn the pedagogy, routines, and classroom structures to effectively support ELs and to integrate the ELD standards into content area instruction.

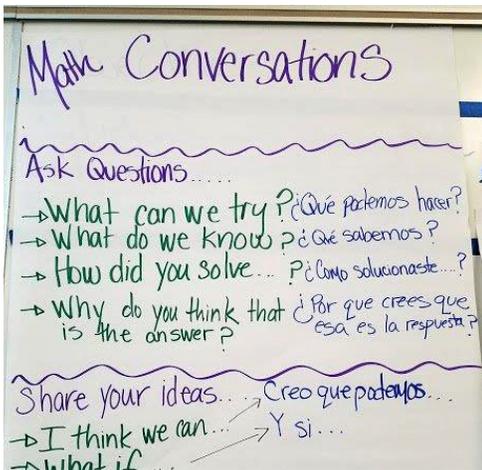
Where We See it in California

Using LCFF funds, **Westminster School District** provides each of its 550 teachers with professional development on how to integrate language development practices for English learners in every subject and grade level. Teachers received training on the new ELA/ELD standards, as well as on **Constructive Conversations**, based on the work of Kenji Hakuta from **Understanding Language at Stanford**. While 44% of the students in the district are designated as English learners, district leaders recognize that all of their students need more English language development. This approach appears promising as the district’s EL math proficiency rates have increased annually since 2015.

SUPPORT ONGOING TEACHER LEARNING AND TEAM COLLABORATION

What Research and Experts Say

Math experts and practitioners agree that investing in sustained professional development is not only essential, but perhaps yields the greatest returns in terms of student learning.³⁴ For math teachers, it is critical that they receive professional development on language and literacy strategies that are specific to math content and the language needs of their particular EL students. In addition to this training, math teachers need ongoing coaching and regular collaboration with EL specialists and ELD teachers, access to models of effective instruction, and regular opportunity for feedback and reflection.³⁵



Where We See it in California

To learn how to make the instructional shifts called for in the Common Core, the 4th grade team at **Sun Empire Elementary School** in Fresno County, participated in a week-long intensive professional development program offered at Fresno State University called **Cognitively Guided Instruction (CGI)**. CGI guides teachers to understand children's intuitive mathematical thinking and to create opportunities for students to engage with each other and the content to build their mathematical conceptual understanding and practices.³⁶ Building on this training, the team of teachers meets regularly to refine lesson plans and assessments. Statewide, only 15 percent of fourth-grade English learners met grade-level standards in mathematics in 2017. But at Sun Empire, 49 percent met or exceeded the standards. This outcome reflects a 39 percentage point increase from 2015 to 2017.

To support teachers' implementation of the Common Core in math, since 2014 the **Santa Clara County Office of Education** has joined a community-wide collaborative – the East Side Alliance – comprised of the East Side Union High School District and its seven feeder elementary school districts: **Alum Rock, Berryessa, Evergreen, Franklin-McKinley, Mount Pleasant, Oak Grove, and Orchard** in San Jose, who collectively serve over 80,000 students, 31% of whom are ELs. The county office of education provides symposia on Common Core math content, instruction, and growth mindset to high school and middle school teachers from the Alliance schools. After the initial symposium, teachers form teams to continue working together as a professional learning community that includes working with a math coordinator from SCCOE and **Instructional Leadership Corps** coaches, analyzing student work, and examining data to reflect on issues of equity and access to rigor for English learners. County math specialists in-part credit these professional learning communities for improvement on CAASPP math results from 2015 to 2017 for 8th grade English learners at every district in the Alliance.

Actions districts and county offices of education can take to provide sustained teacher professional learning opportunities to simultaneously support English language development and math achievement for ELs:

1. **Provide common planning time for ELD and math teachers to collaborate and mutually support each other in integrating ELD and math.**
2. **Facilitate structured opportunities for ELD and math coaches and specialists to work together across schools and districts to support teachers and integrate ELD into the math curriculum.**
3. **Ensure that professional learning is aligned to the needs of English learners, that it is modeled and supported by site and district leadership, and sustained by ongoing coaching and collaboration.**

English learners are often placed into courses with low levels of content rigor including remedial courses and segregated EL-only classes. These classes often deny students rich academic discourse and rigor. English learners who are placed in non-college-preparatory courses almost never “jump track” into college prep courses – even after achieving English proficiency – thereby precluding admission to a four-year university after high school graduation.³⁷

REDUCE TRACKING AND DIFFERENTIATE INSTRUCTION

What Research and Experts Say

In many districts, math tracking begins as early as elementary school. A significant body of research has pointed to the detrimental effects of tracking and ability grouping which often results in permanent labels and can cause students to internalize narratives about who can and cannot excel in math.³⁸ However, when schools de-track their math classes, students across the achievement spectrum actually pursue more advanced math courses, enjoy math more, and have higher math achievement.³⁹

Where We See it in California

In 2014, **San Francisco Unified** passed a math course sequence policy which de-tracked all math classes through the 10th grade. Since then, all students are placed in heterogeneous Common Core-aligned math classes, with support classes and A-G approved SDAIE classes for English learners. To balance the goal of achieving equity with the desire to support high-performing students, the school board approved different pathways of acceleration, including taking two math classes in 9th or 10th grade or taking math courses at the community college in order to reach AP Calculus or AP Statistics by 12th grade. To support teachers to effectively differentiate their instruction, the district’s math department provides professional development and coaching for instructional leaders and teachers. Although the new policy was designed to address equity for all student groups, 2017 CAASPP scores in math indicate that the policy may have contributed to improved outcomes for English learners. In 2017, 29% of 11th grade English learners met or exceeded the standards in math – five times the rate of 11th grade English learners across the state. This outcome reflects a 6 percentage point increase over the last two years.



PROVIDE ACCESS TO RIGOR WITH SUFFICIENT SUPPORT

What Research and Experts Say

To help English learners fully access rigorous coursework, schools must provide supports to accommodate ELs' language needs. And school systems should ensure that the math curriculum is aligned across all grade levels so that English learners who enter school in elementary and middle school are taught the foundational math concepts and skills they will need for college preparatory math classes in high school. Programs that provide English learners with a combination of English language development *and* supportive access to academic content, such as Specifically Designed Academic Instruction in English (SDAIE), yield positive outcomes.⁴⁰ In SDAIE, teachers provide scaffolds – such as graphic organizers or sentence frames – to help students access the content. Teachers should closely monitor students' English language development and gradually reduce and remove the scaffolds. Teachers can also support students' access to rigorous content by using gestures, real-life objects, and other visual models together with oral explanation and discussion.⁴¹

Where We See it in California

In an effort to advance equity, **Alhambra Unified School District** de-tracked its middle school math curriculum and adopted an Integrated Math course sequence for 9th-11th grades. In 9th grade, all students, including English learners, are enrolled – via open enrollment – in an A-G approved Integrated Math I course, with different sections offering different instructional strategies and supports, including acceleration, SDAIE, smaller class sizes, and use of instructional aides. At two of the three high schools, students needing additional math support are enrolled in a math support class that affords students more time to learn and practice what they are learning in their core math class. The district offers a 7-period student schedule to enable students to take support classes without infringing upon enrollment in college preparatory and electives courses.

Actions districts can take to ensure equitable access to rigorous academic coursework:

- 1. Reduce tracking in math classes and provide open access to advanced courses with appropriate language supports for ELs.***
- 2. Build in systemic supports for English learners such as SDAIE, differentiated instruction, primary language materials, bilingual classroom aides, and math support classes, while also providing ample opportunities for supplemental support such as tutoring, access to digital learning tools, and enrichment activities.***

CONCLUSION AND RECOMMENDATIONS FOR STATE-LEVEL ACTIONS

Under the principle of local control, it is primarily the responsibility of district leaders to ensure district resources and systems are aligned to support progress toward student goals and equity. As illustrated by this report, many districts and schools across the state are already engaging in this challenging work by shifting school climate, classroom instruction, and teacher support to improve the math educational experience and outcomes for English learners.

But schools and districts cannot do this work alone. State agencies like the Department of Education and the California Collaborative for Educational Excellence along with county offices of education, each have important roles to play to ensure that policies such as LCFF expand access to opportunity for English learners and improve the quality of learning experienced by all students. For example, these entities should share best practices, facilitate Professional Learning Communities (PLCs), connect districts with vetted service providers, provide districts with sustained assistance when necessary, provide oversight and hold districts accountable, and generally ensure that resources are effectively leveraged and deployed.

TO SPECIFICALLY SUPPORT EFFECTIVE MATH INSTRUCTION FOR ENGLISH LEARNERS, WE MAKE THE FOLLOWING STATE-LEVEL RECOMMENDATIONS:

- 1** The CDE should identify and vet primary language instructional materials and assessments for math (including digital learning tools), especially at the secondary level and in the primary languages most frequently spoken by California English learners⁴² in order to fully realize the expanded learning opportunities made possible by Prop 58.
- 2** The CDE and CCSESA (California County Superintendents Educational Services Association) should facilitate opportunities for collaboration between math and ELD specialists to develop professional learning modules, instructional materials, and videos of model lessons that effectively integrate the ELD standards with math instruction.
- 3** The CDE should provide districts with guidance relating to high-quality math curricula and instructional materials that effectively integrate the English language development standards into the core math curriculum.
- 4** The CDE should support districts in improving and expanding quality bilingual programs in line with the principles of the English Learner Roadmap Policy. To do so, the CDE should:
 - a. work with the Commission on Teacher Credentialing and teacher preparation programs to expand bilingual certification opportunities;
 - b. create incentives to encourage bilingual teachers to obtain bilingual authorizations; and
 - c. support funding for districts to develop or expand bilingual programs, including the acquisition of high-quality instructional materials and professional learning opportunities for bilingual teachers and paraprofessionals.

The time is now for the state, counties, and districts to harness the best practices and innovations from the field to close the opportunity and achievement gaps that have characterized English learners' education for far too long. With the opportunities presented by the many policies designed to address the needs of English learners, we are optimistic that more schools and districts will adopt the research-informed practices highlighted in this report. We are also hopeful that the CDE, CCEE, and county offices of education will effectively guide and support districts and schools in this important work to advance opportunity and learning for California's English learners.

END NOTES

- 1 “California Common Core State Standards: Mathematics” (Sacramento, Calif.: California Department of Education, 2014).
- 2 Will Tyson, Reginald Lee, Kathryn M. Borman, and Mary Ann Hanson, “Science, Technology, Engineering, and Mathematics (STEM) Pathways: High School Science and Math Coursework and Postsecondary Degree Attainment,” *Journal of Education for Students Placed at Risk (JESPAR)* 12, no. 3 (Dec. 2007): 243-270. <https://doi.org/10.1080/10824660701601266>.
- 3 See Sarah Feldman and Veronica Flores Malagon, “Unlocking Learning: Science as a Lever for English Learner Equity,” The Education Trust-West, January 2017.
- 4 “California English Learner Roadmap State Board of Education Policy: Educational Programs and Services for English Learners” (Sacramento, Calif.: California Department of Education, 2017).
- 5 California Department of Education, “California Assessment of Student Performance and Progress, 2015-2017,” <http://caaspp.cde.ca.gov/sb2017/> (Accessed Oct. 2017).
- 6 California Department of Education, “DataQuest Graduates, 2014-2016,” <http://dq.cde.ca.gov/dataquest/page2.asp?level=State&subject=Graduates&submit1=Submit> (Accessed October 2017).
- 7 The Education Trust-West analysis of California Department of Education data, 2016-17 “Staff assignment and course data,” available at <http://www.cde.ca.gov/ds/sd/df/filesassign.asp>.
- 8 U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, “National Assessment of Educational Progress (NAEP) Data Explorer, 2015 Mathematics Assessment,” <https://nces.ed.gov/nationsreportcard/naepdata/dataset.aspx> (Accessed November 2017).
- 9 We filtered for districts and schools that serve near or more than the state average of English learners and students qualifying for free and/or reduced price meals and whose English learners also scored higher than the state average for English learners. These filters enabled us to focus on a representative sample of districts and schools serving high populations of English learners.

District/School	% English Learners (2016-17)	% Qualifying for Free and/or Reduced Price Meals (2016-17)	% ELs Meeting or Exceeding Math Standards on CAASPP (2017)
STATE AVERAGE	4th grade – 28% 8th grade – 14% 11th grade – 11%	58%	4th grade – 15% 8th grade – 6% 11th grade – 6%
Sun Empire Elementary School (Kerman Unified, Fresno County)	4th grade – 54%	84%	4th grade – 49%
Alhambra Unified School District (Los Angeles County)	4th grade – 21% 8th grade – 17% 11th grade – 16%	65%	4th grade – 37% 8th grade – 35% 11th grade – 37%
Rowland Unified School District (Los Angeles County)	4th grade – 32% 8th grade – 13% 11th grade – 14%	71%	4th grade – 17% 8th grade – 18% 11th grade – 14%
San Francisco Unified School District (San Francisco County)	4th grade – 34% 8th grade – 15% 11th grade – 18%	53%	4th grade – 26% 8th grade – 14% 11th grade – 29%
Westminster School District (Orange County)	4th grade – 48% 8th grade – 25%	71%	4th grade – 41% 8th grade – 22% Source: https://caaspp.cde.ca.gov/sb2017/ResearchFileList

- 10 Rebecca M. Callahan, “Tracking and High School English learners: Limiting Opportunity to Learn,” *American Educational Research Journal* 42, no. 2 (Jan. 2005): 305-328.
- 11 Vickie Ramos Harris and Araceli Sandoval-Gonzalez, “Unveiling California’s Growing Bilingual Teacher Shortage: Addressing the Urgent Shortage, and Aligning the Workforce to Advances in Pedagogy and Practice in Bilingual Education” (Long Beach, Calif.: Californians Together, 2017), <https://www.californiantogether.org/wp-content/uploads/2017/07/June-2017-CalTog-Bilingual-Teacher-Full-Brief-r4-1.pdf>.
- 12 Rachel A. Valentino and Sean F. Reardon, “Effectiveness of Four Instructional Programs Designed to Serve English Learners: Variation by Ethnicity and Initial English Proficiency” (Stanford, Calif.: Stanford University Graduate School of Education, 2014), http://cepa.stanford.edu/sites/default/files/Valentino_Reardon_EL%20Programs_12_15_14.pdf.
- 13 Kathryn J. Lindholm-Leary, “The Rich Promise of Two-Way Immersion,” *Educational Leadership*, Dec 2004/Jan 2005, 56-59.
- 14 Vickie Ramos Harris et al., “Unveiling California’s Growing Bilingual Teacher Shortage.”
- 15 Adam Voight, Gregory Austin, and Thomas Hanson, “A Climate for Academic Success: How School Climate Distinguishes Schools That Are Beating the Odds” (San Francisco, Calif.: WestEd, 2013), https://www.wested.org/online_pubs/hd-13-10.pdf.
- 16 Martha Castellón et al., “How Six High Schools Graduate English Language Learners College and Career Ready” (Stanford, Calif.: Stanford Graduate School of Education, 2015), <http://ell.stanford.edu/sites/default/files/Schools%20to%20Learn%20From%20.pdf>.
- 17 TODOS and National Council of Supervisors of Mathematics, “Mathematics Education Through the Lens of Social Justice: Acknowledgment, Actions, and Accountability” (Tempe, Ariz.: TODOS and National Council of Supervisors of Mathematics, 2017), http://www.todos-math.org/assets/docs2016/2016Enews/3_pospaper16_wtodos_8pp.pdf.
- 18 Julia M. Aguirre and Maria del Rosario Zavala, “Making Culturally Responsive Mathematics Teaching Explicit: A Lesson Analysis Tool,” *Pedagogies: An International Journal* 8, no. 2 (Feb. 2013): 163-190.
- 19 See Ivannia Soto, *ELL Shadowing as a Catalyst for Change* (Thousand Oaks: Corwin, 2012).
- 20 “California Common Core State Standards,” California Department of Education.
- 21 Judit Moschkovich, “Mathematics, the Common Core, and Language: Recommendations for Mathematics Instruction for ELs Aligned with the Common Core” (Stanford, Calif.: Understanding Language, Stanford University Graduate School of Education, 2012), http://ell.stanford.edu/sites/default/files/pdf/academic-papers/02-JMoschkovich%20Math%20FINAL_bound%20with%20appendix.pdf.
- 22 Cory Koedel and Morgan Polikoff, “Big Bang for Just a Few Bucks: The Impact of Math Textbooks in California” (Washington, D.C.: Brookings, 2017), www.brookings.edu/research/big-bang-for-just-a-few-bucks-the-impact-of-math-textbooks-in-california/.
- 23 Rebecca Perry, Stacy Marple, and Frances Reade, “Instructional Materials: Who Makes the Choice? Findings from the Annual Survey on Implementing the Common Core State Standards in Mathematics” (San Francisco, Calif.: WestEd, 2017), <http://www.wested.org/resources/instructional-materials-who-makes-the-choice/>.
- 24 Margarita Calderón, Robert Slavin, and Marta Sánchez, “Effective Instruction for English Learners,” *The Future of Children* 21, no. 1 (Spring 2011): 103-127.
- 25 Telephone interview with Phil Daro, co-author of Common Core State Standards for Mathematics.
- 26 Jeff Zwiers, et al., “Principles for the Design of Mathematics Curricula: Promoting Language and Content Development” (Stanford, Calif.: *Understanding Language*, Stanford University Graduate School of Education, 2017), http://ell.stanford.edu/sites/default/files/u6232/ULSCALE_ToA_Principles_MLRs_Final_v2.0_030217.pdf.

END NOTES

- 27 Telephone interview with Annie Camey Kuo, Postdoctoral Scholar, Understanding Language at Stanford University Graduate School of Education; Steven Weiss, Project Manager, Stanford ELL Leadership Network; and Renae Lynn Skarin, Project Manager and Associate Researcher, Understanding Language at Stanford University Graduate School of Education.
- 28 Jeff Zwiars, et al., "Principles for the Design of Mathematics Curricula."
- 29 Mary Schleppegrell, "The Linguistic Challenges of Mathematics Teaching and Learning: A Research Review by Mary Schleppegrell," *Reading & Writing Quarterly* 23, no. 2 (April 2007), 139-159.
- 30 *Sustaining a Focus on Language in Mathematics Classrooms, Math in Common® Community of Practice Fall Leadership Convening*. (2017) (statement of Leslie Hamburger, Co-Director of Quality Teaching for English Learners at WestEd, Sacramento, Calif.).
- 31 Laura S. Hamilton, et al., "What Supports Do Teachers Need to Help Students Meet Common Core State Standards for Mathematics?" (Rand Corporation, Nov. 2016), <https://pdfs.semanticscholar.org/d787/c856b38a5559c353c6bb4a435cae624949e1.pdf> and Rebecca R. Perry, et al., "Taking Stock of Common Core Math Implementation: Supporting Teachers to Shift Instruction," (WestEd, July 2015), <http://www.issuelab.org/resources/27051/27051.pdf>.
- 32 Perry et al., "Instructional Materials: Who Makes the Choice? Findings from the Annual Survey on Implementing the Common Core State Standards in Mathematics"
- 33 Sultan Turkan and Megan Schramm-Possinger, "Teaching Content to English Learners in the Era of Common Core Standards" (Princeton, N.J.: ETS, 2014), https://www.ets.org/Media/Research/pdf/RD_Connections_23.pdf.
- 34 Telephone interviews with Lori Hamada, Director of AIMS Center for Mathematics and Science and Kirsten Sarginger, Mathematics Coordinator for the Santa Clara County Office of Education.
- 35 Maria Santos, Linda Darling-Hammond, and Tina Cheuk, "Teacher Development to Support English Language Learners in the Context of Common Core State Standards" (Stanford, Calif.: Understanding Language, Stanford University Graduate School of Education, 2017), <http://ell.stanford.edu/sites/default/files/pdf/academic-papers/10-Santos%20LDH%20Teacher%20Development%20FINAL.pdf>; Linda Darling-Hammond, Maria E. Hyster, Madelyn Gardner, "Effective Teacher Professional Development (Palo Alto, Calif.: Learning Policy Institute, 2017), https://learningpolicyinstitute.org/sites/default/files/product-files/Effective_Teacher_Professional_Development_REPORT.pdf.
- 36 Thomas P. Carpenter, et al., *Children's Mathematics: Cognitively Guided Instruction*. (Portsmouth, NH: Heinemann, 2015): xviii-xix.
- 37 Callahan, "Tracking and High School English Learners," 305-328.
- 38 TODOS and National Council of Supervisors of Mathematics, "Mathematics Education Through the Lens of Social Justice."
- 39 Jo Boaler, *Mathematical Mindsets: Unleashing Students' Potential Through Creative Math, Inspiring Messages and Innovative Teaching* (San Francisco, Calif.: Jossey-Bass, 2016): 111-115.
- 40 Laurie Olsen, "Meeting the Unique Needs of Long Term English Language Learners" (Washington, D.C.: National Education Association, 2014), https://www.nea.org/assets/docs/15420_LongTermEngLangLearner_final_web_3-24-14.pdf.
- 41 Deandra L. Murrey, "Differentiating Instruction in Mathematics for the English Language Learner," *Mathematics Teaching in the Middle School* 14, no. 3 (Oct. 2008): 146-153.
- 42 Spanish, Vietnamese, Mandarin (Putonghua), Arabic, Filipino (Pilipino or Tagalog), and Cantonese are the most common home languages for English Learners reported by the CDE in 2016. Together, these six languages account for 91% of English Learners in California. Spanish is the most commonly spoken home language, accounting for 83% of California's ELs.

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.

ACKNOWLEDGMENTS

We offer our appreciation to the S.D. Bechtel, Jr. Foundation and the Bill & Melinda Gates Foundation for their generous support, which made this report possible. We also offer our gratitude to the many individuals who shared their expertise and perspectives with us as we developed this report.



The Education Trust-West

510.465.6444
1814 Franklin Street, Suite 600
Oakland, California 94612

www.edtrustwest.org

To view this report online, scan:

