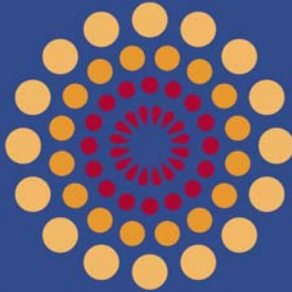


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education**first**



Improving Early Math Instruction and Outcomes

Information and Recommendations for California
Policymakers, Education Leaders and Funders

November 2019

Commissioned by



Acknowledgements

Education First thanks the Heising-Simons Foundation for underwriting our research into early math in California; in particular, we appreciate the generous advice, insights and support from program officer Kimberly Brenneman throughout the project. In addition, Education First is grateful to the dozens of researchers, educators, state leaders and advocates who provided their time and insights to inform this work.

This presentation of findings, as well as any omissions or errors, is the responsibility of Education First alone



The Heising-Simons Foundation is a family foundation based in Los Altos and San Francisco, California. The foundation works with its partners to advance sustainable solutions in climate and clean energy, enable groundbreaking research in science, enhance the education of our youngest learners, and support human rights for all people.

Education First is a national, mission-driven strategy and policy organization with deep expertise in education improvement. Its mission is to deliver exceptional ideas, experience-based solutions and results so all students—and particularly low-income students and students of color—are prepared for success in college, career and life.



The Heising-Simons Foundation seeks to support efforts to help all of California’s young children succeed in learning math

Why?



Some research suggests that early math skills may be a stronger predictor of students’ future success than any other early learning outcome. With this research in mind, the foundation is exploring ways to help ensure more students from low-income families and children of color are appropriately challenged in math and supported in their early years of school to reach proficiency by 4th grade.

What?



These slides summarize key findings from research Education First conducted on “early math,” including and interviews with more than 30 leaders in the field and explore:

- **Why early math* is important**
- **Current math outcomes in California**
- **Possible strategies to improve early learning outcomes in math**
- **Ideas for how policymakers, education leaders and funders can implement these strategies**

* Early math generally includes any formal or informal mathematics instruction or learning for children through age 8. This summary of research—with recommendations—is focused mainly on instruction and learning for 4-8 year-olds , or children in preschool to 3rd grade.

The Heising-Simons Foundation joins other philanthropic efforts to support of early math: Its early math initiative reflect funders’ growing interest in using a variety of strategies and entry points to attend to math in the early years



- Provide a solid, healthy early start that sets children up for success at home, in school and in life; its grantmaking emphasis in math is focused on ensuring all students are stimulated and challenged, both in and out of school, particularly in STEM



- Ensure that students graduate from high school ready to succeed in college; its grantmaking emphasis in math is focused both in middle schools and in PreK-16 community change



- Build on state efforts to develop more seamless, well-functioning and effective early childhood systems; its grantmaking emphasis in math is focused on supporting leaders, teachers and families and policy and advocacy networks



- Improve opportunities for children, youth and families; a new foundation, its grantmaking emphasis in math is focused on supporting early math in the Charlotte-Mecklenburg (NC) area



- Advance the economy by supporting education from cradle to career; its grantmaking emphasis in math is focused on supporting early math and early childhood funding for low-income communities in Chicago

Funder interest in early math acknowledges that early student success in math may be a stronger predictor of students' future success than any other early learning outcome



Between birth and age 8, children begin to conceptualize what numbers are and how to use them and begin **developing motivations and beliefs about their own math abilities**



Math skills at entry into kindergarten are important **because children who do well in math early on tend to do very well throughout school**

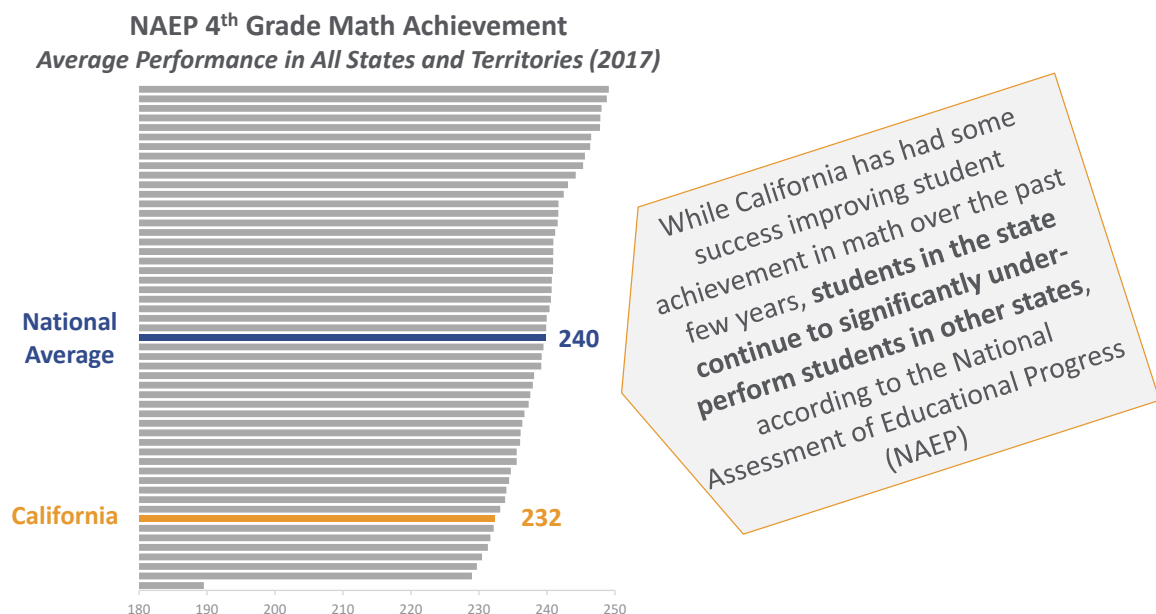


Early **math skills are more strongly linked** to later reading skills than are early reading skills are to later math skills

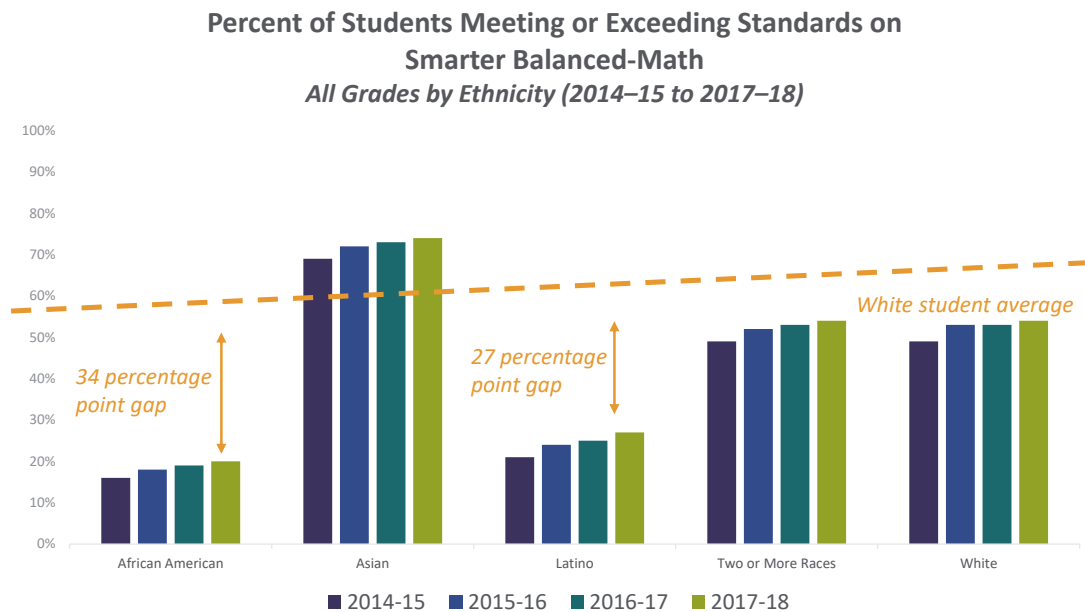


Students' growth in math skills across the very early years of formal schooling (from preschool to late 1st grade) **is strongly correlated** to their later achievement

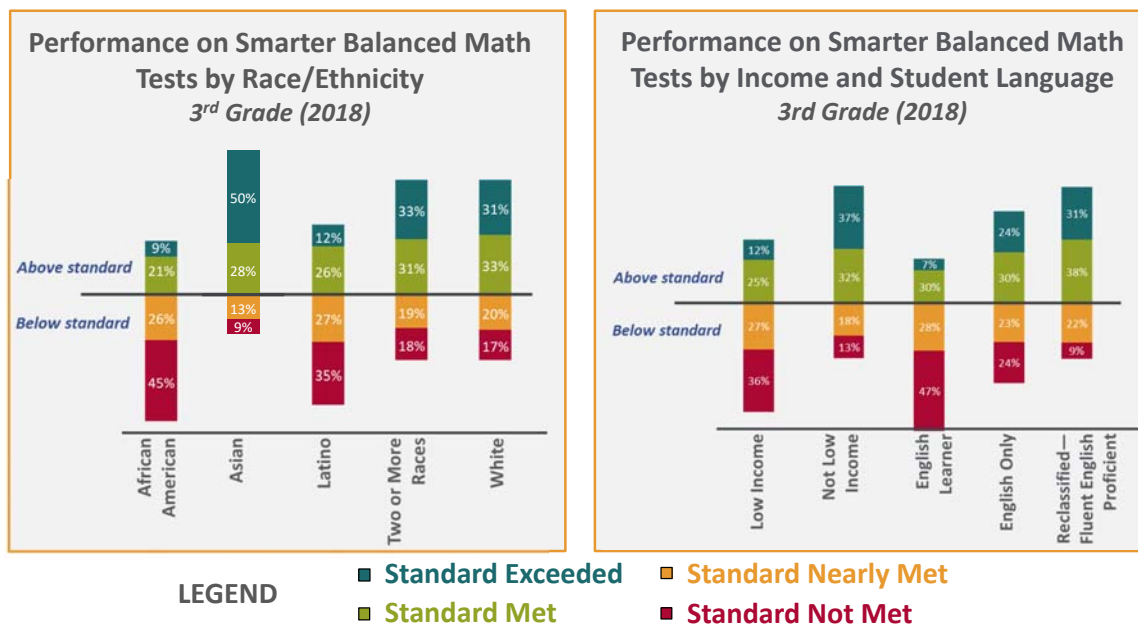
“Early math” seems especially ripe for attention in California, as schools in the state have persistently struggled to prepare early learners to succeed in mathematics



Moreover, California's Asian and White students out-perform students from other groups; these gaps have remained even as overall achievement has improved slightly



Differences in performance between racial, ethnic and other student groups are already clear by 3rd grade, the first year of statewide testing



Education First’s research identified five main strategies with potential to improve early math outcomes for low-income students and students of color in California



Improve the effectiveness of leaders who influence the quality and content of teaching math in the early grades



Better support and train the teacher workforce which—in early education—is generally poorly compensated and under-prepared



Involve families as authentic partners in building children’s early confidence and conceptual understanding in math, in school and out of school



Create infrastructure and tools that support early math including developmentally appropriate kindergarten readiness assessments, a strengthened Quality Rating Improvement System, and aligned PreK-12 standards and curriculum



Build coherence between PreK and K-12 systems by better connecting standards, data and training between these systems and ensuring successful transitions for students between preschool and elementary school

The following slides provide rationale for these strategies and actions that policymakers, education leaders and funders can take to implement them. Research uncovered strategies in addition to these five; however, those presented here closely to the rationale and provide a sample of opportunities for stakeholder groups to improve early learning math outcomes.

Why does *effective leadership* matter for improving early math?



- Preschool directors and elementary school principals **influence both the quality and the content** of curriculum and teaching in their buildings; to be effective coaches of teachers, they need knowledge of child development.
- Because the early education and K-12 systems are so different (and sometimes even work at cross purposes), **dedicated leaders to champion coherent early math and overall systems alignment** can help maintain focus and energy over time.
- Leaders who understand and **advocate for the spectrum of student needs** during ages 4–8 are necessary for solutions to be effective.

“People need to ...have the ability to talk the early childhood talk while also being credible to those in K-12. Finding those code switchers is really hard.”

—Researcher

“Districts that are taking this more seriously are investing in principal leadership.”

—Researcher

Policymakers, education leaders and funders can take action to increase the abilities of leaders to support the needs of early learners in mathematics; here are two ideas to get started...



1

Create (or replicate/ extend) leadership institutes for cohorts of PreK-Grade 3 education leaders to strengthen their understanding of early child development and what high quality math instruction looks like

2

Pilot a program to enhance counties' and Head Start offices' expertise and technical assistance capacity to support leadership development within the early learning community



Why do *teacher support and training* matter for improving early math?



- Studies show the early education and early elementary teacher workforce is **poorly compensated and under-prepared**, leading to **high turnover rates** and **challenges retaining high-quality** teachers.
- Separate locations, administrative systems and training opportunities in school districts **silos early learning educators from PreK–Grade 3 educators**, hampering collaboration. Plus, many early learners are in home-based care, where their **teachers often do not have access to professional learning** opportunities.
- Some teachers do not see themselves as mathematicians and **need support to develop their own confidence** to teach math.

*“There are issues with professional development, for sure. **Teachers don’t have the skills they need to teach to the [current] expectations in mathematics.**”*

—Researcher

*“**[Teachers] don’t know how to support early math learning or what research shows. They’re using 20–30 year old models.**”*

—Researcher



Policymakers, education leaders and funders can take action to improve the abilities of teachers to support the needs of early learners in mathematics; here are two ideas to get started...



1

Enhance the capacity and expertise of county education offices and Head Start centers to help all early learning teachers integrate effective early math into curricula, instruction and assessment

2

Improve access to professional training for home-based preschool teachers, including designing programs specifically for them, open existing trainings and scheduling trainings at convenient times*

*See the Fresno County Superintendent of Schools profile to see how one county office of education supports home-based and other providers outside the K-12 system [insert link]. One of a series of three profiles commissioned by the Heising-Simon Foundation, the Fresno County Superintendent of Schools profile describes how it and its partners have prioritized supporting the teachers of children from birth to age five.



Why does *family engagement* matter for improving early math?



- Research suggests that **children are more likely to succeed in math when parents or caregivers engage** children in math-related activities too.
- Authentic, **culturally responsive relationships (undergirded by an appreciation for the assets families bring to the table) between educators and families** allow educators to tap families' resources and knowledge.
- Early math strategies must attend to students' varied language and culturally based constructs because numeracy is culturally specific, for example—**how families from different cultures “count” can be different.**

“Family engagement efforts ‘often disregard the cultural and social resources of non-dominant families.’”
—Researcher

“We should be seeking to bring math into spaces where children and families are already engaged.”
—Policy advocate



District- and county education office-based leaders and funders collaborating with them can take action to increase the effectiveness of engagement practices for families of color; here are *three* ideas to get started...



1

Include strategies for effective, culturally appropriate family engagement processes in the coursework of teacher and administrator preparation programs

2

Strengthen family engagement programs especially for non-white parents, designing them to use content that helps educators explore institutional racism and social injustice as barriers to early math learning*

3

Design an explicit family engagement pilot program, created with the help of non-profit family engagement specialists, that allows educators to explore asset-based, culturally appropriate approaches to engagement and treats families as equal partners who share teaching responsibilities for young children

*See Education First's [profile of King County \(in Washington state\)](#) to see how several school districts are working to improve their family engagement practices [insert link]. One of a series of three profiles commissioned by the Heising-Simons Foundation, the King County profile describes how five districts and an education services agency are addressing what they view as a primary barrier to an asset-based culturally appropriate approach to family engagement: institutional racism.



Why do a stronger infrastructure and better tools matter for improving early math?



- Without a coherent data system that includes student outcomes across PreK-12, **it is difficult for state and local leaders and stakeholders to evaluate improvement efforts** or compare different approaches.
- Participation rates in California's QRIS program are low (informal or home-based providers are not required to use it) and the **rating system does not include items that correlate to student achievement in math** (or other learning areas).
- **Quality measures of early learning success are not widespread in California**, making it difficult for school districts and county offices to provide supports to providers inside and outside the PreK-12 system.

"California does not require kindergarten readiness assessments. People don't feel they are being measured or held accountable."

—Foundation program officer

"Administrators and teachers need a uniform and continuous data system—then schools and teachers can track student growth and needs."

—Researcher



Policymakers, education leaders and funders can take action to enhance California's infrastructure for early learning in mathematics; here at *three* ideas to get started...



1

Support the development of a new statewide PreK-16 data system and help stakeholders research and determine if math achievement specifically should be an indicator in California's new student longitudinal data system

2

Strengthen QRIS as a tool to further improve the program quality of early learning settings by ensuring the state's revised QRIS correlates to student achievement in math and reaches greater participation among informal providers, especially those in home-based settings

3

Explore options to scale statewide use of a Kindergarten-readiness assessment that includes developmentally appropriate measures of mathematics readiness to help K-12 educators better determine what supports to offer incoming students—and what support preschool educators need to better prepare these students



Why does *coherence* across PreK-Grade 3 matter for improving early math?



- Achieving coherence across PreK and K-to-Grade 3 systems means a **strong connection within and across levels of schooling and in all elements** (e.g., leadership, curriculum, assessments, standards, teaching strategies professional development).
- Continuity is important because there is evidence students with a more seamless educational experiences across grades have **better educational outcomes**.
- In particular, one rigorously designed study suggests **coherence can improve outcomes**. A study of child-parent centers in Chicago serving low income children PreK-Grade 3 showed participation was associated with positive gains in reading and math that persisted to 9th grade and beyond.

*"Comprehensive PreK–Grade 3 approaches hold the potential to **improve child outcomes** and to prevent or close achievement gaps."*

—Researcher

*"The vision...is to **improve the quality and coherence of children's learning opportunities**, from...before they enter the K-12 system...throughout school."*

—Researcher



Policymakers, education leaders and funders can take action to increase coherence across PreK-12 systems to improve outcomes for early learners; here are *three* ideas to get started...



1

Develop effective leaders of PreK-12 systems and programs by creating new positions in districts or county offices for leaders whose sole focus is to enhance coherence between the PreK and K-12 systems. Consider placing these leaders in cabinet level positions

2







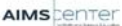

Design, fund and open comprehensive PreK–Grade 3 pilot school models to help policymakers and funders see first-hand what coherence looks like and what it can accomplish for educators, students and parents—and what challenges need to be addressed for further scaling

3

Document how school systems creatively reallocate resources to support PreK-Grade 3 by conducting or commissioning a series of case studies documenting how some school systems have successfully changed and funded professional learning to support PreK–Grade 3 coherence







California has assets on which to build efforts to advance the five strategies; some initiatives in the state are working to improve math quality across grade spans











INITIATIVE	DESCRIPTION	MAJOR PARTNER
	<p>A network to advance the field of mathematics, focusing on math from birth through eight years. Network members collaborate on research and tools to make early math practice visible.</p>	
	<p>An initiative to build leadership capacity within ten districts and support each one in carrying out a continuous improvement plan for implementing math standards, including supports for teachers.</p>	
	<p>The California Mathematics Council is an affiliate of the National Council of Teachers of Mathematics. It consists of teachers, administrators and parents who are committed to improving mathematics teaching and learning in California.</p>	
	<p>The AIMS Center at Fresno Pacific University has been focusing research on instruction with teachers in kindergarten through 2nd grade to make student-centered, developmentally appropriate practice visible.</p>	



Additional assets include networks that are dedicated to building the capacity of educators to work together to improve instruction, data use and assessment

INITIATIVE	DESCRIPTION
	CORE districts—Fresno, Garden Grove, Long Beach, Los Angeles, Oakland, Sacramento, San Francisco and Santa Ana—share a focus on instructional leadership , comprehensive school improvement and accountability.
	Ed Partners facilitates educators working as teams to build capacity for change at the district level. This network has not had a math-specific focus to date.
	The California County Superintendents Educational Services Association (CCSESA) advocates on behalf of K-12 and early childhood education at state and federal levels. It also develops and coordinates statewide training to support county superintendents.
	Pivot Learning partners with educators at the school, district and state level to develop and implement strategies for high-impact change. Its services include professional development, budgeting and strategic planning processes and MTSS framework supports .

Funders that have led initiatives or networks to improve PreK-Grade 3 coherence are additional assets

INITIATIVE	DESCRIPTION	MAJOR FUNDER
	The Packard Foundation has made sizable investments in Starting Smart and Strong communities, which include Fresno, Oakland and Franklin-McKinley. These investments support alignment and quality instruction for early learning.	
	SEAL, the Sobrato Early Academic Language Model, focuses on P-3 alignment and language development for English learners .	
	Silver Giving supports many early education programs, including an initiative in San Francisco to put preschools and elementary schools on the same campus . This model includes coaching teachers and school leaders across grade spans.	
	First 5 California distributes Proposition 10 funds to local communities through the state's 58 individual counties. Each county has created its own local First 5 county commission to foster teamwork and promote relationships amongst educators to support children and families.	
	The Center for Early Learning conducts research, convenes community leaders and advocates for change to ensure that young children have access to early learning opportunities and develop in healthy ways.	

Research uncovered five considerations that California leaders should keep in mind as they begin to pursue different strategies to improve outcomes in early math

Early Math Implementation Considerations—from Research and Interviews

- 1 Beware of pushing strategies up from K-12 into early learning: Implementing practices common in K-12 schools in early childhood settings may encourage wider use of developmentally inappropriate practices
- 2 Incorporate cultural responsiveness and an asset-based perspective into all improvement efforts
- 3 View technical strategies such as co-location of preschools at elementary schools to improve coherence as important but insufficient efforts; a focus on quality through improvements in curriculum, instruction and assessment is also necessary
- 4 Broaden the geographic reach of efforts beyond major metropolitan areas
- 5 Lead with “bottom-up” approaches and let those drive top-down initiatives



7 | Appendices

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We spoke to education leaders and researchers who shared their insights into California's early childhood and K-12 priorities, school readiness and math instruction*

Community Partners and Funders

- Susan Harvey, Arron Jiron and Lisa Lomenzo, *S.D. Bechtel, Jr. Foundation*
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- Arun Ramanathan, *Pivot Learning Partners*
- Greta Bornemann, *Puget Sound Education Service District (Washington state)*
- Gary Waddell, *Santa Clara County Office of Education*

Project Advisory Board Members

- Vince Stewart, *Children Now/California STEM Network*
- Maria Meraz, *Parent Engagement Academy*
- Heather Hough, *Policy Analysis for California Education (PACE)*
- Phil Daro, *SERP/Common Core State Standards*
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- Kristi Kauerz, *National P-3 Center (Colorado)*
- Alice Klein and Prentice Starkey, *WestEd (Early Math Initiative)*
- Neal Finkelstein and Rebecca Perry, *WestEd ("Math in Common" evaluation)*



*Quotations used on the following slides are taken from interviews with those listed on this page, unless otherwise indicated; quotations have been edited for clarity.

Thank you!
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