Fresno County Schools:

Bringing Math to the Youngest Learners and Their Teachers

BACKGROUND

This profile of the Fresno County Superintendent of Schools, the county's office of education, is one of three the California-based Heising-Simons Foundation asked Education First, a national education policy and strategy consulting firm, to write. The profiles are designed to help more California policymakers, education leaders and funders see how different communities are prioritizing early learning in mathematics to improve outcomes for their youngest learners, especially for low-income students and students of color.

"Early mathematics" encompasses any formal or informal instruction for learning for children from birth to age 8, when children begin to conceptualize what numbers are and how to use them; develop early mathematical thinking, such as counting and understanding spatial relationships and patterns; and develop beliefs about their own mathematical abilities. Some ground-breaking research suggests that early mathematical skills, such as knowing numbers and ordinality, correlate more strongly with student success in later elementary school than do other indicators, such as literacy skills and behavior, and that children who do well in math early tend to do very well throughout school.

The Fresno County Superintendent of Schools' profile provides an overview of how the county office of education works to improve the quality of instruction for early care providers working with children from birth to age 5. These providers usually work outside the span of authority and support of both the county office and the individual districts and charter schools it supports.

For additional information on the Heising-Simons early math initiative and an overview of the profiles, please see the introduction to the profiles or go to the Heising-Simons Foundation webpage. ■

"A lot of early childhood people don't think of themselves as math teachers," says Paul Reimer of the AIMS Center for Math and Science Education, an organization that helps Fresno County early learning educators enhance their understanding of and ability to teach mathematics. "Some teachers have told me they're in early childhood because they don't like math and believe they can handle the math at that level."

Many seasoned observers working in the field of early learning agree with Reimer. "A lot of early learning teachers don't think they have math strengths," one California advocate for early learning observes. "We're talking about lack of strengths in making patterns and shapes; we're not talking calculus." Kristen Reed of the Education Development Center studies the impact of professional development on early learning teachers and sees that "many preschool teachers aren't well prepared to teach math and don't feel comfortable doing so."[1]

To deepen the skills and knowledge of teachers in the K12 system, policymakers and education leaders—through direct lines of authority—can set goals and provide supports for teachers on the front lines of school districts.

But state and local leaders have far less influence on providers serving children outside of K12 buildings and campuses, especially those serving children from birth to age three; at those ages, most children spend time in "informal" learning environments, such as childcare offered by friends, family and neighbors. Research completed for the comprehensive "Getting Down to Facts II" education systems study in California (published in 2019) concludes, "As of 2012, at most 4 percent of the state's infants and toddlers attended licensed center-based programs, and another 8 percent were in licensed family child care homes."[2] Data from Kids Count—an annual report on child well-being in the United States—reveal the estimated average percentage of children ages 3–4 enrolled "in school" between 2015 and 2017 totaled only 5 percent. Kids Count defines schools as nursery school, preschool or kindergarten; "school" is inclusive of programs sponsored by federal, state or local agencies, including Head Start programs.[3]

This predicament presents a challenge to those seeking to improve early learning instruction in general and mathematics teaching in particular. Because they aren't associated with a school district, many early childhood providers do not have access to professional development programs or coaching, high-quality curriculum, student achievement data or other tools that are more commonplace for teachers in the K12 system.

FRESNO BY THE NUMBERS

the fifth most populous city in the state

32 school districts

204,000+ students

74% of whom receive free or reduced cost meals

According to state tests, about one-half of third-graders across districts in Fresno county meet grade-level standards in math (mirroring the state average, also at about 49 percent). However, the county's low-income students outperform the state average for low-income learners by nearly 4 percentage points: 41 percent versus 37 percent.

[1] "Mathematics for Pre-school Children—and Their Teachers." *Education Development Center*, www.edc.org/mathematics-pre-school-children-and-their-teachers, accessed 7 October 2019.

[2] Stipek et al. *Getting Down to Facts II, Technical Report: Early Childhood Education in California*. Version 2. Stanford: Stanford University, March 2019.

[3] "Young children are not in school in California." *Kids Count Data Center*, The Annie E. Casey Foundation, accessed 23 September 2019.

The Fresno county office of education—called the Fresno County Superintendent of Schools—is confronting this predicament head-on. Lupe Jaime-Mileham, the county office's senior director of early care and education, notes that "Fresno County has prioritized it." The office offers early learning educators in the community multiple learning opportunities that cover a range of child development topics. It has been deliberately working to equip teachers with new skills that will help young children develop early math competencies, conceptual understanding and confidence.[4]

COMPREHENSIVE EFFORTS TO IMPROVE EARLY LEARNING IN FRESNO COUNTY

The county education office delivers services to improve the quality of teaching and learning for children (from birth to age 5) participating in early learning settings outside of its school systems through four primary approaches:

1. **AIMS Center for Math and Science Education.**
2. **Fresno County Superintendent of Schools STEM Department.**
3. **Fresno County Superintendent of Schools Early Care and Education Department's Early Stars Quality Results and Improvement program (QRIS).**
4. **Fresno County Superintendent of Schools Early Care and Education Department's Lighthouse for Children Child Development Center (CDC) program.**

1. AIMS Center for Math and Science Education

The AIMS Center is a community-facing arm of the AIMS Education Foundation, a nonprofit organization founded in the 1980s and embedded at Fresno Pacific University. Its start-up funding came from the National Science Foundation, and it began as a graduate math and science education program focused on the development of math and science materials to support teacher professional development. However, as the K12 market became saturated with materials from other competitors, the center steered its focus to working directly with preschool teachers—in and outside the school system in Fresno and throughout the county—rather than producing materials.

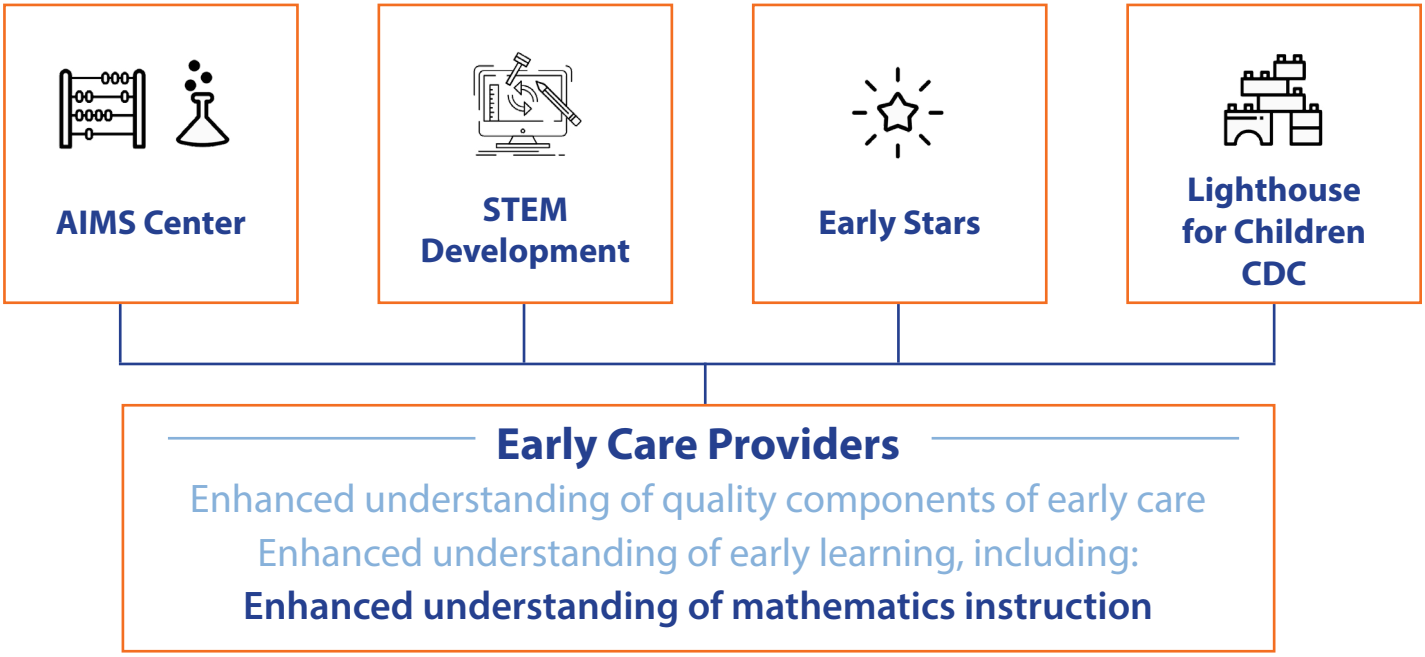
Team members at the AIMS Center are all former teachers with experience as coaches and designers of professional learning experiences. According to executive director Paul Reimer, the team members share a vision that children learn best through engagement and constructing their own knowledge. "It's exciting not having our work anchored in materials," he says, elaborating:

> "What we've tried to do is avoid being considered 'a program.' We know districts and counties like to implement programs. We're not interested in that. The crux of our work is empowering professional educators to notice and value children's developmental processes. We need to develop the capacity to leverage their experiences with children for instructional purposes. We're advocating for stuff outside of textbooks. We're advocating for a lens they take up that helps them make better decisions about how and when to use materials and when to use them for particular children. We're trying to enhance their decision-making processes."

Head Start is the center's biggest partner; its teachers and directors serve nearly 3,000 children across the country. To ensure the AIMS Center is working as effectively as possible to improve math teaching in Head Start centers, the AIMS team worked closely with 25 teachers and directors from two of the county's 36 Head Start Programs during the 2017–18 and 2018–19 school years. During this "phase one" partnership with Head Start, the team conducted classroom visits, provided coaching and specialized training and modeled high-quality instruction to teachers. Phase one accomplished its goals, according to Reimer: designing a structure of support for Head Start educators, understanding the Head Start system and creating an approach that is sustainable.

Now in the third year—and "phase two"—of the partnership, the AIMS Center is working with a third Head Start program and an expanded participant list of 35 early learning educators that includes assistant directors and paraprofessionals. The new, third site offers an early Head Start as well as a traditional program and, as a result, the target population of student beneficiaries has expanded from preschool students to children from birth to age 5.

HOW THE COUNTY OFFICE REACHES PROVIDERS OPERATING OUTSIDE DISTRICT SCHOOL SYSTEMS



In parallel, during this same period (2017–2019), Reimer and his team conducted hundreds of clinical interviews with early learners in a variety of settings to collect examples of children's knowledge and natural mathematical thinking, particularly as expressed during play. In brief but regular conversations with children during this research effort, AIMS Center staff presented several short, play-oriented tasks and asked children to show off a variety of mathematical skills and understandings. For example, children were asked to "count items, say a number word sequence, produce collections of a given number, tell the number of items in small sets without counts, sort plastic animals into groups by color and count them, count claps or marbles dropped into a cup, count hidden items, or build block towers and count the number of blocks used."[4] Researchers filmed many of these interactions and carefully noted how students responded.

Children's block play is one example of how the AIMS Center has applied the interview data to help teachers support the development of young learners' mathematical thinking. Reimer notes that studies have shown that block play—and how sophisticated it is—is linked to later mathematical achievement. He explains how the team applies what it learned through the interviews:

> "We encourage teachers to take advantage of block play to have conversations with students. A teacher might approach a group of children and ask, 'How many blocks are you using? How tall is a tower? How does it compare to another tower?' A teacher might also introduce vocabulary related to math: 'Did you turn the blocks? Did you slide them? Did you flip them?' Flip, slide and turn are all concepts related to geometry."

"We've been using these data to design professional development that supports teacher interactions with kids and that helps teachers work with parents to support learning through natural, play-based activities at home," Reimer says.

[4] Paul N. Reimer. "Videos of Preschool Mathematical Thinking for Teacher Learning." *Proceedings of the 39th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, Indianapolis, October 5–8.* Ed. Enrique Galindo and Jill Newton. Indianapolis: Hoosier Association of Mathematics Teacher Educators, 2017. 315-318.

2. Fresno County STEM Department

With its staff of five, the county education office's own STEM department pays special attention to supporting students' early learning in mathematics and not just learning in grades K12. The department regularly advises on math content for county-sponsored teacher development efforts targeted at preschool teachers and childcare providers. And it offers a catalog of learning opportunities open to anybody working with young learners, including private providers working with children from birth to age 5. To support participation, many of the offerings for preschool educators are delivered on Saturdays or in the late afternoon on weekdays. Cost is minimal, with the county education office charging no more than $15.00 per session.

Department director John Dueck notes, "Our offerings are for school districts and private preschools; these include home preschools. We've had sessions on geometry writ large for early learners, shapes, number sense, number talks and counting collections, for instance."

Dueck reports that the instructional strategies used by many early learning educators are limited to little more than direct instruction with minor emphasis on building conceptual understandings. Dueck's team is trying to change that in its coaching of early learning educators:

> "We asked ourselves if we were implementing strategies that worked. We saw our students were not making connections to concepts. They could count to 20. That was great. But they couldn't show me four fingers."

Dueck's department is also working with private and district providers to understand that math is not something performed at a particular time of day.

"We don't segment literacy like that because we're using language all day long," he says. "We need to think of math in the same way." Dueck and his team have helped home-care providers like Rosalva Fernandez become more skilled math teachers (see profile on page 8).

3. Early Stars

The Fresno County Superintendent of Schools also manages Early Stars, a pioneering effort to increase the quality and accessibility of early care and education in Fresno County. While not focused solely on supporting math like the AIMS Center and Fresno County Superintendent of Schools' STEM Department, Early Stars is the county's key initiative to broadly improve teaching and learning in in-home and center-based early care programs. It regularly taps help, advice and expertise from these two math-focused efforts to shape its work with providers in this subject area.

According to the county office's Jaime-Mileham, Early Stars offers high-quality and free professional development and training, targeting licensed childcare centers, family home-care providers and families, friends and neighbors caring for young children. In particular, Early Stars helps licensed facilities work toward and achieve higher ratings within the state QRIS or Quality Counts California.

Jaime-Mileham explains Early Stars' teacher development efforts—provided by a variety of experts and agencies and all culled from research-based strategies—include areas such as instructional strategies and ways to support dual-language learners and children with special needs. Many home childcare providers take advantage of its coaching services. She adds that the Early Stars team "prides itself in collaborating with a diverse range of partners to serve in-home and center-based providers." Indeed, Early Stars deliberately contracts some of its coaching work out to other agencies, such as the Fresno School District, the County Department of Public Health and the Central Valley Children's Services Network, as a sustainability strategy to ensure the coaching efforts will continue over time. It also works directly with other agencies, including other school districts and county nonprofits, to strengthen their own internal coaching capacity to work with preschool teachers in the community.

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"I have a student who was expelled from two programs before his grandmother brought him to me. Now, even though he's not in kindergarten yet, he's doing two- and three-digit math problems."

—Rosalva Fernandez, family childcare home provider

PROFILE: AN EARLY LEARNING STAR

Family childcare home provider and teacher Rosalva Fernandez is one example of how Early Stars benefits community providers and, according to county leaders, Fernandez is a star herself.

Twelve years ago, Rosalva Fernandez left her management position at a major national retailer to care for her young children, the last of whom she was about to give birth to. Soon after her daughter was born and with a house full of three additional young children, she responded affirmatively to a friend who asked if she would care for her child as well. Fernandez grew to love the work, finding it far more fulfilling than her management job, which required a long commute and time away from her family. She decided not to return to her former employer and applied for a license to operate a small family childcare facility. Today, she owns and operates a large family home-based childcare program for 14 children from 6 weeks to 8 years old. Her childcare program employs one full-time and one part-time assistant and a bus driver who picks students up from school and drops them at her home.

California's QRIS has awarded her program four stars for two years running; Fernandez says she is striving for five stars, the highest rating. She credits the quality of her childcare program to her motivation, hard work and the supports she receives from the Fresno County Superintendent of Schools and its partners, in particular, Early Stars and the STEM department.

An Early Stars coach visits Fernandez four to six times a year and facilitates her participation in other professional development activities, including those focused on math content and pedagogy. "My coach is available anytime I want to call her or ask her a question online," Fernandez notes.

Fernandez also participates in mathematics workshops provided by the county office's STEM Department. This past year, she attended a two-day session on geometry that focused on using play to teach geometric concepts: "The instructors showed us different ways to teach shapes and patterns and how to connect day-to-day situations with mathematics concepts." Fernandez credits an earlier workshop on diameters and angles with influencing her instruction: "We now have language to discuss angles and techniques to help kids count the corners of shapes and to sort, count and even add objects by shape." Fernandez also uses the materials she's given at the mathematics workshops and accesses the website to print out materials. She continues:

> "My curriculum has been influenced significantly by my learning, how my students count and sort and talk about patterns and how I support children of so many different ages."

Fernandez is a teacher, a leader and an owner of a home-based childcare program who has gained confidence: "The fact that I have children for five consecutive years makes me lucky. It's amazing what you can do with kids in mathematics. I wish every provider could do this."

4. Lighthouse for Children Child Development Center

Like the Early Stars program, the Lighthouse for Children CDC is not exclusively focused on mathematics or science but rather works to support early childhood educators in many ways.

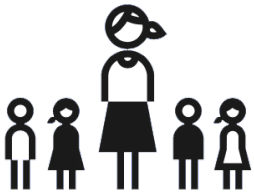
The Lighthouse for Children CDC is a center preschool. Anchored in downtown Fresno, the program is a collaboration between First 5 Fresno County and the Fresno County Superintendent of Schools. The two agencies worked with the community to decide not only what the center should do but also where it should be located. Jaime-Mileham notes that community members advocated for downtown Fresno for two reasons. First, they argued that a limited number of licensed early childhood centers exist in the city center. Second, the location would counter the narrative that families access downtown only for limited serviced or work. Furthermore, the CDC was built in the middle of downtown between the federal, family and criminal courts to represent a beacon of hope for families.

This bet to place the center downtown has paid off well, county leaders believe, because families across a wide range of economic levels who live and work downtown are taking advantage of Lighthouse for Children CDC.

Although it offers an on-site preschool, the center also serves as a demonstration site and innovation lab for early childhood professionals and showcases what excellent teaching looks like and how children can thrive in this environment. It offers observation areas and on-site training opportunities for practitioners to learn about its approach to quality early care and education. School districts and external providers, including those offering home-based care, have access to programming, trainings, institutes for 30 groups of three practitioners and a streaming video of live instruction—daily. During the 2018–2019 school year, the center served 96 students and 450 practitioners, 25 percent of whom worked with early learners outside a school district or Head Start program.

Mathematics is a frequent focus of the professional learning the center provides; one recent teacher development session explored ways teachers can build early math learning opportunities into school transition times.

LIGHTHOUSE CENTER 2018-19 SCHOOL YEAR



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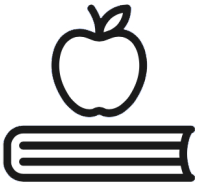

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PRIORITIZING THE EARLIEST LEARNING

Fresno County Superintendent of Schools is on the cusp of a trend to bring instructors outside school systems into its network of instructors. It delivers training to educators outside the traditional system through four delivery chains. "We've really prioritized working with students from birth to five. We know that learning gaps start well before kindergarten. If we're going to prioritize the earliest of learning in math, we have to go where the students are, and that's often outside organized systems," says Jaime-Mileham. Home-based early learning provider Rosalva Fernandez, her colleagues and her students are beneficiaries of this effort. "I wish everyone could experience the joy I do in teaching mathematics to young children," Fernandez says. ■

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INTERVIEWS AND PHOTOS

Quotations and descriptions about the Fresno County Superintendent of Schools' efforts to improve early math instruction in in-home and center-based preschool environments were obtained through interviews with Jonathan Dueck, Rosalva Fernandez, Lupe Jaime-Mileham, Paul Reimer and Isela Turner, all of which occurred May–September 2019. In addition, we are grateful to the Fresno County Superintendent of Schools for sharing the photos of students and teachers used in this report.

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—particularly low-income students and students of color—are prepared for success in college, career and life.

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