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TOWARD AN INFRASTRUCTURE TO SUPPORT INSTRUCTIONAL IMPROVEMENT IN PRE-K TO 3 MATHEMATICS

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Toward an Infrastructure to Support Instructional Improvement in Pre-K to 3 Mathematics: Four Districts' Experiences with the California Education Partners

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Learning in pre-kindergarten is often disconnected from learning in the primary grades. Teachers at different grade levels typically use different curricular materials and instructional strategies, and research shows that they frequently repeat material that students already know (Cohen-Vogel et al., 2021; Engel, Claessens, & Finch, 2013; Bassok et al., 2016). The disconnect between pre-K and early elementary school can compromise student learning and fail to take advantage of the gains children made in Pre-K (Engel et al., 2013; Reynolds, Magnuson, & Ou, 2006). School districts in California and across the country are now attempting to create stronger pathways for students from pre-K to through early elementary years. These efforts, often known as P-3 initiatives, seek to sustain the gains made in preschool by ensuring access to high-quality and connected educational experiences from pre-K to 3rd grade (Kauerz, 2006; Bogard & Takanishi, 2005; Graves, 2006).

In Fall 2020 a non-for-profit organization, California Education Partners, launched an initiative to foster P-3 coherence in mathematics instruction in small to midsized school districts across California. The P-3 Coherence Collaboration sought to help districts become coordinated and aligned systems that support high-quality teaching and student learning in mathematics across the pre-k and elementary divide. They initially recruited 10 California school districts to engage with them in a three-year initiative, which they considered a pilot program to adjust and refine their approach.[1]

This brief summarizes findings from a study of Ed Partners' work with the pilot districts. From January 2021 until August 2023, we documented the supports they provided to the pilot districts. We also identified the challenges, opportunities, successes and areas for improvement that four of these districts experienced as they worked to develop district systems to foster instructional improvement in mathematics from P-3. In this report, we focus changes in what we call the infrastructure for instructional improvement in mathematics: the set of supports that districts put in place to improve instruction. The districts in the P-3 Coherence Collaboration sought to extend their infrastructure to include pre-K, focus them on high-quality mathematics instruction, and create greater connections between the elements so that they were mutually supportive.

The Collaboration

We analyzed 34 interviews with Ed partners staff and agendas from 30 meetings and convenings over three years. From this, we identified nine core strategies they used with the pilot districts, summarized in the box below.

1	Intentional recruitment	Intentionally recruited small or medium-sized districts that served large populations of historically marginalized students, had their own preschool programs and had superintendent buy-in
2	Creation of district Improvement Teams	Required districts to form improvement teams of about 10 people to take leadership of the Collaboration that typically included an upper-level district leader, head of early childhood education, district leadership in

[1] Since this initial pilot cohort Ed Partners has added three new cohorts of California districts, totaling 42 districts.

		math education, pre-K to 3 teachers, and school leaders. The composition varied by district
3	Convenings	Held 1½-day convenings for participating district improvement teams three times a year to learn together, reflect on their current work, and plan next steps. District teams shared ideas, engaged in continuous improvement activities, built shared understandings of their pre-K to 3 district systems, and collectively learned about effective mathematics instruction
4	Shared Learning Opportunities (SLOs)	Along with university partners, offered virtual professional development to all teachers, school leaders, and district leaders in participating districts focused on high-quality mathematics instruction
5	Coached team leads	Provided monthly individualized coaching to improvement team leads.
6	Superintendent convenings	Brought superintendents from districts participating in any California Education Partners project together twice yearly to provide updates and professional learning opportunities
7	Continuous improvement approach	Used continuous improvement as a vehicle for analyzing district systems; identifying, testing, and adapting promising practices for fostering P-3 coherence; and supporting collective learning across multiple districts around a shared aim
8	Develop a common assessment	Encouraged districts to adopt a common assessment to routinely collect data and track student learning
9	Analyze and build district systems to improve P-3 coherence	Encouraged districts to analyze and adapt their current systems and build new ones to better connect early childhood and elementary to support effective mathematics instruction

Ed Partners took a systemic approach to instructional change, simultaneously building teachers' and leaders' knowledge of effective pedagogy and improving district policies and structures to support these high-leverage teaching practices.

Building Capacity. Early math education researchers and educators provided ongoing learning opportunities for teachers and school leaders. In collaboration with these research partners, Ed Partners worked to foster a vision of mathematics instruction rooted in cognitively guided instruction (Carpenter et al., 1999; Carpenter et al., 2016) and aligned with Common Core State Standards-Mathematics. They encouraged districts to move toward classroom instruction that builds on what students already know about math, provide opportunities for students to collectively make meaning of mathematics, elicit students' mathematical thinking as they solve problems, use students' mathematical thinking to inform instructional decisions, and position each student to see themselves as capable in mathematics. They used a particular activity, counting collections, to illustrate these high-leverage practices, but encouraged the use of the high-level practices throughout math instruction.

Policies and Structures. California Education Partners simultaneously encouraged districts to think more comprehensively about the range of aligned district systems needed to foster P-3 coherence, creating what they called the Coherence Framework to guide districts' efforts. The P-3 Coherence Framework articulated four main levers for fostering P-3 coherence: 1) clear expectations for P-3 grade level standards, 2) common high-leverage pedagogical practices, 3) monitoring P-3 student progress to guide decision-making, and 4) building teacher and administrative capacity.

The Study

We studied four districts in the pilot cohort to learn about their efforts and experiences with the P-3 Coherence Collaboration. The districts ranged from 300 to 1600 students. The proportion of students eligible for free lunch ranged from 64% to 92%, with 25% to 55% dual language learners. We observed convenings and professional development sessions, collected and analyzed California Education Partners' documents, and interviewed California Education Partners staff. To understand the ways in which districts changed their infrastructure for supporting early childhood mathematics from 2020-2023, we drew on twice annual interviews with each district's leadership for the initiatives (called the improvement team in most districts) as well as annual interviews with district superintendents. We supplemented these interviews with district documents, observations of improvement team meetings, initiative meetings and professional development, as well as perspectives of Ed Partners' staff and consultants who worked most closely with each district.

We found that all districts made multiple changes in their infrastructure to support high-leverage and coherent math teaching from pre-K to grade 3. We focused on changes in the six elements of infrastructure shown below.

We found that all four districts made substantial changes to their infrastructure for mathematics, although there was some variability. All four districts made changes in teacher learning and pedagogical approaches. But two of the districts implemented only a particular math learning activity (counting collections) they learned through the Collaboration, a relatively superficial change that would not significantly affect math instruction overall. The other two districts went much further in their efforts to change pedagogy, integrating the principles of high quality mathematics instruction (rather than just a discrete activity) into different instructional supports.

Most districts also made changes that stretched beyond teacher learning and pedagogical approach to include school leader learning (three districts), instructional oversight (two districts), and mathematics instructional frameworks (three districts). For example, one district shifted its instructional oversight system so that classroom walkthroughs incorporated the high-leverage practices into their observation rubrics and focused on formative forms of feedback that illuminated what students were thinking. Another district adopted an assessment instrument, the Learning from Children Growth Assessment, which was aligned with the high-leverage instructional practices. Professional learning for teachers focused on both assessment and the teacher practices. These additional changes are notable as most initiatives focused on improving instruction fail to include the full range of district supports for instructional improvement.

Although most of the changes districts made reflected what they were learning in the P-3 Collaboration, they were not always consistent with each other. For example, one district engaged in professional development related to counting collections with the P-3 Collaboration. However, the district also

focused on the implementation of a new supplemental curriculum promoting a basic-skills version of math fluency, coupled with a new mathematics assessment focused on speed, which they saw as a way to boost standardized test scores. Teachers, therefore, received mixed messages about how they should teach.

All four districts also created greater connections between pre-k and the elementary grades, ensuring that different supports were mutually supportive and reinforcing. All four districts made considerable progress in building bridges across pre-K to elementary and aligning systems to support mathematics instructions. But some districts were able to go further in these pursuits than others.

Districts' pre-existing capacity and prior experience played a role in the changes the four districts made to their mathematics infrastructure. Districts were more able to make substantive change in a given element when they had some pre-existing capacity with that element. For example, the districts that already had a mathematics framework and a system of school leader learning were more likely to be able to repurpose those systems in ways that transformed them. Those districts that did not have a given element—or who had it but it was in disarray at the start of the initiative—were able to make progress in integrating high quality mathematics, but that progress was less substantial.

Another factor that affected district changes was the involvement of a person with the authority to make changes in the P-3 Collaborative. The P-3 Collaborative teams that we led by a superintendent or assistant superintendent were able to make more infrastructure changes than the team led by the Director of Early Learning, who had no K-12 authority in the district.

Lessons Learned

Several qualities of the P-3 Collaborative appeared to contribute to its effectiveness in promoting infrastructure change.

1. **A genuine collaboration.** Ed Partners staff served in a coaching rather than a directive role. They provided opportunities for districts to reflect on their current practices in the context of new information, and then make their own decisions. For example, Ed Partners brought in experts to share current research on early math teaching and district reform, and they engaged leadership teams in activities, such as an analysis of their math curriculum in relation to the math learning standards. The collaborative approach also allowed for individualization. Districts varied hugely in size, capacity, resources, student population, and so on. Any effort to make systemic change required consideration of the specific district context.

2. **Elevating the voices of pre-K leaders and teachers.** Ed Partners insisted that early childhood leaders and teachers be part of district improvement teams, created spaces for conversation and mutual learning across pre-k and elementary, and encouraged elementary school leadership to visit preschool classrooms and learn more about what mathematics instruction could look like for the districts' youngest learners. These actions appeared to chip away at the status differentials between early childhood and TK-12 teachers and leaders and kept early childhood education on the front burner during discussions about instructional improvement in mathematics.

3. **Simultaneous focus on both teaching and learning in classrooms and district systems**. The Collaboration focused both on teacher and leader learning about high-leverage math teaching

practices and elements of the system that were needed to support high-leverage instruction. Their strategy was simultaneously top-down and bottom-up.

4. **Broad view of district systems necessary to support instructional improvement.** Ed Partners cued district teams to examine the ways that multiple district elements were consistent with the approach to mathematics they were trying to support, aligned with one another, and included prek-K as well as TK-3. In so doing, they encouraged districts to move beyond a typical approach to improving instruction by focusing on teacher learning and/or curriculum and assessment to think through the ways that this work could be guided by a framework for high quality instruction, supported by school leaders, and monitored for the purpose of instructional improvement.

5. **Learning opportunities and support to multiple levels of the system**. The initiative provided professional learning opportunities for multiple levels of the system from teachers to school leaders to district leaders to superintendents. These supports were tailored to each level's specific needs but were focused on common messages about high-quality mathematics instruction and the necessity of building district systems of support across the pre-K to elementary divide.

6. **Taking the lessons about job-embedded professional development to the system level**. Research on professional learning for teachers has long identified job-embedded professional development—that is, professional development that happens in teachers' classroom—as an effective approach to supporting teacher change (Althauser, 2015; Borko, 2004; Darling-Hammond et al., 2017; Putnam & Borko, 2000). Ed Partners incorporated this approach into their coaching of district leads, offering real-time guidance and support to district leads as they worked with their teams to engage in continuous improvement, planned district learning activities in mathematics, and made changes in their instructional infrastructure.

7. **Time.** The Collaboration continued for three years. Many of the most significant changes in infrastructure we observed were not seen until the second or third year. A briefer Collaboration would not have been sufficient, and in fact most districts wanted support beyond the three years.

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