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Introduction

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, repeat material that students already know, or implement instruction for which children are insufficiently prepared (Engel, Claessens, & Finch, 2013; File & Gullo, 2002; Goldstein, 1997). The disconnect between pre-K and early elementary school can compromise student learning and fail to take advantage of the gains children made in preschool (Engel et al., 2013; Reynolds, Magnuson, & Ou, 2006).

State and local policymakers in California and across the country are now attempting to create stronger pathways for students from pre-K through their early elementary years. These efforts, often known as *pre-K to 3 initiatives*, seek to sustain the gains made in preschool by ensuring access to high-quality and connected educational experiences from pre-K through third grade (Kauerz, 2006; Bogard & Takanishi, 2005; Graves, 2006). California has made an effort to align state preschool standards to K–12 standards, and districts are adopting or creating curricular materials that are continuous and use similar pedagogical approaches in both early education and elementary curricula. These districts are creating linked data systems so that they can track students as they move from pre-K into elementary school, establishing single site leadership for pre-K to Grade 5 schools, and developing a repertoire of professional development strategies that bring together pre-K, transitional kindergarten (TK),[1] and kindergarten teachers (Marietta & Marietta, 2013; Nyhan, 2015; Valentino & Stipek, 2016).

To date, however, there have been few systematic investigations of what it takes for school districts to bridge the historically separate spheres of pre-K and K–12 education, and how schools experience policies designed to achieve this bridge (Whyte, McMahon, Coburn, Stein, & Jou, 2016). Thus, while we know something about the broad strategies school districts are using, we do not know about the process of implementing pre-K to 3 initiatives, the challenges districts face, and which strategies are successful in achieving greater pre-K to elementary continuity. To reduce fade-out and promote overall high-quality, coherent educational experiences for young children, administrators need guidance on how to cross the preschool and elementary divide. This may be especially important for students from low-resource communities who benefit more than students from higher resource communities from high-quality preschool (Duncan & Magnuson, 2005). Policymakers and funders need guidance about the levers they can use to strategically support school district efforts. And district leaders need information on

[1] Transitional kindergarten is California's public school option for children who are not old enough for kindergarten to gain social and academic skills. The program is not mandatory and is designed for 4-year-olds who turn 5 between Sept. 2 and Dec. 2. Hopkinson (2017).

effective strategies for supporting pre-K to elementary continuity. Absent this information, it is difficult to identify the key levers that funders, policymakers, and educational leaders can use to ensure the success of pre-K to elementary initiatives.

In this report, we share findings from a study investigating the efforts of two urban California school districts to create a more seamless educational experience from pre-K to elementary grades. We focus on mathematics instruction because the disconnect may be especially acute in mathematics. Pre-K and elementary teachers are typically more comfortable and familiar with—and spend more time teaching—literacy than mathematics. Although math is the primary focus of the study, we expect that many of the issues also apply to literacy and other subjects.

Specifically, we ask:

1. What strategies are the two districts using to foster pre-K to elementary alignment and continuity in mathematics teaching and learning?
2. To what degree have the districts achieved alignment and continuity in their pre-K and elementary policy in mathematics?
3. How have school leaders and teachers experienced districts' strategies?
4. What continuing challenges do district leaders face in their efforts to foster alignment and continuity in mathematics?

We define *continuity* as the degree to which teaching and learning connect and are scaffolded across grade levels. Continuity is important because there is evidence that students who have more seamless educational experiences as they move across grades have better educational outcomes (Engel et al., 2013; Geiser, Horwitz, & Gerstein, 2012). We define *alignment* as the degree of connection among different elements of policy (e.g., the district's curriculum, assessments, standards, professional development) at a given level of schooling (e.g., preschool or early elementary). Importantly, alignment and continuity are two separate dimensions. It is possible to have alignment within early learning or within elementary, and still have discontinuity between the two. Similarly, it is possible to have a high degree of continuity within one element of instructional policy (e.g., the curriculum) such that preschool and elementary are well connected, while that element of instructional policy is not well aligned with others (e.g., principal professional development).

We will show that the strategic choices that the districts made resulted in instructional policies that had quite different patterns of continuity and discontinuity. In one district, efforts to bridge pre-K and elementary happened within the context of a district-wide approach to align multiple systems of instructional support, including creating a vision of high-quality instruction, an interim assessment system linked with professional

learning communities, and instructional walkthroughs for leadership using tools linked to the vision of high-quality instruction. However, this district's efforts were mainly focused on literacy and there was less continuity and alignment in the district's mathematics curricula, assessment, and teacher professional development. The other district had high levels of continuity across pre-K and elementary in mathematics curriculum, assessment, and professional development. But these efforts were less well connected with school leader learning, and structures such as walkthroughs and professional learning communities were more emergent. We will also show that these differences at the district level were associated with different experiences for teachers and school leaders as they sought to create more seamless educational experiences for students in their progression across the levels.

We begin by providing an introduction to the two districts in our study. We then provide an overview of our research design. Next, we describe the strategies that the two districts used to foster alignment and continuity between pre-K and elementary. In the third section, we assess the degree to which the two districts have achieved alignment and continuity in their instructional policy. Fourth, we move to the school level, describing how school leaders and teachers have experienced district efforts. In the fifth section, we discuss the continuing challenges that district leaders face. We close with implications for district leaders, funders, and state policymakers.

District Profiles

We studied two California school districts' efforts to build continuity and alignment in pre-K to elementary mathematics in the 2016–2017 school year. We call the districts Almond Valley Unified School District and Cypress Unified School District.[2] We selected these two districts because (a) they were both making concerted efforts to create stronger connections between pre-K and elementary education in the district, and (b) they were doing so using different strategies. Studying two districts with similar goals that employ different strategies provided an opportunity to learn the affordances and limitations of different strategic approaches. In this section, we begin by providing a brief overview of each district and then outline the strategies they have pursued for creating continuity and alignment in mathematics from pre-K through early elementary.

[2] All names used in the report—districts, schools, individuals, and agencies—are pseudonyms.

Almond Valley Unified

Almond Valley Unified School District serves more than 70,000 children. Nearly half of the city's children live in poverty and 90 percent of the students in Almond Valley Unified qualify for free or reduced-price lunch. The district serves a predominantly Latinx population; nearly 70 percent of students are Latinx, followed by Asian Americans, Whites, and African Americans. A little over 10 percent of the population receives special education services, and 21 percent of the population is English Language Learners.

The district provides services for students from birth through age 4 in a variety of programs including preschool classrooms at school sites and five child development centers. Of the 66 elementary schools, 46 have preschool classrooms (most of which are half-day) on site. As a whole, the district serves more than 3,200 preschool students. Pre-K classes are supported by preschool funding from the state, but the district also committed additional funds to ensure that every child in the district could attend preschool, regardless of their eligibility. Every elementary school in the district offers TK classes.

Historically, the students in Almond Valley have performed below the state average in mathematics. In 2016–2017, only 22 percent of students (Grades 3–8 and Grade 11) met or exceeded standards on the math Smarter Balanced Assessment (SBAC), compared to 37 percent statewide. There were also notable differences among different groups of students in Almond Valley: 14 percent of African American students, 16 percent of Latinx students, and 42 percent of White students met or exceeded standards on the math SBAC (California Department of Education, 2016). See Appendix A for a description of the district as a whole.

We worked with three schools in Almond Valley: Carlson, Edinburg, and Oakhurst. We chose schools that (a) had district-managed pre-K classrooms on site, (b) served low-income students, and (c) were working on issues of alignment and continuity on site. Table 1 presents the main characteristics of the three participant schools at Almond Valley Unified.

Table 1. Characteristics of Participant Almond Valley Schools and Students

School	Enrollment (K & up)	Enrollment by Ethnicity	% FRL	% ELL	Language Pathways	# PRE-K Classrooms	# TK Classrooms
Carlson	796	77.5% Latinx; 9.9% Asian American; 4.5% African American; 4.9% White; 1.5% Two or more races; 0.8% American Indian/ Alaska Native	97.5%	27.0%	English	4	1
Edinburg	591	61.9% Latinx; 22% Asian American; 11.8% African American; 0.7% Two or more races; 0.3% American Indian/ Alaska Native; 0.2% Native Hawaiian/ Pacific Islander	96.8%	36.0%	English	2	1
Oakhurst	722	64% Latinx; 21.1% Asian American; 5.4% African American; 4.4% White; 2.8% Two or more races; 1% Native Hawaiian/ Pacific Islander; 1% American Indian/ Alaska Native	96.0%	31.2%	English	2	1

Cypress Unified

Cypress Unified School District serves just over 50,000 students in pre-K through Grade 12 schools. The district has a highly diverse student population in terms of ethnicity, language, and socioeconomic status. The largest ethnic group is Asian American, but Latinx is close behind followed by White, African American, Filipino, and students who identify as multi-racial. Just over 50 percent of students qualify for free and reduced-price lunch. There are forty-four languages spoken by Cypress Unified's students; 24 percent of the students are English Language Learners.

The early learning department provides services for 2,225 preschool students served by co-located state-funded preschools on elementary school campuses and stand-alone early education centers. Of the 4,502 students who enroll in the district's kindergarten classrooms, 22 percent attend preschools managed by the district. The early learning department also serves 416 students in transitional kindergarten. Just over a third

of the district's elementary schools have preschool classrooms on site; 20 percent have TK classrooms.

Cypress Unified has a history of performing at or above state averages in mathematics. In the 2016–2017 school year, 50 percent of students (Grades 3–8 and Grade 11) met or exceeded the standards in SBAC. However, in spite of strong averages, the district struggles to support African American and Latinx students in reaching proficiency in mathematics. Only 14 percent of African Americans and 25 percent of Latinx were proficient in mathematics that year (California Department of Education, 2016).

We worked with three schools in Cypress Unified: Davis, Green Valley, and Paul Robeson. As in Almond Valley, we chose elementary schools that (a) had pre-K on site, (b) served low-income students, and (c) were working on issues of alignment and continuity on site. Table 2 presents the main characteristics of the three participant schools in Cypress Unified. See Appendix A for a description of the district as a whole.

Table 2. Characteristics of Participant Cypress Unified Schools and Students

School	Enrollment (K & up)	Enrollment by Ethnicity	% FRL	% ELL	Language Pathways	# PRE-K Classrooms	# TK Classrooms
Davis	206	60.7% African American; 14.1% Latinx; 5.8% Native Hawaiian/ Pacific Islander; 3.9% Two or more races; 1% White; 12.1% none reported	84.5%	6.8%	English Plus Pathway	3	1
Green Valley	375	71.5% Latinx; 12.5% White; 5.3% African American; 2.1% two or more races; 1.6% Asian American; 5.9% none reported	62.1%	46.9%	Elementary Dual Language Immersion Pathway (Spanish)	1	0
Paul Robeson	206	49% Latinx; 29.6% African American; 5.8% Native Hawaiian/ Pacific Islander; 4.4% Two or more races; 1.5% White; 7.3% None reported	75.7%	48.1%	English Plus Pathway, Elementary Dual Language Immersion Pathway (Spanish Pre-K), English Language Development	3	1

Research Design

The findings in this report are derived from data collected during the 2016–2017 school year as part of a larger longitudinal study of alignment and continuity in pre-K to Grade 2 mathematics instruction in the Almond Valley Unified and Cypress Unified school districts. We employed a mixed-method research design that incorporated the following:

- interviews with district leaders and district staff;
- interviews with school leaders and pre-K through Grade 2 teachers at the participant schools;
- a survey of pre-K through Grade 2 teachers at the participant schools;
- observations of district meetings and professional development; and
- analyses of key district artifacts, such as policy documents, professional development agendas and materials, scope and sequence documents, and walkthrough tools.

The incorporation of these multiple sources of data to address our research questions allowed for a multifaceted and nuanced analysis of continuity and alignment of math teaching and learning in the Almond Valley and Cypress school districts as students moved from preschool to the elementary grades. See Appendix B for a full description of the data sources and methods employed in this research.

Question 1: District Strategies for Fostering Pre-K to Elementary Alignment and Continuity in Mathematics Teaching and Learning

While both districts were committed to the goal of pre-K to elementary alignment and continuity, Almond Valley Unified and Cypress Unified made different strategic choices about how to achieve this goal. Here, we provide a summary of each district's strategies for fostering continuity and alignment in pre-K through elementary mathematics during the 2016–2017 school year.[3] We draw the findings in this section from interviews with district leaders and analysis of policy documents. We conclude that, during the time of our study, Almond Valley's efforts to foster greater connections in pre-K to elementary

[3] It is important to note that both districts shifted their strategies somewhat during the 2017-2018 school year, which is not covered in this report. Almond Valley adopted a much more central focus on mathematics district wide, including in the walkthroughs, school leader professional development, and teacher professional development. They also moved towards a school-based model of teacher professional development. Cypress Unified rolled out new curricular units for TK, invested more coaching support for teacher professional development in low-income and low-achieving schools (including two of the three schools in our study), and developed a partnership between the early education department and leaders who supervised one cohort of elementary schools focused specifically on pre-K to elementary continuity and alignment. We will discuss these changes in a future report.

mathematics were developed as part of a system-wide approach to alignment and continuity across subject areas that placed a strong emphasis on leadership, developing district-wide systems for instructional improvement, and aligning tools for instruction. By contrast, Cypress Unified's efforts were much more focused on mathematics teaching and learning. These efforts were less connected to leadership, and the district had fewer district-wide systems of instructional support.

Almond Valley Unified: A Central Focus on Instructional Systems and Leadership

Almond Valley pursued its efforts to foster pre-K to elementary alignment and continuity in mathematics within the context of its overall approach to instructional improvement in pre-K through Grade 12 across content areas. The overall strategy to foster instructional improvement included creating a clear vision of high-quality instruction, implementing a district-wide walkthrough structure to enable district and school leaders to learn about progress towards that vision, and a system of professional learning communities (PLCs) where people at all levels of the system gathered and analyzed data to inform instruction. Collectively, we refer to these elements as a *system of instructional support*.

At the heart of their system of instructional support was something called the Instructional Practice Guide (IPG). The IPG, developed by the non-partisan, non-profit organization Achieve the Core, is a document that lays out expectations for classroom practice consistent with Common Core State Standards (CCSS) from kindergarten through Grade 12. It is a developmental rubric that measures teaching based on five dimensions: classroom culture, lesson content, student engagement, instruction aligned to standards, and monitoring of student progress. One central office leader explained that the IPG was "a critical document for alignment because it allows for an alignment of language.... Everyone can be grounded in the same mission, vision, and common language" about what they want to see in classrooms.

The IPG was then used to guide a second element of the system of instructional supports: regular instructional walkthroughs. In Almond Valley, walkthroughs involved a one-day visit to a school during which members of the walkthrough team visited several classrooms to observe instruction. During the walkthroughs, observers were to pay particular attention and note teacher and student behaviors during a lesson. Walkthroughs were performed by staff who worked at different levels of the district: upper district leadership, district department heads, and school leaders. District leaders conducted weekly walkthroughs in cross-functional teams to increase shared understanding of instruction and coordination across units. School leaders conducted walkthroughs with their supervisors six to eight times a year as a vehicle to foster instructional leadership. In the second half of the year, walkthroughs for school leaders were focused

on mathematics and supported by the mathematics department. All instructional walkthroughs used a rubric linked to the IPG to evaluate classroom instruction and school-wide conditions related to improving instruction. Data from the walkthroughs were used to discuss what was working and strategies for improving instruction in a given school.

A third element of their system of instructional supports was the use of professional learning communities (PLCs), with common structures and goals at multiple levels of the system. All teachers in the school district participated in grade-level PLCs led by lead teachers, who were responsible for planning and leading the weekly meetings with other teachers within their schools. PLCs for Grades K–12 were school-based, but because there were only one or two pre-K and TK classrooms in each school, PLCs for these grades were cross-school. Principals also participated in cross-school PLCs, and members of district central offices participated in cross-unit PLCs (e.g., the director of early learning participated in walkthroughs with the director of English Language Learning, the director of Special Education, and the Chief Academic Officer). PLCs were intended to cultivate shared knowledge about essential standards and instructional practices aligned to the standards. In addition, during PLC meetings, team members were to use common protocols to review student data from common grade-level assessments to track student progress and adapt instruction accordingly. Representatives from the mathematics and ELA department supported lead teachers in facilitating this work at their school sites during regional meetings with other lead teachers and principals from their regions.

In addition to creating the system of instructional supports, the district also invested heavily in *professional learning for school leaders* as a vehicle for fostering alignment and continuity across content areas. Instructional walkthroughs, discussed above, were the cornerstone of these learning opportunities for principals. There were also specific efforts that focused on early education. Starting in 2014, the early learning department began what they called the Early Learning Lab as a way to support school leaders in creating continuity between pre-K, TK, and elementary classrooms on their school site. The Lab focused on the competencies outlined by the National Association of Elementary School Principals (NAESP) publication *Leading Pre-K-3 Learning Communities: Competencies for Effective Principal Practice*. Lab participation involved five three-hour sessions with practice-based experiences in-between each session. Participation was voluntary; by our study year, approximately 80 percent of elementary school principals and assistant principals had taken part in the Early Learning Lab. Finally, there was occasional professional development for school leaders focused on subject-matter content.

In terms of *curriculum and instruction* in mathematics, Almond Valley Unified focused on aligning instructional tools to the standards. The district had three different curricula in mathematics: one in pre-K, one in TK, and a newly adopted mathematics textbook in elementary that was on the state's list of approved texts linked to the Common

Core State Standards in Mathematics (CCSS-M). In the department for curriculum and instruction as well as the early learning department, district staff developed pacing guides to help teachers select activities from the curriculum to align with the CCSS-M and the California Preschool Learning Foundations. The mathematics department also developed an online tool referred to as Quarterly Planners. Quarterly Planners were designed to align with textbooks and offer additional guidance to teachers. The Quarterly Planners specified for each unit the essential questions, models, materials, and strategies to be used in instruction. The organization of the Quarterly Planners and the interactive features online were developed to make it easier for teachers to use the new curriculum productively. Finally, district leaders emphasized the importance of following the pacing guide and using the adopted curriculum, encouraging teachers to make only minor adjustments to meet the needs of specific children in the class.

The district also had in place an *interim assessment system* in mathematics from Grades 1 through 12, which staff from all levels of the system (from teachers through to the very top district leaders) were to use in their PLCs to inform instruction and decision-making. The interim assessments consisted of multiple-choice items drawn from an item bank provided by an external company. District leaders selected items that they saw as linked to standards. In kindergarten, there was a district-developed assessment. Unlike other interim assessments in the district, the results of this assessment were included in the kindergarten report card, so kindergarten teachers experienced it as fairly high stakes. With its pre-K students, the district used the Desired Results Developmental Profile (DRDP), a teacher observation measure in which math is one of eight domains assessed: approaches to learning/self-regulation, social and emotional development, language and literacy development, cognition (including math and science), physical development/health, history/social science, and visual and performing arts. They also had district-made interim assessments for pre-K, although they were trying to phase those out during the year of the study because they saw them as redundant with the DRDP.

In an effort to foster continuity, the early learning and curriculum and instruction departments used a common approach to *teacher professional development*. This involved multiple training cycles that began with district-wide training, where teachers in a given grade level were released to have professional development on a particular instructional strategy or common assessment. For pre-K, TK, and kindergarten teachers, these professional development workshops were followed by an opportunity for small groups of teachers to observe one another implementing the practice in their classroom, followed by a structured debrief in their PLC. Pre-K, TK, and kindergarten received more extensive professional development because the district devoted additional funds. The district-wide workshops for Grades 1 and above as well as workshops plus observations for the earlier grades happened multiple times throughout the year. During the year of our study, the district-wide training cycles in pre-K through elementary were more likely to

focus on literacy than mathematics. In the elementary grades, this was because the district was in the midst of a new curriculum adoption for English Language Arts.

In addition to these district-wide training cycles, coaches from the math department provided intensive support to schools with a math focus for the year. The coaches also responded to requests from schools to address school-specific needs and requests from sites that the assistant superintendents determined needed more support based on their interim assessment data or data from instructional walkthroughs.

Finally, Almond Valley also made some *structural changes* to foster greater connection between early education and elementary, including elevating the director of early learning in their organizational chart so that the position was parallel with those of the directors of college and career, special education, and English Language Learners. Furthermore, the school principal was responsible for both pre-K and elementary programs on their school site. Finally, and perhaps most notably, in 2014, the district moved kindergarten out of the K–12 curriculum and instruction department and into early learning department. This structural move was seen as a way to bring expertise in early childhood education into professional development for kindergarten teachers in order to create stronger continuity between early childhood and elementary.

Cypress Unified: A Central Focus on Mathematics Teaching and Learning

In contrast to Almond Valley's emphasis on district-wide structures to foster instructional support, leadership, and aligning instructional tools, Cypress Unified's efforts to foster alignment and continuity in mathematics focused more intensely on mathematics teaching and learning. In particular, during the year of our study, the district placed considerable emphasis on aligning content and pedagogy in the curriculum, assessment, and teacher professional development. After the state adopted CCSS-M and California Preschool Learning Foundations, Cypress Unified embraced the vision of mathematics teaching and learning put forth in the state standards. The district articulated their goal for math instruction as "all students will make sense of rigorous mathematics in ways that are creative, interactive, and relevant in heterogeneous classrooms." The district adopted an ambitious approach to instruction, focused on instructional strategies to elicit student thinking via the use of rich mathematics tasks and student discourse.

Rather than purchasing commercial curriculum linked to the new state standards as Almond Valley did, Cypress Unified decided to develop its own curriculum units with this vision of mathematics at its core. To foster continuity, these curriculum units were developed for pre-K through high school. The mathematics department took the lead in developing and subsequently revising these units but worked closely with the math specialist from the early learning department on the pre-K and TK units. The curriculum

units had a common structure across the grades, adapted slightly for pre-K and TK. The mathematics department identified a small number of what they considered to be high-leverage pedagogical strategies to foster this approach to instruction and built these strategies into curriculum units for pre-K through high school.

For example, one of the high-leverage pedagogical strategies was math talks. Math talks, as described in Cypress Unified's curriculum, are quick teacher-led, student-centered discussions about one problem. The point is to cultivate a classroom culture that values student discourse, student thinking, and multiple solutions. A teacher presents a problem to students. Students spend approximately one or two minutes silently solving the problem mentally. Students then share their answers with the class and the teacher asks questions that help students express themselves, understand each other, and clarify their thinking to make sense of the problem and its possible solution pathways.

District leaders adopted an approach to implementation of the curriculum that depended upon teacher judgment. Compared with Almond Valley, where district leaders emphasized following the curriculum with minor modifications, teachers in Cypress Unified were encouraged to use the task-based activities and pedagogical approaches embedded in the curriculum units, but to use professional judgment to adapt them to meet students' needs. As one district leader explained,

> We don't have a compliance mindset in terms of "You have to do it exactly the way that the lesson plan is written…." We've provided lesson plans that help teachers know what it might be like to move away from a guided practice model, but if you know some other alternative lesson… that you love that gets at the same target mathematics, that's fine.

The math department worked with the assessment office to align the district *interim assessments* with the pedagogical strategies and math content in the curriculum. Starting in kindergarten, there were twice-a-year interim assessments that involved scoring children's responses to a common rich task from the math curriculum units. Like Almond Valley, teachers also collected DRDP data in pre-K.

In terms of *teacher professional learning*, the early learning and mathematics departments had a common focus in mathematics: getting familiar with the units and learning the specific pedagogical strategies around which the curriculum was centered. The ways in which they enacted this focus differed, however. In the early learning department, generalist coaches worked one-on-one with teachers modelling instruction and providing targeted feedback. They also provided occasional mathematics workshops and facilitated monthly gatherings on different topics, including mathematics, dual language learning, and the DRDP. Pre-K and TK teachers self-selected into communities

they were interested in. By contrast, the mathematics department provided site-based professional development focused on kindergarten and above. Mathematics coaches worked with schools to select a model of support, ranging from leading the school in lesson study to supporting schools in deepening their understanding of the standards and specific pedagogical approaches. In most schools, the coaches worked with teacher leaders, who were volunteers responsible for facilitating grade-level and professional development meetings. Teacher leaders received additional professional development on both the mathematics and on leading professional development at their schools.

In contrast to teachers, there was limited emphasis on *professional learning for school leaders* related to mathematics. In 2011, the district instituted single-site leadership for elementary schools with co-located preschools. After that transition, the early learning department supported principals by providing professional development on the many issues related to supervising pre-K. During the time of our study, this initial infusion of more intensive support had transitioned to quarterly meetings. In contrast with Almond Valley's approach to supporting school leader learning related to pre-K that focused on instruction, Cypress's support focused mainly on operational issues related to preschools (e.g., preschool licensing and special education regulations). The mathematics department did provide information sessions about the new curriculum units and the district's high-leverage pedagogical strategies to school leaders for pre-K through elementary in the 2015–2016 and 2016–2017 school years, but these were neither frequent nor at the heart of the district's strategy for school leader professional learning.

The central strategy for professional learning for elementary school and early childhood center principals was critical friends groups. Developed by the assistant superintendents who supervised school leaders, critical friends groups are small groups of principals who agree on a common "problem of practice" that they want to investigate and work on, for example, second language learning or literacy learning. Principals opted into groups based on topics they were interested in. They collected data on their problem of practice and received support from their peers and supervisors on instructional leadership strategies to address their problem of practice. Interviews with district leaders who supervised principals suggest that few principals opted into groups focused on mathematics. The district also initiated instructional walkthroughs during the 2016–2017 school year. Walkthroughs involved principals from six or seven schools along with their supervisors. They followed a standardized process that focused on the problems of practice identified by host schools. The most commonly identified problems of practice for elementary principals were related to comprehensive literacy, and problems of practice rarely involved pre-K classrooms. The most common problems of practice for stand-alone early education centers were literacy and social-emotional learning.

As in Almond Valley, these efforts to foster continuity and alignment in mathematics teaching and learning were pursued in the context of broader district-wide efforts to align systems of instructional support. But these systemic efforts were less developed and not well connected to mathematics. There was a vision for high-quality instruction in the district strategic plan, but it remained very general. The walkthrough structure was new and mainly involved school leaders, not district administrators. There were professional learning communities at schools, but they were implemented unevenly and did not exist in a systematic way at the central office level as they did in Almond Valley.

One main achievement in Cypress Unified was integrating the student data systems from early education with that of elementary, so that it was possible to track student data as they moved from pre-K into elementary. Kindergarten teachers and school leaders were able to access the extensive data that the district collected on pre-K students using the same data dashboard used for students in TK through Grade 12. As one district administrator explained,

> We assigned all [early education students] a [unique ID], which is what we assign to all the kids K–12. That way, we can match data, and essentially help follow the kid, and develop a record for the kid with all of their assessment results. [And we can] give teachers who are getting incoming students a very full picture of where this kid is at right away. Along the way, once we have that in place, we were then able to match up those systems a little bit better.

The district also worked to extend existing planning and reporting tools to include early grades. For example, they extended their standards-based report card from K–12 to include TK, and required that the school improvement plan include attention to kindergarten readiness data. They created a single website for mathematics instruction that included all information about the approach to mathematics, professional learning opportunities for teachers, and information for families of students in pre-K through high school.

Finally, leaders in Cypress Unified made some major *structural changes* to foster continuity and alignment of early education and K–12. They elevated the director of the early learning department to a cabinet-level position, raising the profile of early learning and signaling the central importance of early childhood in the district's mission as a whole. As mentioned above, they moved to single-site leadership of elementary schools with preschool on site, with the school principal overseeing pre-K as well as TK through Grade 5.

Summary

While both districts used some similar strategies to foster pre-K to elementary alignment and continuity in mathematics, their emphasis and the extent to which those strategies were connected with one another differed. As summarized in Table 3, Almond Valley Unified placed a strong emphasis on building an integrated system of instructional support across content areas. They sought to ensure that individual elements were interlocking and spanned multiple levels of the system from the district to the classroom. By contrast, Cypress Unified's systems of instructional support were not fully developed and had few connections with one another. Almond Valley also invested heavily in principal learning in ways that were systemic and linked to the district's instructional approach. Opportunities for principal learning about early education were instructionally focused. By contrast Cypress Unified's approach to professional learning for school leaders emphasized principal choice at the elementary level, and most principals chose to focus on operational rather than instructional issues related to preschool. Neither district focused professional learning for school leaders on mathematics during the year of our study.

While both districts made considerable efforts to align curriculum and instruction, Cypress Unified took an approach that focused deeply on mathematics. Because they created their own curriculum from pre-K to high school, they were able to embed a consistent approach to pedagogy across pre-K and elementary. They also focused their teacher professional development on selected high-leverage pedagogical strategies in mathematics that were also central to the curriculum. By contrast, Almond Valley focused on aligning their instructional tools. They had three different commercial curricula and tried to create continuity via pacing guides that linked the curriculum to the standards. While they had a common professional development model across pre-K and elementary, there was little focus on mathematics in the early grades (pre-K, TK, and K).

Finally, both systems invested in similar structural changes, including elevating the director of early learning to a higher level of the district and creating single-site leadership at the school level. We discuss the implications of the differences in the strategies in the next two sections of the report.

Table 3. Comparison: District Strategies for Pre-K to Elementary Alignment and Continuity

	Almond Valley Unified	Cypress Unified
System of Instructional Support	• Instructional Practice Guide • Instructional walkthroughs • Professional learning communities focused on assessments	• Integrated data system pre-K–12 • Extended district planning and reporting tools to include TK and pre-K • Integrated communication system for mathematics, pre-K–12
Professional Learning: School Leaders	• Instructional walkthroughs • Early Learning Lab focused on ECE • Occasional subject-area professional development • More likely to focus on ELA than mathematics	• Critical friends groups supported peer learning on topics of school leaders' choice; limited focus on mathematics • Occasional instructional walkthroughs; limited focus on mathematics or early education • Voluntary professional development on operational aspects of supporting pre-K program
Curriculum, Instruction, and Assessment	• Focus on aligning tools • Adopted commercial mathematics curriculum in pre-K and elementary • Developed scope and sequence to link curriculum to standards • Interim assessments linked to standards, 1–12; district-made assessment in K; DRDP in pre-K	• Focused on aligning mathematics • Created mathematics curriculum pre-K–high school aligned with standards • Common emphasis on high-leverage pedagogical strategies to improve mathematics learning pre-K–12 • Build interim assessments into the curriculum, K–8; DRDP in pre-K
Professional Learning: Teachers	• District-wide cycles of training in ECE and elementary; limited focus on mathematics • School-level support for math-focused schools and those with school-specific needs	• Different professional development models in ECE and elementary • Common focus on specific high-leverage pedagogical strategies in mathematics, pre-K–high school
Structural Changes/ Other	• Elevating director of ECE to director level • Single-site leadership for pre-K and elementary	• Elevating director of ECE to cabinet level • Single-site leadership for pre-K and elementary

Question 2: Progress Towards Alignment and Continuity in District Instructional Policy in Mathematics

Alignment and continuity in instructional policy in general is very challenging for any district to achieve (Schmidt, Cogan, Houang, & McKnight, 2001; Massell & Goertz, 2002; Cohen & Spillane, 1992; Smith & O'Day, 1991). But continuity in instructional policy across pre-K and elementary may be especially difficult. Pre-K and elementary have historically operated as quite separate entities within school districts (Hachey, 2013). In fact, a large proportion of preschool programs have not been at all connected to districts. Even as districts seek to create stronger alignment and continuity, pre-K and K–12 continue to be governed by different state policies, have different funding streams,

and, in California, different staffing and credentialing processes (Coffman & Kauerz, 2012; Manship, Farber, Smith, & Drummond, 2016). The previous section reported on district strategies at Almond Valley and Cypress Unified to bridge these historically separate policies and processes and foster alignment and continuity in mathematics instructional policy.

In this section, we analyze the degree of alignment and continuity between pre-K and elementary grades of district policy in mathematics. We view alignment and continuity as existing in continua. Both districts were moving towards alignment and continuity and were further along in some dimensions than others. We focus most attention in this section and the next on pre-K through Grade 2, as this focus enables us to understand several grades on each side of the preschool and elementary transition.

We conclude that different elements of Almond Valley Unified's system for instructional support were carefully aligned with one another and the standards. However, these supports were often focused on literacy, contributing to disconnects in mathematics teaching and learning across grades. By contrast, Cypress Unified's deep focus on the mathematics in their curriculum and instruction efforts led to a high degree of continuity between early education and elementary in an approach that was aligned with assessment and teacher professional development. Limited engagement with school leader professional learning and a dearth of systemic supports, however, created several key disconnects across different elements of instructional policy.

Alignment and Continuity in Almond Valley Unified

Almond Valley Unified endeavored to foster continuity and alignment across content areas (including mathematics) by creating multi-level, integrated systems of instructional support. These efforts were designed to encourage and support teachers to improve instruction for pre-K through elementary and beyond. This system of instructional support was notable for the degree to which it existed at every level of the system (classrooms through to the highest district leaders) and, with a few exceptions, from pre-K through Grade 12.

These different supports for instructional improvement appeared to be **well aligned**, but also interlocking. That is, at the policy level, they promoted a common approach to instruction across content areas. There were also multiple linkages between different elements of the system. In our observations of district walkthroughs, for example, we saw district leaders engaging school leaders in discussions of the degree to which the instruction they observed in classrooms was linked to the standards. Individually and collectively, leaders assessed each classroom using a rubric linked to the IPG. We found evidence from observations and interviews of teachers, school leaders, and district leaders

that interim assessment data were being used in PLCs to identify and strategize ways of improving instruction.

Professional development for school leaders was also **well aligned** and integrated into these systems of instructional support in Almond Valley. Walkthroughs for school leaders mirrored those done by cross-functional teams at the central office and were also grounded in the IPG. The Early Learning Lab also linked with and reinforced the vision of instruction in the IPG, translating it to the early childhood context. For example, activities sought to help school leaders understand how to see "rigor" or "student ownership for learning" in early childhood teachers' classrooms. This translation was especially important because the IPG—the heart of the district's instructional system—did not extend to pre-K. As mentioned in the previous section, most of the professional development for school leaders during the year of the study was focused on literacy. Walkthroughs, however, did focus on mathematics in the spring of 2017.

At the same time, there were key points of disconnection in alignment and continuity in mathematics. First, district leaders had taken great care to select mathematics texts that were consistent with CCSS-M and attempted to align their existing pre-K curriculum with the California Early Learning Foundations. They also created scope and sequence documents in pre-K, TK, and K–12 to help teachers draw on the parts of the textbooks that addressed the standards. Nevertheless, there was **low continuity** between early education and early elementary in *curriculum and instruction in mathematics*. To assess continuity in the curricula, we analyzed the units in the pre-K, TK, and elementary mathematics textbooks (K through Grade 2) that were related to number and number sense. We chose to focus on number and number sense as these are key competencies in early childhood mathematics. To assess the degree to which the mathematical content built over time, we coded the curricular topics that were addressed by the activities in the units. We also coded activities for their cognitive demand: the degree of challenge a student may encounter in completing a task. Sometimes, the activities did not provide enough guidance about the intentions for students in order for us to apply a code. In those cases, we coded the activity "Not Enough Information" or NEI. See Table 4 for definitions of codes for cognitive demand.

Table 4. Definitions of Codes for Cognitive Demand

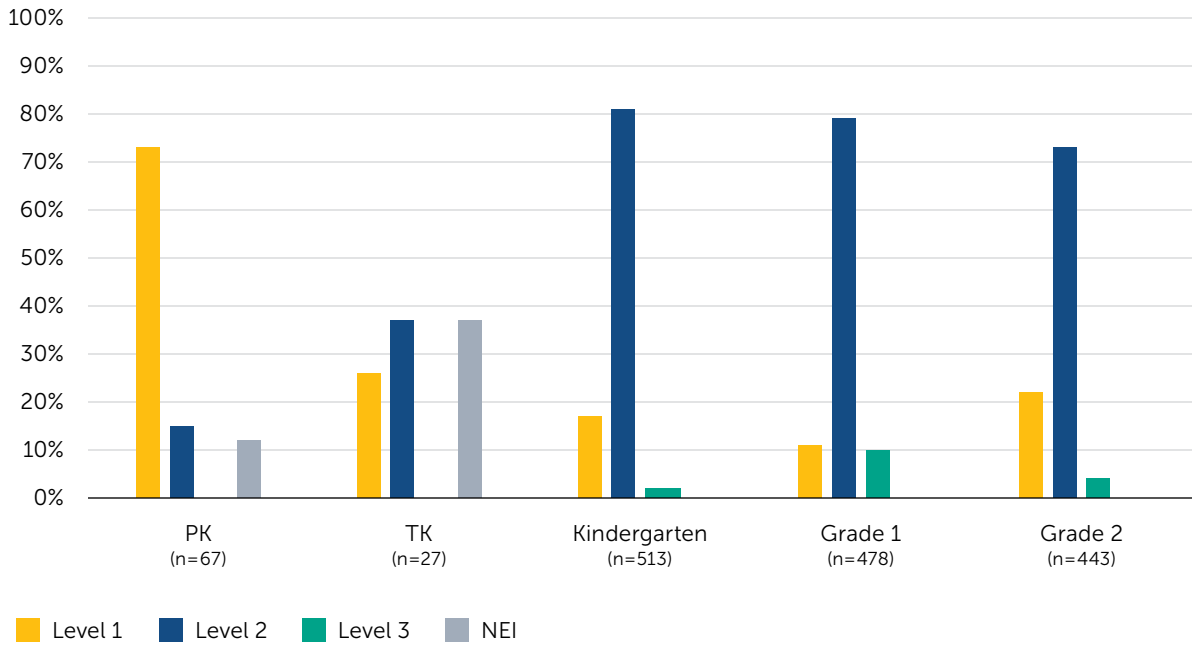
Level	Definition
Level 1: Recall/Reproduction	Recall fact or definition or simple procedure
Level 2: Application of Concepts	Make choices to solve, classify, organize, notice, compare to solve problems
Level 3: Strategic Thinking	Make choices in solving and explain thinking. Justify and demonstrate choices to solve complex tasks involve multiple steps
Level 4: Extended thinking	Make several connections within and across fields. Create original models or develop new theories
Not Enough Information (NEI)	Expectation for student engagement is unclear

Adapted from Webb, Alt, Ely, and Vesperman (2005).

We found that the pre-K and TK curricular materials related to number and number sense that teachers were asked to use in the district-created scope and sequence did not fully address competencies laid out in the California Early Learning Foundations for pre-K or the relevant standards from the Foundations and CCSS-M for TK. The pre-K units addressed only seven out of nine number and number sense standards in the Foundations. The TK units addressed only three out of nine of the relevant standards in the Foundations and CCSS-M for kindergarten. Missing content in pre-K and TK created poor continuity in content between pre-K and elementary. For example, there were no activities related to adding or subtracting in pre-K or TK even with small numbers, in spite of the fact that these skills are in the California Preschool Learning Foundations. Thus, the curriculum provided limited scaffolding for adding and subtracting in kindergarten. There were similar issues with comparing groups of objects (which lays the groundwork for comparing numerals), verbal counting, and others.

We also found **low continuity** in cognitive demand. The CCSS-M and the California Preschool Learning Foundations are designed so that students have the opportunity to engage in learning activities that have a range of cognitive demand in a given grade level. This design implies that an ideal situation would involve a mix of low, moderate, and high levels of cognitive demand in all grades so that students have the opportunity to engage in procedural review plus analysis and extending. Yet, as is apparent in Figure 1, curricular materials in pre-K and TK had a much higher percentage of activities with a cognitive demand of 1 (recall) and much lower percentage of cognitive demand of 2 (skill and application) than in Grades K through 2. Of note, there were also very few activities with level 3 cognitive demand, and none with level 4.

Figure 1. Almond Valley Unified: Cognitive Demand Percentages by Grade Level



We also found **mixed alignment** between the curriculum and interim assessments, depending upon the grade level. To assess alignment between the curriculum and the interim assessments, we drew on our analysis of the content and cognitive demand in kindergarten, first-, and second- grade units related to number and number sense.[4] We identified the content that was most salient in the units and then assessed the relationship between these topics and those assessed on the interim assessments. For cognitive demand, we compared the percentage of different levels of cognitive demand in the curriculum units with those levels in the interim assessments in a given grade level.[5]

In kindergarten, we found that there was strong alignment in the content but weak alignment in cognitive demand between the district-created kindergarten interim assessment and the curriculum. In terms of content, the kindergarten assessment focused on seven of the nine most-covered topics in the curricula. However, the missing content was more complex than that represented in the assessment. In terms of cognitive demand, there was a higher proportion of items with low cognitive demand in the assessment than in the curriculum (43 percent of items were level 1 in the assessment

[4] We did not include pre-K or TK in this analysis, as they are not part of the formal interim assessment system in the district.
[5] There is no existing research that establishes a benchmark for what constitutes ideal alignment between the curriculum and assessment in terms of content and cognitive demand. However, we know from research that a lack of alignment is problematic (Polikoff, 2012). Here, we note the different levels of alignment and misalignment in Almond Valley and Cypress but cannot make claims that a given level of alignment is necessary for instructional improvement.

compared to 17 percent in the curriculum). Taken together, these findings suggest that the kindergarten assessment focused on lower level mathematics than the curriculum.

In Grade 1, we found less alignment in content than we found in the kindergarten assessment: the interim assessments included six out of the 11 most-salient topics from the curriculum, along with two additional topics. However, the content that was included in the assessment represented the more complicated and mathematically important concepts in the curriculum. At the same time, the interim assessment had lower cognitive demand than the curriculum (24 percent of activities were level 1 in the Grade 1 assessment, while 11 percent of activities were level 1 in the Grade 1 curriculum). So, while the assessment focused on higher level content than the curriculum, it did so in ways that fostered lower cognitive demand.

In Grade 2, there was a high level of alignment in content (covering the five most frequently taught concepts, plus several additional ones). However, there were also a number of items on the interim assessment that were not included in the curriculum. These items focused on content that tended to be more conceptual than those represented in the curriculum (for example, representing addition and subtraction without numerals, understanding subtraction as an unknown addend problem). There was a similar level of cognitive demand between the curriculum and the assessment in Grade 2 (26 percent of level 1 in the assessment, 22 percent in the curriculum). Thus, like Grade 1, the assessments in Grade 2 focused on higher level content than the curriculum, but in contrast to Grade 1, did so at a similar level of cognitive demand.

The majority of district-wide teacher professional development in Almond Valley focused on English Language Arts during the year of the study. As mentioned earlier, for elementary teachers, this was an intentional decision by the district because they prioritized supporting the implementation of a brand-new English Language Arts curriculum. To assess the degree of alignment between the curriculum and the district-wide teacher professional development,[6] we analyzed the nature of activities for their consistency with instructional approaches embodied in the curricula, and messages about how teachers should be using the curricula. The professional development that did focus on mathematics had a consistent format across pre-K through elementary (described earlier). This was especially true with pre-K through kindergarten, because the professional development was delivered by the early learning department. Yet while the teacher professional development was consistent in format, there was not a consistent focus on specific instructional strategies in

[6] District-wide teacher professional development was supplemented by intensive work by the mathematics department in schools with a math focus during the 2016–2017 school year, and responding to site-specific requests for support. We were not able to observe these site-specific efforts, so our analysis of alignment is focused on the district-wide teacher professional development.

mathematics across the grades. During the year of our study, the mathematics department provided professional development on a wide range of topics that were well aligned with the curriculum and also with the IPG, including: support for implementing the lesson structure of the adopted curriculum in elementary, instructional shifts with the CCSS-M, use of tools, teacher questioning, eliciting student talk (especially supporting second language development via student talk), and support for building conceptual understanding. In contrast, the teacher professional development provided by the early learning department, to the degree that it focused on mathematics, emphasized incorporating hands-on and play-based activities into their mathematics instruction.

Alignment and Continuity in Cypress Unified

By contrast, perhaps by focusing so centrally on mathematics itself, Cypress Unified was able to develop high continuity in the mathematics curriculum and instruction in pre-K through Grade 2. The curriculum, in turn, was well aligned with teacher professional development and moderately aligned with assessment. However, Cypress Unified had fewer systems of instructional support (e.g., systematic walkthroughs, PLCs, etc.) in the district generally, and those they had rarely focused on mathematics instruction. There was also little emphasis on professional learning for school leaders in mathematics.

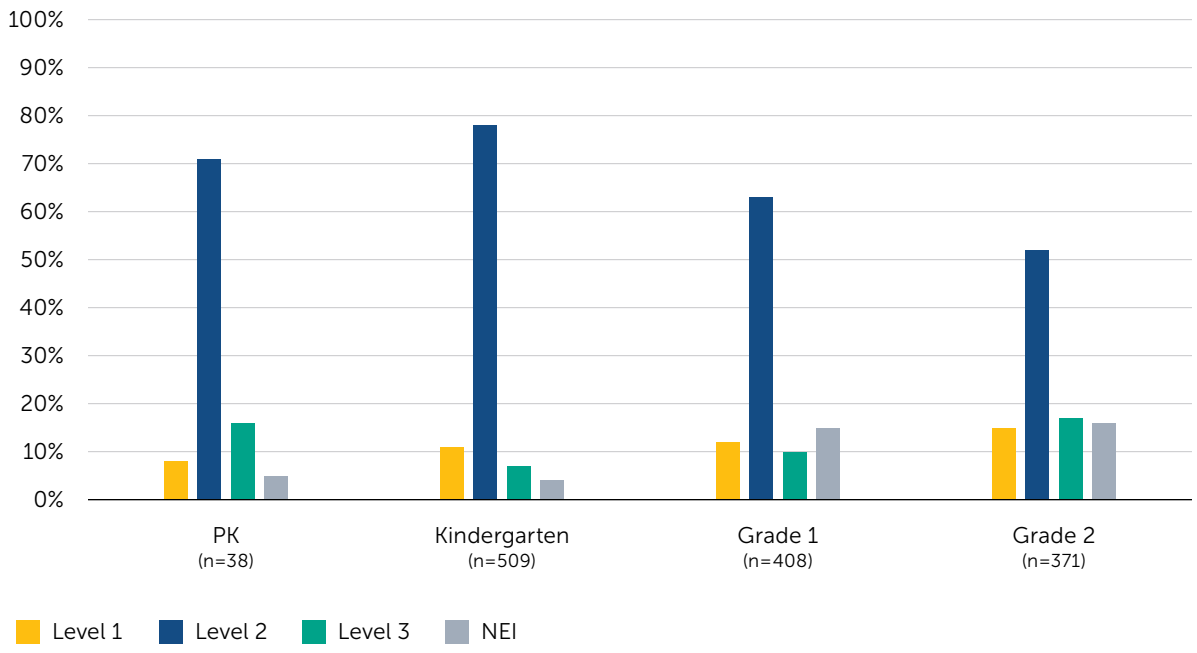
We found that the curriculum had, across levels of school, **a high continuity in terms of instructional strategies and content**.[7] In terms of instructional strategies, there was a consistent emphasis from pre-K through Grade 2 on student thinking through the use of activities that encouraged multiple strategies for solving problems and required students to explain their thinking.[8] Teaching math content through students' explorations and explanations appears consistently in units for pre-K through Grade 2 through routine use of the district's high-leverage instructional strategies. (Recall that to analyze continuity in content, we coded activities in the units for the topics they addressed.) We found that the mathematical content built across grades in grade-appropriate ways in the Cypress Unified curriculum units. For example, there was a logical progression of add and subtract, with activities related to "add and subtract within 5" starting in pre-K, increasing in frequency in kindergarten, and then decreasing in Grade 1. At the same time, "add and subtract within 20" started in kindergarten, increased in Grade 1, and decreases in Grade 2, supplanted by "add and subtract within 100."

[7] At the time of our study, the district had not yet completed curriculum units in TK. Thus, the analysis in this section does not include TK.

[8] This emphasis continues through Grade 12. However, we restrict our discussion throughout this section to pre-K through Grade 2, because those are the curriculum units that we analyzed.

The curriculum also had a **high continuity in terms of cognitive demand**. That is, the curriculum units in Cypress Unified better reflected the aim of the California Preschool Learning Foundations and CCSS-M to have students experience activities at a range of cognitive demands in each grade level. As can be seen in Figure 2, the configuration of level of cognitive demand was somewhat similar across grades, with pre-K units having, on average, somewhat higher cognitive demand than kindergarten and Grade 1. It is also important to note the higher levels of activities coded NEI in the Cypress curriculum units compared to Almond Valley, especially in Grades 1 and 2. (Recall that we coded activities as NEI if there was not sufficient information about expectations for student learning for us to code.) This means that teachers in Cypress had less guidance on what successful enactment of the activities might look like, which may influence activity enactment in the classroom.[9]

Figure 2. Cypress Unified: Cognitive Demand Percentages by Grade Level



We also found a **moderate alignment** between the curriculum and the district interim assessment system. Importantly, one part of the district's interim assessment system involved formative assessment tasks that were built into the curriculum units. Thus, the assessments embodied the same ambitious approach to mathematics instruction as the rest of the activities in the units. Indeed, the assessment tasks mirrored the district's high-leverage pedagogical strategies emphasized in both the curriculum

[9] It is important to note that Cypress Unified revised its curriculum units for the 2017–2018 school year to provide more guidance for teachers. We coded these units as well and found a sharp decrease in the percentage of activities coded as NEI.

and teacher professional development. Because the assessment tasks only involved either three or four activities each, they tended to cover a subset of the most salient topics in the units. However, those they covered tended to be the most conceptual mathematics in the units, leading us to consider them to have high alignment in content. Alignment in cognitive demand was mixed depending upon the assessment. The kindergarten assessment was at a lower level of cognitive demand than the curriculum, while Grade 1 and Grade 2 interim assessments and the curriculum had more similar levels of cognitive demand. More specifically, 33 percent in the kindergarten assessments were level 1 (two out of six activities), compared to 11 percent of activities in the kindergarten unit. In Grade 1, 17 percent of the activities (one out of six) in the assessment were level 1, compared to 12 percent of the activities in the curriculum. In Grade 2, 17 percent of the activities (one out of six) in the assessment were level 1, compared to 15 percent of the activities in the curriculum.

We found that teacher professional development in Cypress Unified had **high alignment** with the curricula. It consistently and repeatedly emphasized the high-leverage instructional strategies promoted by the curriculum. For example, during five separate teacher professional development sessions that we observed (three facilitated by early learning and two by the math department), we coded 77 different invocations of the pedagogical strategy "math talks." Professional development also gave teachers opportunities to experience the instructional strategies in the curriculum, for example, by having them solve problems that appeared in the curriculum units. In spite of the fact that early learning and the mathematics department used a different model of professional development, both focused on the same set of high-leverage pedagogical strategies, leading to a **high degree of continuity** in content of teacher professional development for pre-K through elementary.

While there was high alignment and continuity in curriculum, instruction, assessment, and teacher professional development, there was **weak alignment** between the curriculum and school leader learning. Elementary school principals—including those with pre-K and TK classrooms on their campuses—had a number of professional learning opportunities to support their instructional leadership, including critical friends groups, a new walkthrough strategy, and occasional professional development from content specialists. However, during the 2016–2017 school year, there were few if any critical friends groups in the district focused on mathematics teaching and learning. Similarly, district staff who facilitated the walkthrough process and assistant superintendents who supervised principals reported that these opportunities were content neutral. That is, they were guided by protocols that were to be used across all content areas. There was only one professional development opportunity for school leaders that focused on the high-leverage instructional strategies that were built into the curriculum, but this professional development was brief (one of many in a daylong meeting for administrators)

and voluntary. Further, the explicit efforts to foster continuity for school leaders with pre-K or TK classes at their school site (quarterly daylong meetings) focused mainly on operational issues, rarely instructional ones. Furthermore, district leaders reported that few walkthroughs were conducted in pre-K or TK classrooms; instead, they mainly focused on classrooms for kindergarten and above.

Finally, as discussed in the previous section, there were few system-wide, reinforcing systems supporting the district's vision of mathematics for pre-K through elementary in Cypress Unified. The district had interim assessments but did not use them consistently across central office departments, different schools, or across early education and TK–12. The walkthrough structure was new and not fully developed, and rarely focused on mathematics or pre-K and TK classrooms. While the mathematics department and early learning department had a strong shared vision of high-quality mathematics instruction, that vision was not built into the walkthroughs or other supervisory structures used by assistant superintendents in charge of schools. Lastly, while the district had a technical infrastructure for sharing data across pre-K and elementary, whether teachers accessed the data system was left to their and their school leaders' discretion. District and school leaders reported limited systemic use.

Summary

We found that both districts achieved greater levels of continuity and alignment in some elements of district instructional policy, while disconnects still remained. More specifically, Almond Valley created an integrated system of supports for instruction that was well aligned with their efforts to support school leader learning. However, there were disconnects between pre-K, TK, and elementary curricula and, while there were similar models for teacher professional development, the district intentionally decided to prioritize English Language Arts during the year of the study. The mathematics professional development that did occur, while promoting a consistent approach to mathematics instruction, had had somewhat different focus in pre-K through K (provided by the early learning department) than in Grade 1 and above (provided by the mathematics department). By contrast, Cypress Unified had a high level of continuity across pre-K and elementary in its curriculum, strong alignment with teacher professional development, and moderate alignment with its assessment system. However, a lack of opportunities for elementary principal learning related to pre-K and mathematics and a less-developed system of instructional supports meant that there were few mechanisms to reinforce the district's approach to mathematics instruction for pre-K through elementary.

Question 3: Districts' Efforts to Promote Alignment and Continuity as Experienced by School Leaders and Teachers

To foster pre-K to elementary alignment and continuity, districts need to create conditions that enable schools to support instructional improvement within grades and continuity in instruction across the grades. We investigated how teachers and school leaders in the six schools in our study experienced the two districts' policies and actions. As in the previous section, we focused our efforts on preschool through Grade 2, drawing on data from interviews with principals, coaches, and teachers in three schools in each district. We also administered a teacher survey.[10] See Appendix B for a more extensive discussion of methods.

Although our district-level analysis suggested more limited alignment and continuity in mathematics curriculum and instruction in Almond Valley Unified, most teachers at Almond Valley perceived these elements to be well coordinated, both within and across grade levels. Furthermore, we found that Almond Valley school leaders and teachers had a shared focus on following the curriculum and teaching to standards but did not have a shared understanding of pedagogical practices that could help students achieve the standards.

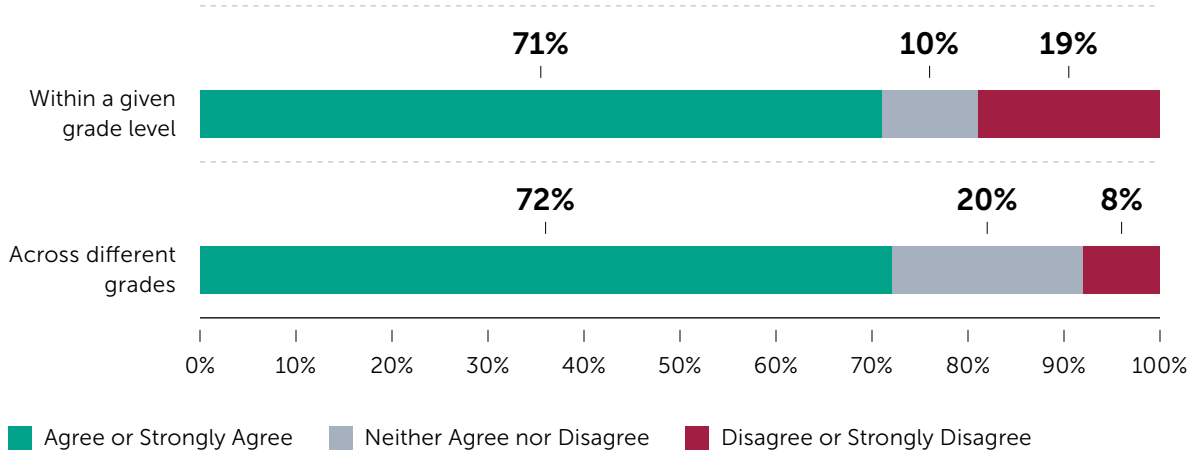
By contrast, even though our district-level findings uncovered high levels of alignment and continuity in curriculum and instruction in Cypress Unified, the majority of the teachers perceived a lack of alignment and continuity. Nevertheless, both teachers and school leaders were able to articulate a set of targeted pedagogical practices that the district was promoting to support students in meeting the standards.

School Experiences of Alignment and Continuity in Almond Valley Unified

We found that most teachers in Almond Valley perceived alignment and continuity in curriculum and instruction. On our teacher survey, the majority of teachers in our three sample schools agreed or strongly agreed with the statements "curriculum, instruction, and learning materials are well coordinated across different grades" (continuity) and "there is consistency in curriculum, instruction, and learning materials within a given grade level" (alignment). See Figure 3.

[10] In addition to the interviews and teacher survey, we also conducted classroom observations and student assessments in pre-K classrooms during the study year. These additional data collection activities were part of our ongoing longitudinal study of children as they move across the grades. Because the focus of this report is how teachers and school leaders perceived the district efforts pre-K to Grade 2, we do not include here findings from classroom observations and student math assessments.

Figure 3. Percentage of Almond Valley Teachers Who Agree That Math Curriculum, Instruction, and Learning Materials Are Well Coordinated



N = 39

Furthermore, school leaders at all three Almond Valley sites said that "implementation of the district's curriculum" and "instruction aligned to standards" were main priorities with regard to math at their respective schools. Based on interview data, teachers were well aware of these priorities from messages they had received from school administrators and other school instructional staff.

Teachers and school leaders attributed the alignment and continuity they experienced at the school site to the aligned instructional systems the district put in place. For example, teachers reported that they experienced common professional learning at a school, were using similar instructional materials, and worked together regularly in their professional learning communities. One teacher explained:

> I think the majority of my practices is the same [at the school level]. Because we all communicate with each other how we are teaching math. We are all pretty much on the same page when it comes to not getting hung up on pacing and meeting the kids where they're at.... Then, we have so many [grade-level] meetings. We discuss these all the time, and, then, we bring it all together at our professional learning meetings, where each grade level shares out their ideas. I find it to be pretty similar.

School leaders reported that their own professional learning opportunities helped develop a shared perspective of instruction across the district. In particular, school leaders

said that the five areas of focus[11] and indicators in the IPG and the walkthroughs helped them develop a shared vision of instruction aligned to the standards. For example, one principal said: "I think [the IPG] makes it, as a district, more calibrated, as well as the site, too, because we're actually able to go off of something and kind of speak the same language." School leaders also indicated that the IPG and the walkthroughs helped them to provide more targeted feedback on instruction to teachers during evaluations. For example, one principal said,

> [At the walkthroughs] they're having us practice how to give effective feedback.... At the same time, it also serves as an opportunity for the teacher that was observed, and the principal that hosted, to be able to use that information to improve their site's instruction.

School leaders also believed that the professional development they had received from the early learning department helped them extend their instructional leadership practices to the early education classrooms on their campuses. One principal explained, "Our district really pushed the Early Learning Lab, which focuses on early learning, so pre-K through Grade 1. That really brought into my knowledge around what's expected and what's appropriate for that age level. That's been huge." Another stated, "We have to make sure that we're providing what's required by state law to facilitate pre-K, but also providing a rigorous learning environment [that is] as well developmentally appropriate."

Although teachers experienced district policy in mathematics as being aligned and having continuity, they had a hard time identifying specific pedagogical approaches in mathematics that the district was promoting or that they were working on. When asked in interviews about the cornerstones or most important aspects of their math teaching, there was little overlap in teacher responses, beyond following the curriculum (mentioned by 45 percent of the teachers; n = 40) and emphasizing hands-on instruction (mentioned by 33 percent of the teachers). Furthermore, other than hands-on learning, characteristics of high-quality math instruction identified by most school leaders, such as an emphasis on promoting student discourse, multiple strategies to solve problems, and conceptual understanding, did not figure prominently in teachers' descriptions of the cornerstones of their math instruction. It appears that the glue that bound math instruction together in Almond Valley was curriculum and the standards much more so than instructional strategies or pedagogical approaches.

[11] As we discussed earlier, the five areas of focus in the IPG are (a) culture of learning and high expectations, (b) challenging content aligned with the CCSS for Mathematics, (c) student ownership of their learning, (d) every student gets the support they need to access the lesson content, and (e) students demonstrate their understanding.

Thus, it appears that the district's investment in aligned instructional systems such as the IPG, walkthroughs, and professional learning communities have helped teachers and school leaders develop a sense of the district's key instructional priorities related to following the curriculum and linking instruction to the standards, fostering the perception of alignment and continuity across grades. But their efforts did not yet get to the level of pedagogical practices in mathematics that teachers should use as they implemented the curriculum.

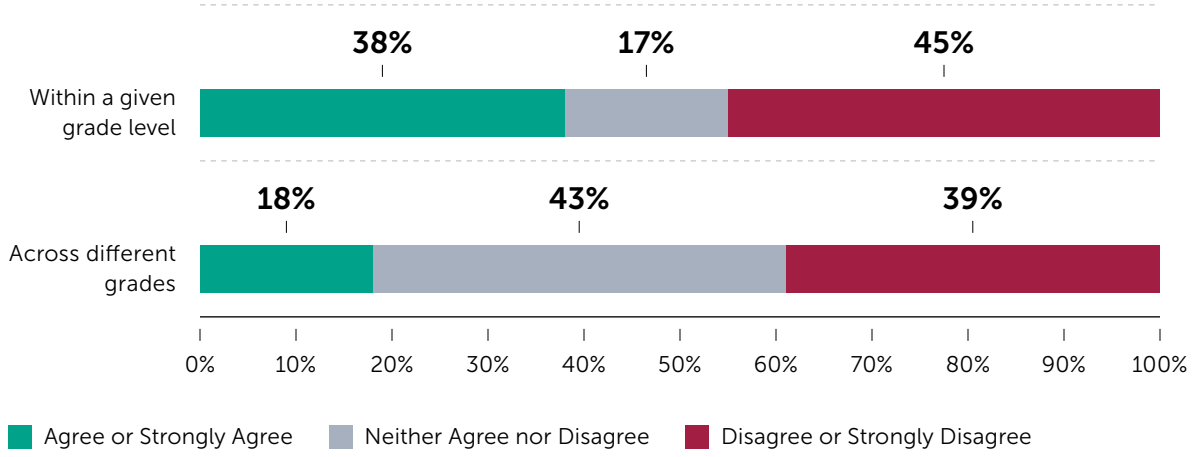
The district's emphasis on professional learning opportunities for school leaders has not only enabled school leaders' preparedness to lead efforts to bridge early education and elementary instructionally, it has also provided tools to help them focus teachers on using the new curriculum. Indeed, 60 percent of teachers in our survey agreed or strongly agreed that their principal provided them with useful feedback to improve their math instruction. But principals may not have had sufficient knowledge of specific instructional strategies required to advance the tenets embedded in the IPG, which may have hindered the development of a shared pedagogical framework at their schools.

Teachers and school leaders in Almond Valley were mainly focused on instructional tools, including the curriculum and pacing guides. At the same time, the instructional tools themselves were not as aligned as they could be. A greater focus on mathematics in general and specific high-level pedagogical strategies specifically may be key to developing a more seamless instructional experience for students in mathematics across the early learning–elementary divide.

School Experiences of Alignment and Continuity in Mathematics in Cypress Unified

By contrast, teachers in Cypress Unified were decidedly mixed in their assessment of the degree to which curriculum, assessment, and professional development were aligned and fostered continuity. As shown in Figure 4, only 38 percent of the teachers agreed or strongly agreed with the statement, "In this district, there is consistency in curriculum, instruction, and learning materials *within* a given grade level." This proportion was even lower—18 percent—with regard to consistency *across* grade levels.

Figure 4. Percentage of Cypress Teachers Who Agree That Math Curriculum, Instruction, and Learning Materials Are Well Coordinated



N = 29

Two out of the three principals also reported that they did not feel entirely prepared to supervise the early education classrooms on their school sites. One explained,

> I don't have that experience [with preschool] so it is challenging. It's challenging to be supportive and to offer evaluations and observations. I'm like, "That was great," so I … go to [pre-K staff] meetings but I don't feel like I'm super qualified.

Furthermore, in contrast to school leaders in Almond Valley who referred to instruction when they talked about their roles vis-à-vis early education classrooms, the school leaders in Cypress largely discussed their roles in operational terms. One principal explained his responsibilities for the early childhood classroom in a way that echoed others in our sample:

> I oversee all of the pre-K here. It deals with the operational aspect of licensing. We're a licensed facility. The instructional program? I would say right now, where I am with the pre-K is mostly around the operational, because there's a ton of operational stuff with pre-K. Then, orchestrating the instructional stuff, so making sure the coaches are in the right spot, making sure we have release dates for collaborative planning, that kind of stuff.

School leaders attributed their lack of preparedness both to their own experience as middle or upper elementary teachers and to lack of professional development to support their work with early childhood classrooms. The early learning department did

provide regular professional development on early childhood for school leaders. But Cypress Unified emphasized principal choice, and few principals opted to participate in these learning opportunities.

Although Cypress Unified teachers perceived curriculum, instruction, and learning materials to lack alignment and continuity, most of them (23 out of the 29) agreed that, at least to some extent, their schools had a shared perspective on how to teach mathematics. Moreover, both teachers and school leaders at all three schools pointed to specific pedagogical strategies: math talks and another of the district's high-leverage instructional strategies called the *three-read protocol*. One teacher explained:

> We're all doing this. We're all doing that. I think that there is a great effort made school-wide [towards a shared perspective]. We've talked about this. We've talked about how maybe something like the math talks and the three-read protocol are things that students, when I was teaching fourth and fifth grade a couple of years ago, were still struggling with, because it's something that wasn't introduced to them until they were in third grade. Now, these kindergartners, who're getting accustomed to these and these other ways of doing things, they might be able to access the materials a little bit better when they're older, because they've—because of just the amount of exposure to it.

Another teacher pointed to a shared focus on conceptual understanding of mathematics and student discourse, which are key tenets of the district's approach to mathematics education that are built into the curriculum and supported by district professional development pre-K through elementary:

> [As a school] we go over the mathematical practices. We talk about implementing those in the classroom. If you're implementing those, you are looking at conceptual ideas versus rote memorization. I think there is a big push for using manipulatives and increasing student talk around mathematics.

We also found substantial overlap between school leaders' perspectives on high-quality math instruction and teachers' reports of the cornerstones of their math instruction. In particular, both school leaders and teachers highlighted student discourse, hands-on learning, and student engagement. That said, conceptual understanding was mentioned as an important aspect of math instruction by all school leaders, yet only 17 percent of the teachers cited it as a cornerstone of their instruction.

It is puzzling that teachers and school leaders perceived so little alignment and continuity in mathematics curriculum, instruction, and learning materials, given our assessment of the relatively high levels of both at Cypress Unified and the fact that their comments revealed considerable continuity in the instructional approaches in mathematics they are working on within and across grades. We suspect teachers' views of the continuity of instruction may reflect some skepticism about the quality of the curriculum because it was authored by the district rather than a publisher, something many teachers commented on. Teachers' perspectives may have also been based on earlier versions of the curriculum. The math units have been revised each year in response to teacher feedback, and although our analyses show a high degree of alignment and continuity now, prior years' versions were likely less so. Teachers' skepticism may also stem from their perceptions of the support they receive. Teachers in our sample schools reported that they had limited instructional support from school leaders in mathematics. Only 19 percent of teachers agreed or strongly agreed that their principal provided them with useful feedback to improve their math instruction, compared to 60 percent of teachers in Almond Valley. Finally, Cypress Unified teachers' perceptions of limited alignment and continuity in math instruction may be due to the lack of reinforcing instructional systems related to mathematics present at Cypress Unified (such as the IPG, systematic walkthroughs, and professional learning communities in Almond Valley) that bring the main instructional ideas to the fore in multiple and reinforcing ways.

Summary

Even though our examination of alignment and continuity in mathematics instructional policy at Almond Valley Unified uncovered several disconnects (see Question 2), we found that the majority of teachers at Almond Valley perceived math curriculum, instruction, and learning materials to be well coordinated within and across grade levels. We hypothesize that the district's strong emphasis on the standards and clear-cut expectation that all teachers used the district's adopted curriculum underlay school leaders' and teachers' perceptions of alignment and continuity, even in the absence of a shared understanding of pedagogical practices to advance student learning in mathematics.

On the other hand, while our study uncovered higher levels of alignment and continuity in mathematics instruction at Cypress Unified, teachers at Cypress perceived a lack of alignment and continuity. We hypothesize that those perceptions may have been connected to teacher skepticism as to the quality of the district's math curriculum and the limited extent to which teachers felt their principals provided useful feedback to improve their math instruction. The lack of system-level and interlocking instructional supports, such as the IPG, the walkthroughs, and the PLCs in Almond Valley, may have also contributed to Cypress teachers' perceptions of disjointed math instruction at their schools.

Question 4: Continuing Challenges of Fostering Pre-K to Elementary Alignment and Continuity in California School Districts

Both Almond Valley Unified and Cypress Unified School Districts have made strides in fostering greater alignment and continuity between pre-K and elementary in mathematics. However, it is challenging work for multiple reasons, some of which districts control and some of which are outside their control. In this section, we discuss the continuing challenges that district and school leaders face in doing this work. We describe three sets of challenges identified by interviewees: those related to different beliefs about the goals and nature of instruction, those rooted in district organization and policy, and those that are a consequence of state policies.

Different Beliefs About Instruction for Young Children

Scholars have long pointed to different instructional priorities present in early childhood education and the K–12 system (File & Gullo, 2002; Goldstein, 1997; Stipek & Byler 1997). Early childhood educators have traditionally focused on the whole child, especially on social-emotional learning; many early childhood practitioners view academic instruction of any kind as developmentally inappropriate for young children. In contrast, subject-matter teaching is a core component of elementary education. Reflecting this difference, the California Preschool Learning Foundations includes social-emotional development (California Department of Education, 2008), but this dimension of development is absent in the Common Core State Standards that guide elementary school teachers (Common Core State Standards Initiative, 2018).

In addition to differences between the early childhood and elementary educators' views on whether academic subjects should be taught, there are differences in their views on the nature of appropriate instruction. Traditionally, many early childhood educators have advocated for play-based learning experiences—instruction that is provided spontaneously in the context of child-initiated activity. Most elementary teachers, in contrast, are trained to engage in teacher-initiated learning activities. The early childhood preference for child-initiated (or child-centered) instruction dates back to a debate in the 1960s on appropriate strategies for early childhood compensatory education (Stipek, 2013). Many early childhood educators fought against direct instruction (often referred to as *drill and kill*), which they believed would undermine young children's natural motivation to learn. The more recent increased focus on standards and accountability has reinvigorated this debate, with many early childhood educators expressing concerns about standards promoting what they consider to be developmentally inappropriate, teacher-directed instruction (Stipek, 2017).

Supporting the fears among early childhood educators, the rise of the accountability movement has pushed elementary classrooms even further towards a focus on academics and direct instruction. Studies show, for example, an increased focus on literacy and mathematics in kindergarten and decreased attention to untested domains such as music and art, which are core to many early childhood programs (Bassok, Latham, & Rorem, 2016). Initiatives that seek to bring together pre-K and elementary education must contend with these different histories, beliefs, and pressures related to instruction. The question is: How can districts create a bridge that connects these different visions of teaching and learning?

District-level staff, especially those in the early learning departments in both districts, reported that these different understandings of high-quality instruction for young children were alive and well in the different divisions in the district. For example, one administrator in Cypress Unified said, "We [early education administrators] talk a lot about developmentally appropriate practice, about child development, about the classroom environment, about social and emotional learning." This same administrator, who has a multiple credential and an early childhood permit and is knowledgeable of both worlds, described district staff in K–12 as being more focused on academics. "[In K–12] we're talking about assessments.... We're talking about early literacy skills." Similarly, an early childhood leader in Almond Valley Unified explained, "It's almost like there's two sets of folks. It's the skills that children need, or it's the social-emotional piece."

These different beliefs played out in tangible ways in work on mathematics instruction in both districts. In Almond Valley, for example, the different understandings manifested during walkthroughs that involved members of early learning and K–12 departments. Administrators in the different departments had different interpretations of the rigor and quality of instructional approaches in early education classrooms. In particular, there were differing opinions about the role of play in a kindergarten classroom. In Cypress Unified, these different beliefs were manifest in discussions about the instructional focus in TK classrooms. For example, one district leader explained, "In the past, TK was just another year of kindergarten. It was very structured. It was teacher-led. There wasn't as much play. I struggled with that because they're 4-year-olds, still, so they are of pre-K development." This district leader also reported that the more academic view of TK was built into the TK report card.

Siloed Departments

In large school districts, the early childhood and K–12 departments can be somewhat siloed. Early childhood and K–12 often have parallel enrollment divisions, professional development, transportation, food, and sometimes principal supervision. For example, in describing the challenges that Cypress Unified faced in connecting early education with

K–12, one administrator said, "The challenges [include]… the risk of [the early learning department] functioning as its own mini district. It runs its own student nutrition. It runs its own student assignment. It runs its own—I mean, I could go down the list." Early learning departments can also be physically separate from K–12. In Cypress Unified, the early learning department is located in a different area of the city. In Almond Valley, it is in a separate building next to the main office.

Siloing, however, is not restricted to early learning and K–12. Like many large school districts, both districts experienced separation between the curriculum and instruction department (responsible, in this case, for mathematics instruction) and the division that houses assistant superintendents who supervise school leaders. Like large school districts across the country, it has at times proven challenging to coordinate across these divisions. For example, an administrator who managed principals in Cypress Unified said, "Isolated work is still part of how we do business here." An administrator in Almond Valley described similar challenges: "I think what's difficult is that we have early learning, then we have our first-grade literacy, then we have our math coaches that span K–6. It's very separate."

These separations between departments at the central office were consequential for two reasons. First, the structural separation seemed to exacerbate differences in beliefs about high-quality instruction. Prior research suggests that fragmented organizational arrangements allow different district departments to perpetuate different understandings of instruction (Coburn & Talbert, 2016; Coburn, Toure, & Yamashita, 2009; Spillane, 1998). Indeed, several people in each district attributed the differences in beliefs about mathematics learning for young children to a lack of opportunity to learn with and from one another. Second, the structural separation can make it difficult for the district to coordinate instructional supports and instructional messages across the different district departments. For example, in Cypress Unified, staff of the mathematics department reported challenges in getting on the agenda to meet with school leaders to provide information or professional learning about the new mathematics curriculum and the pedagogical approaches they were working on with teachers. Those in charge of the agendas for those meetings (the division that supervised school leaders) had different priorities. In Almond Valley, leaders pointed to tensions about who has responsibility for teaching and learning in the early elementary grade classrooms. One district administrator described this state of affairs:

> We've got a system that's used to thinking and speaking and supervising, challenging and developing from K to 12, or maybe TK to 12. And another group that's preschool to 3. How do we figure that out, positionally, structurally, in a way that really blends and accentuates each other's work, and doesn't feel like people are stepping on other people's toes?

Policy and Funding Differences

Preschool and TK–12 education are funded and managed separately in California (Jacobson, 2009). They are governed by separate state and federal policies related to funding, teacher credentialing, health and safety regulations, and professional learning, among others. The amount of funding for TK–12 and pre-K is substantially different in California. California state funding formulae supporting schools are based on Average Daily Attendance of students in TK–12 only, even when the schools themselves have pre-K children on site and pre-K is under district management. Per pupil funding for preschool, whether state preschool or federally funded Head Start programs, is substantially less than the Average Daily Attendance funding in elementary school. A recent state policy, the Local Control Funding Formula, reconfigured funding for public schools to enable greater flexibility in use of funds. Although districts can use state funds under the Local Control Funding Formula to support preschool, pre-K is not included in the formula, so remains a separate stream of funding with separate regulations and accountabilities. Federal Title 1 funds can also be used for preschool, but they constitute a relatively small portion of districts' budgets.

There are also very different requirements for credentialing of elementary teachers and pre-K teachers in California. Teachers in TK and up are required to have a bachelor's degree and a multiple subject teaching credential while pre-K teachers in California are only required to hold an early childhood education permit. In addition, funding streams that support either professional learning or targeted initiatives—from federal, state, and private grant-making institutions—tend to be focused on early education *or* K–12. While there is some funding targeted towards bridging the gap between early childhood education and K–12, these initiatives are the exception rather than the rule.

The differences in funding and policy for preschool and K–12 create challenges in fostering pre-K to elementary alignment and continuity. First, these policy differences make it challenging to have joint or even similar professional learning for teachers across pre-K and elementary. In both districts, professional learning was largely (although not entirely) funded by targeted dollars from the state and private foundations. Most of the funding was for either pre-K or elementary students and, in both districts, there was greater funding for professional learning for preschool educators than for elementary, proportional to the number of teachers. District staff in the mathematics department and early learning, while seeking to build greater connections in teacher learning opportunities, had to design professional learning within these considerable constraints, resulting in quite different professional learning opportunities for preschool and elementary teachers.

Second, even if districts had funding for joint professional development for pre-K and elementary teachers, preschool and elementary teachers had very different work

schedules, in part because of state requirements for hours of operation of early childhood classrooms that are eligible for state funds. Given that early childhood programs in both districts were operated year-round and at different hours during the school year, it was challenging for district leaders to bring pre-K teachers together with elementary teachers for planning and learning opportunities, even when they were at the same school site.

Third, there were different state regulations about health, safety, transportation, and food between pre-K and TK–12. These parallel regulations encouraged the development of parallel district systems within districts. As an early learning administrator in one district explained,

> The systems—like enrollment, staffing, licensing, nutrition—all these things are connected to [state early childhood funding program] and they've kind of been operating in a vacuum [from the rest of the district] for all kinds of different reasons.

Fourth, there were contrasting accountability paradigms for pre-K and TK–12. Elementary and secondary educations are subject to accountability pressures associated with achievement on the Smarter Balanced Assessment (SBAC). Even though students do not take SBAC until the third grade, school leaders and teachers in kindergarten and up were held accountable for performance on district interim assessments in English Language Arts (ELA) and mathematics that are intended to predict performance on the SBAC. By contrast, pre-K is not directly affected by pressure for test scores on SBAC. To maintain their program license, they must collect data on individual student progress on the DRDP, but these data remain at the program level and do not figure into accountability.

Incentives for improvement were also largely absent in preschool. Both districts were beginning to participate in Quality Counts, which is the California version of the Quality Rating and Improvement System (QRIS). QRIS is a framework for rating the quality of early childhood programs that aims to provide information to educators, administrators, parents, and community members about the quality of early childhood education providers. Unlike most states, California does not offer incentives for attaining high QRIS scores in the form of higher reimbursement rates, and participation in Quality Counts was voluntary for pre-K teachers in Almond Valley. In Cypress Unified, the early learning department piloted an assessment called the Kindergarten Observation Form, administered in the beginning of the year in kindergarten but backed away on requiring participation when they got pushback from teachers and others in the district. Given the lack of incentives and the voluntary nature of the program, QRIS did not create high stakes in either district.

Only in Cypress Unified did we see the beginnings of some accountability pressure related to student academic learning in preschool. They administered their own district-

created kindergarten readiness assessment at the end of preschool, which the district used to assess the quality of their pre-K program. This metric was part of the superintendent's performance review, which raised the stakes for the early learning department if not for pre-K teachers.

According to district administrators, all of these differences between state policies for pre-K compared to elementary served to reinforce the separation and silos in the central office. They also created tremendous learning demands for school leaders charged with supervising and leading pre-K on their sites. School leaders needed to learn state rules and regulations and, at times, different processes related to program licensing and credentialing, health and safety, and special education, among other things. This presented a steep learning curve for many school leaders in the district, especially since few came from early childhood backgrounds. In fact, district leaders in one district report that this state of affairs was a significant disincentive for school leaders to take on schools with pre-K classes on site. One district leader explained to us in a follow-up email:

> Principals have concerns as a result of technical, licensing, and systems and operations requirements that are different than elementary education principals. Pre-K to 5 principals need to master the complexities of the compliance and licensing requirements to avoid penalties such as citations and comply with [California Department of Education] regulations.

Lower Priority on Mathematics Instruction in Early Grades

While many of the challenges mentioned above applied to all subject matter areas, creating continuity and alignment in mathematics was particularly challenging. During the year of our study, mathematics was not always a high priority for district leaders. Historically, early childhood education has been more focused on early literacy than other subject areas, and most teachers in the early elementary grades spend more time on literacy than on math. When endeavoring to foster pre-K to 3 alignment and continuity, many districts, including the two in our study, start with literacy. In both districts, K–12 leadership was also focused predominantly on literacy during the year of our study. In the case of Almond Valley, this was because they had recently adopted a new ELA curriculum and thus decided to devote professional development and other resources towards implementing that curriculum.[12] It is less clear why so many K–12 efforts in Cypress Unified were focused on literacy. We heard varying reasons, including the perception that implementation of the new ELA curriculum was more problematic than that of the new mathematics one, that literacy was a particular area of expertise of district leaders leading the work, and the fact that much of the district reform work was based on school leader choice and school leaders were choosing literacy more often than mathematics.

[12] Since we collected data for this report, the district has adopted a district-wide focus on mathematics.

The emphasis on literacy had an impact on efforts to foster pre-K to elementary alignment and continuity in mathematics in both districts. In Cypress Unified, for example, there were strong efforts to develop assessments and data systems that bridged early education and elementary. The assessments were in literacy but not mathematics. In Almond Valley, lead teacher meetings in pre-K and TK were predominantly focused on ELA. Similarly, district leaders reported that at the end of the year they analyzed data from the instructional walkthroughs and found that they were three times more likely to be in literacy than mathematics. Thus, targeted efforts to focus on teacher learning in mathematics instruction in both districts, some funded by time-limited resources, were disconnected from other district structures and support that focused on either ELA or content-neutral instructional strategies.

Summary

The two districts we studied faced many challenges to their efforts to create greater alignment and continuity between preschool and the elementary grades. Some of these challenges concerned deeply rooted beliefs about the purpose of early childhood education and the nature of effective instruction. These differences in beliefs were not unique to these two districts but made it challenging to create shared understandings of effective education for young children across departments. These differences in beliefs were likely exacerbated by structural separations and siloed departments. Silos also created challenges for coordinating priorities and messages to schools. Different state policy for preschool and K-12 did not help matters, creating different funding streams, regulations, and accountabilities that those responsible for both pre-K and elementary had to navigate. Finally, a focus on mathematics was especially challenging, given the propensity of both early education and elementary to focus instructional improvement efforts on literacy.

Implications

Taken together, our study highlights the challenges involved with achieving alignment and continuity across district instructional policy. Both districts were committed to fostering alignment and continuity in their instructional policy from pre-K to elementary and beyond. Both districts have taken bold actions and made considerable gains. Their achievements are remarkable given all the ways in which they were swimming against the tide. They were working against a long history of separation between pre-K and K–12, which is reflected in different beliefs about what constitutes high-quality and developmentally appropriate instruction and also in very different organizational structures. In some respects, these two districts were well positioned to create stronger links between pre-K and elementary because the preschools were co-located with elementary

schools and administratively overseen by the elementary principal. But even under these auspicious circumstances, they had to navigate a state policy system and funding sources that imposed different regulations and accountability systems, fostered different priorities, and in many ways necessitated structural separation in the districts. Efforts to create greater continuity were also challenged by the sheer organizational complexity of central offices in large urban districts, where supports for instruction are stretched across multiple divisions and multiple levels of the system.

In spite of these challenges, Almond Valley was able to create a systemic, interlocking system of instructional supports that brought multiple divisions and multiple levels of the system into the joint project of supporting instruction for pre-K to elementary in similar ways. They were able to provide tools and supports for instructional leaders as they sought to create more seamless instructional pathways at their school sites. Cypress Unified was able to create curriculum units that promoted common pedagogical strategies in mathematics for pre-K through Grade 12, which fostered curriculum continuity across the early grades. Cypress Unified was also able to create a strong pre-K to elementary alignment with professional development for teachers and a moderate alignment with assessments across grades. In addition, they created a data system with the capacity to track students' progress as they moved across the grades. Despite the success of these efforts, both districts have more work to do to create an instructional policy system fully supportive of continuity and alignment across pre-K and elementary in mathematics.

Our study also suggests that the strategic choices made by district leaders as they navigated these challenges made a difference in tangible ways for teachers and school leaders. Almond Valley's investment in systems of instructional support and instructional leadership created a strong perception of alignment and continuity, a sense of shared language and approaches, school leaders who felt prepared to support instruction in preschool and the early elementary grades, and teachers who felt supported by their school leaders. At the same time, their efforts did not foster a shared sense of pedagogical approaches to use with the curriculum. Further, given gaps in continuity across the curriculum in pre-K, TK, and elementary, the focus on using the curriculum may have worked against fostering greater continuity in mathematics instruction across grades. Cypress Unified's decision to construct its own curriculum pre-K to Grade 12, a laser-like focus on creating common pedagogical approaches across grades throughout the curriculum and professional development, and its efforts to link the assessments to these pedagogical approaches appeared to have fostered a shared set of pedagogical practices that teachers were working on. The problem at Cypress Unified was the lack of broader systems of instructional support and limited attention to mathematics in general and instructional issues in pre-K in particular in their work with school leaders. Although school leaders were given opportunities to develop greater knowledge of early childhood education, few took advantage of the opportunities provided. This left principals feeling unprepared to support

instruction in the early grades. It also left teachers feeling a sense of disorganization in instructional policy within and across grades as well as a lack of support from the principal.

These findings have a number of implications for district leaders, policymakers, and funders interested in promoting pre-K to elementary continuity and alignment in mathematics.

Implications for District Leaders

Given the history of separation between early education and K–12 and the complexity of district organizational structures, district leaders interested in promoting pre-K through elementary alignment and continuity must continually find ways to **bridge the silos and create opportunities for district leaders in different departments to work and learn together**. The opportunities should focus on how to better support instructional improvement in schools across pre-K and elementary. These opportunities likely should involve leaders from curriculum and instruction, early learning, and school leader supervision. They should also exist at multiple levels of the district central office, from the top district leaders to frontline professional development providers who are providing services to different grade levels in the same schools. We have examples of these kinds of collaborations from both of the districts in our study. In Cypress Unified, the mathematics department and early learning department became connected through their joint work creating the mathematics curriculum and through cross-division conversations designed to ensure a similar focus in teacher professional development in mathematics. In Almond Valley, regular walkthroughs involving members of different central departments fostered shared goals for instruction and created opportunities for conversation about school leaders' different understandings of rigorous instruction in the early grades.

Second, district leaders should **make an explicit effort to include mathematics instruction in initiatives designed to promote pre-K to elementary alignment and continuity**. The experience of these two districts and others have shown that efforts to promote alignment and continuity that target literacy do not always get to mathematics. Further, content-neutral approaches, found in the walkthrough structures in both districts and the critical friends groups in Cypress Unified, tend to default to literacy in early education and elementary. Given research that suggests that pre-K and elementary teachers are typically more comfortable and confident in literacy compared to mathematics (Burns, 2015), it may be extra important to focus continuity and alignment efforts in mathematics.

Third, district leaders should **provide ongoing learning opportunities to school leaders who explicitly focus on early learning and instruction**. Given the complexity of the state policy structures related to pre-K, elementary principals who oversee pre-K classrooms face a steep learning curve to master the parallel set of regulations, reporting,

and funding structures related to early childhood classrooms on their campuses. Because so few school leaders come to the job with teaching experience or courses in early childhood, they also need to learn about high-quality instruction in early childhood classrooms and supporting teachers in implementing effective instruction. Perhaps because the administrative challenges of supervising pre-K are so substantial and immediate, school leaders feel more pressure to gain support in the operational issues. There is a risk, however, of never getting to the instructional issues. Indeed, in Cypress Unified, where professional learning opportunities for school leaders were driven by choice, school leaders most often requested a focus on operational issues. This focus left them feeling unprepared to support these classrooms instructionally. Almond Valley's intentional and focused effort on instructional issues related to early childhood education enabled school leaders to feel more prepared to observe pre-K and TK classrooms, evaluate teachers, and include those classrooms in their school-wide instructional improvement efforts.

Finally, we did not observe a district that combined a strong emphasis on systems of instructional support, focused efforts on mathematics curriculum and pedagogy, and aligned approaches to instructional leadership. But between the two districts, we observed the benefits of each of these strategies, and the problems encountered when one of them was missing. While there may be other policy levers or strategies that could foster pre-K to elementary alignment and continuity, it seems likely that **a focus on mathematics curriculum and pedagogy alongside aligned approaches to instructional leadership and a system of instructional supports** might create fertile conditions for fostering a more seamless educational pathway for students across the grades.

Implications for State Policymakers

State policymakers should work towards **streamlining and better aligning state funding and policy for early childhood education**. There are considerable structural differences in the management, funding, and policies that apply to preschool versus TK–12. Funding for preschool comes from federal sources (e.g., Head Start, Title 1 used for preschool) and from the state in the form of state preschool or Local Control Funding Formula funds that go to the district. These different sources of funding have different licensing requirements and oversight, teacher training requirements, funding levels, and accountability systems. Some districts and schools find ways to deal with these complexities, but workarounds take considerable time and ingenuity. Creating a seamless educational experience for children as they move from preschool into the early elementary grades would require some streamlining of support for early childhood education at the state level.

While outside the scope of our research, another major challenge to creating pre-K to elementary continuity in California is the substantial difference in teacher

preparation and status (Valentino, R., & Stipek, D., 2016). Pre-K and elementary school teachers are prepared in entirely separate programs, and often in separate institutions. Most pre-K teachers receive their preparation in community colleges, and those who are trained in California state universities typically take their courses in a different department from students learning to be elementary school teachers. A preschool teaching permit also requires substantially less training (24 units) and no supervised practice teaching. Professional development is limited in how much it can address these differences in elementary and preschool teacher preparation. Substantial improvement in the coherence of instructional practices may require **greater alignment in teacher education**.

Implications for Funders

Funders interested in promoting stronger connections for pre-K to elementary should **encourage participation of key stakeholders from multiple divisions involved in instructional improvement in a district**. Many funders who seek to promote pre-K to elementary alignment and continuity interact primarily with the early learning division. Yet this division is one of many whose work is crucial to creating stronger pathways between pre-K and elementary, and in some districts it has limited clout for promoting change at the elementary level. Most crucially, it is important to involve those who supervise school leaders. In both districts, district leaders in the department that supervised school leaders set the agenda for their professional learning. They acted as gatekeepers for those from curriculum and instruction and early learning to work with school leaders on issues of alignment and continuity. Their priorities for the schools tended to predominate over other priorities in the district, whether it was a focus on literacy or attention to elementary grades rather than pre-K or TK. In brief, they are crucial players in efforts to build the conditions for alignment and continuity in schools, yet often they do not play a central role in foundation-funded initiatives intended to support that work.

Second, funders should **attend to the ways in which their funding agenda interfaces with broader district efforts to improve instruction**. The districts' efforts to improve pre-K to elementary alignment and continuity necessarily exist within larger efforts to foster instructional improvement. Pre-K to elementary continuity efforts typically exist alongside other initiatives, some of which are funded by other programs and foundations. Without attention to other initiatives, pre-K to elementary initiatives can, in fact, create complexity that district leaders find difficult to navigate. Targeting funding to one level of schooling (early education or K–12) but not the others may create challenges for building a shared focus or practices across levels of schooling. Stipulations from funders may create constraints for district leaders who are trying to interface with other departments and initiatives. For example, unequal funding and stipulations that came along with foundation-funded initiatives made it challenging for the districts to create common systems of teacher professional learning across pre-K and elementary.

Appendix A: District Profiles

Table A1. District Profiles

	Almond Valley Unified	Cypress Unified
Total enrollment	**74,155**	**55,613**
Enrollment by ethnicity	68% Latinx; 11% Asian American; 10% White; 9% African American	35% Asian American; 27% Latinx; 14% White; 7% African American
% FRL	90%	55%
% ELL	21%	24%
Pre-K enrollment	3,200	2,225
Elementary schools w/ pre-K classrooms	46	26
Elementary schools w/ TK classrooms	66	16
% Met or exceeded standards on math SBAC	22%	50%

Appendix B: Methods

The findings presented in this report are based on data collected during the 2016–2017 school year as part of a larger, multi-year study of alignment and continuity in pre-K to elementary mathematics instruction at the Almond Valley Unified and Cypress Unified school districts. We employed a mixed-methods approach, which included (a) interviews with district leadership and staff; (b) interviews with school leaders at the six participant schools (Carlson, Edinburg, and Oakhurst at Almond Valley; Davis, Green Valley, and Paul Robeson at Cypress); (c) a pre-K to Grade 2 teacher survey at the six participant schools; and (d) observations of district meetings and professional development. We also collected and analyzed key district policy documents. Tables B1 and B2 summarize the data collected at each district and participant school during the 2016–2017 school year.

Table B1. District-Level Data Collection During the 2016–2017 School Year

	# of Interviews with School Leaders (*)	# of Observations	# of Artifacts
Almond Valley	26	9	140
Cypress	34	43	146

(*) Interviews with district leaders and staff took place across the year. Most participants were interviewed once. A few key district staff were interviewed twice.

Table B2. School-Level Data Collection During the 2016–2017 School Year

	# of Interviews with School Leaders (*)	# of Interviews with Pre-K to 2 Teachers (**)	# of Participants in Pre-K to 2 Teacher Survey (***)
Almond Valley			
Carlson	6	17	17
Edinburg	6	9	9
Oakhurst	4	14	14
Total	**16**	**40**	**40**
Cypress			
Davis	4	9	9
Green Valley	4	10	10
Paul Robeson	7	10	10
Total	**15**	**29**	**29**

(*) Each school leader was interviewed at least one time; most school leaders were interviewed twice, once in the fall and once in the spring.
(**) Each teacher was interviewed once, in the fall.
(***) The teacher survey took place in the winter.

As shown in Table B1, at the district level we did 60 interviews with 56 district staff. We took care to interview district staff from the early learning department, curriculum and instruction (including mathematics), the research office, and the division that supervised schools in each district. The district-level interviews elicited participant views about their efforts to foster instructional improvement, pre-K to elementary alignment and continuity, visions of high-quality mathematics instruction, and the nature of their work with schools and teachers to support mathematics instruction. All interviews were transcribed and uploaded in NVIVO qualitative data analysis system. We also did nine observations of district meetings and professional development in Almond Valley and 43 in Cypress Unified.[13] Most of the observations were of professional development for teachers and school leaders. We took ethnographic field notes during observations, uploading completed field notes into the NVIVO system. Finally, we collected 286 district documents (e.g., policy documents, professional development agendas and materials, scope and sequence documents, walkthrough tools, etc.) across both districts.

As shown in Table B2, at the school level, we conducted 31 interviews with 19 school leaders (principals, assistant principals, and school-based coaches). We interviewed most school leaders twice, once in the fall and once in the spring. The fall interview protocol asked school leaders how they interfaced around mathematics with preschool, TK, and K–2. The protocol also elicited their views about mathematics instruction at their schools and math pedagogical strategies that they wanted their teachers to be using. The spring protocol inquired about school leaders' interactions with the early learning department, the mathematics department, and their district supervisors.

We also interviewed pre-K through Grade 2 teachers in all six schools in the fall (N=69) and administered a survey in the winter (*N*=69). The teacher interview protocol elicited teachers' views about the cornerstones of their mathematics instruction, messages they received from administrators about the teaching of mathematics, and the extent to which they felt supported to teach math. The teacher survey, administered in winter, included: questions about teachers' training and experience; characteristics of their students; opportunities to collaborate around math with other teachers; participation in professional development; and the extent to which they saw coordination among curriculum, instruction, and learning materials.

Data analysis

Table B3 reports the data sources we used to address each of our research questions.

[13] This difference in the number of observations mainly reflects differences in the degree to which the districts had events related to mathematics. It also likely reflects our greater proximity to Cypress Unified, which enabled us to attend more events as well.

Table B3. Data Sources

Research Question	District-Level Interviews	School-Level Interviews	Teacher Survey	Observations	District Policy Documents
RQ1	X	—	—	X	X
RQ2	—	—	—	X	X
RQ3	—	X	X	—	—
RQ4	X	—	—	—	—

Research question 1: What strategies are the two districts using to foster pre-K to elementary alignment and continuity in mathematics teaching and learning? Because efforts to foster greater connections between preschool and elementary exist within larger initiatives to improve instruction district wide, we took a broad approach to answering this question. We analyzed interviews with district staff for information about the approaches the district has taken to foster instructional improvement, to improve mathematics, to create better connections between preschool and elementary, and to support learning for teachers and school leaders. Using this approach, we identified key strategies in each district. We then supplemented this analysis with information from our observations of district meetings and professional development and by reviewing key district policy documents. Finally, we checked our understanding of the main district strategies by sharing our analysis with key respondents at each district.

Research question 2: To what degree have the districts achieved alignment and continuity in their pre-K and elementary policy in mathematics? To analyze the degree of alignment and continuity in district instructional policy across pre-K and elementary, we began by analyzing each district's mathematics curriculum for the degree to which it promoted continuity across grades. We then investigated the degree to which other elements of district instructional policy (assessment, professional development for teachers, professional development for school leaders, other systems for instructional improvement) were aligned with the curricula.

Analyzing continuity of the curriculum. We worked with Almond Valley Unified and Cypress Unified to identify their primary mathematics curriculum for pre-K, TK, kindergarten, Grade 1, and Grade 2. We then chose to focus on curriculum units and activities that dealt with number and number sense because these areas of mathematics have a predictive relationship between students' early number competence and math achievement through Grade 3 (Jordan, Kaplan, Ramineni, & Locuniak, 2009).

For the 2016–2017 school year, Almond Valley used three different curricula for pre-K, TK, and elementary. For pre-K, the district used a district-designed plan for all academic instruction including language and literacy, numbers and math, social-emotional skills, and visual art. The numbers and math section of the curriculum was based largely on the standards-aligned curriculum *Handwriting Without Tears, Get Set for School*. For TK, the district drew on activities from their TK Visual Arts curriculum (TKVA). For kindergarten through Grade 8, the district used Houghton Mifflin Harcourt's *Go Math!* as its primary resource for mathematics instruction. The pre-K curriculum had 67 activities related to number and operations. The TK curriculum was not organized in units, but in weeks. We considered each week as an activity. TKVA had 27 weeks of content on numbers and number sense. The kindergarten curriculum had eight units related to number and operations, Grade 1 also had eight units, and Grade 2 had six units that addressed numbers and number operations. See Table B4 for information on the number of units and activities we analyzed.

In 2016–2017, Cypress Unified was in its third year implementing its core curriculum that had been written by teachers and district staff. The district's curriculum and instruction department managed the development, pilot, and revision of its core curriculum, which they sought to align to the California Preschool Learning Foundations and CCSS-M. The organization of this curriculum was similar to most mathematics curricula—arranged in units aligned to mathematical topics in the Common Core Standards. The pre-K curriculum had three units related to number and operations, kindergarten had eight units, and Grade 1 and Grade 2 each had six units. At the time of our study, the district had not yet completed TK units, so we do not include these in our analysis. See Table B4 for information about the number of units we analyzed at different grade levels.

After identifying units to be examined, we determined which parts of the units would be the focus of our analysis. We determined that the focus of our analysis would be activity types that appeared consistently across grades, which would allow us to look for patterns among the activities. The types of activities that we analyzed varied within each district's curriculum and across grades. For example, in Cypress Unified's curriculum, every daily lesson involved four types of activities: launch, explore, summarize, and math talks. In Almond Valley, every daily lesson contained five distinct activities: engage, explore, explain, elaborate, and evaluate. We refer to each of these as an *activity*. In Almond Valley, the pre-K curriculum contained a total of 67 activities, TK curriculum contained 27 activities, kindergarten contained 513 activities, Grade 1 had 478, and Grade 2 had 443 activities. Cypress Unified's pre-K curriculum contained 38 activities, kindergarten had 509, Grade 1 had 408, and Grade 2 had 371 (see Table B4). Each activity was coded for the content addressed by an activity and the level of cognitive demand.

Table B4. Number and Operations Units and Activities

Grade Level	# of Units		# of Activities	
	Almond Valley	Cypress	Almond Valley	Cypress
Pre-K	NA	3	67	38
TK	NA	NA	27	NA
Kindergarten	8	8	513	509
First grade	8	6	478	408
Second grade	6	6	443	371
Total	**22**	**23**	**1501**	**1326**

Our content codes were derived from the California's Common Core State Standards in Mathematics (CCSS-M) and Preschool Learning Foundations (2015–2016). The set of codes were related to Counting and Cardinality, Number and Operations in Base Ten, Operations and Algebraic Thinking, Measurement and Data, and Geometry. Any given activity could contain multiple content topics and would therefore receive multiple content codes. When an activity addressed content that was not captured by our content codes, we identified that as not applicable (NA). For example, we did not have content codes that addressed the measurement of time. It is common in early childhood settings for there to be lessons related to teaching children how to tell time. If this subject, or another like it that was not captured in our codes, appeared in our items, it received the code NA.

Within our content codes, there were relationships among codes that reflected a progression of subject matter as it related to increasing numbers. For example, verbal counting numbers 1 to 10 was one code and verbal counting numbers 11 to 20 was a second categorization. There were certain topics that allowed for this categorization, which made it possible for us to look at the structure and organization of the curriculum. These topics included learning to count verbally, to count, to write and recognize numbers, to compose and decompose numbers, to add and subtract, and to add and subtract three whole numbers.

We developed codes for cognitive demand by adapting Webb's Depth of Knowledge Levels (DoK) (Webb, Alt, Ely, & Vesperman, 2005). Webb identifies four levels of cognitive demand: (1) recall or reproduction, (2) application of concepts, (3) strategic thinking, and (4) extended thinking. We adapted Webb's four levels of cognitive demand based on Mary Kay Stein and Margaret Smith's framework for understanding cognitive demand of instructional

tasks in mathematics (Smith & Stein, 1988). Each activity received one cognitive demand code.[14] See Table B5 for cognitive demand codes.

Table B5. Cognitive Demand Codes

Level	Definition
Level 1: Recall/Reproduction	Task requires recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. The task is a one-step, well-defined procedure. The task has students demonstrate a rote response, perform a well-known task, or follow a set procedure.
Level 2: Application of Concepts	Task requires noticing or describing non-trivial patterns; explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data. The task has students make some decisions as to how to approach the problem or activity. Actions may take more than one step.
Level 3: Strategic Thinking	Task requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, a task that has more than one possible answer, requires students to explain their thinking or make conjectures is at level 3. Generally, the cognitive demands are complex and abstract because the task requires more demanding reasoning.
Level 4: Extended thinking	Task requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time. The cognitive demands of the task should be high and the work should be very complex. For example, students should be required to make several connections, relate ideas within the content area or among content areas, and have to select one approach among many alternatives on how the situation should be solved.

Multiple coders with an inter-rater reliability of .89 applied codes to the curricula. After codes were applied to all possible items, we compiled counts of the content addressed and the cognitive demand for each activity. We examined patterns of the content covered and the distribution of cognitive demand across different types of activities within and across grades.

Analyzing alignment of other aspects of instructional policy with the curriculum. We used several different approaches to analyze the alignment between each district's curriculum and other elements of the district's instructional policy.

Alignment with interim assessments. To analyze the alignment between the curriculum and each district's interim assessments, we coded the aspects of the assessments related to number and number sense for content and cognitive demand using the same codes that we used for the curricula. Based on the thinking that one would not expect interim assessments to include all the content covered in a curriculum, we

[14] When not enough information was available to decipher what the task demanded of students' thinking processes or engagement, we indicated that there was not enough information by coding it "NEI".

identified those topics in the curriculum that were most salient in each grade level, which was, in this case, the content that appeared in more than 25 activities. To assess alignment in content, we then calculated how many of these topics (as coded using content codes) at a given grade level appeared on the interim assessment for that grade level. To assess the alignment of cognitive demand, we investigated the relationship between cognitive demand of all the activities in the units in a grade level related to number and number sense and the cognitive demand of all the items related to number and number sense in the interim assessment.

Alignment with professional development. To assess alignment between the curriculum and both teacher and school leader professional development facilitated by district staff, we analyzed field notes of observations we did of professional development. We supplemented that analysis with a review of agendas and descriptions of professional development in interviews. We identified the degree to which the professional development did the following: (a) emphasized consistent messages about the nature of high-quality mathematics instruction; (b) focused on using the curriculum and, if so, whether it was procedural (e.g., how to use the curriculum) or substantive (e.g., investigating the nature of the mathematics or pedagogical approaches); and (c) drew on activities in the curriculum in the professional development itself. After reviewing all the data, we used the rubric in Table B6 to determine the level of alignment.

Table B6. Levels of Alignment for Teacher and School Leader Professional Development

Level	Definition
Tightly aligned	Consistent and explicit messages about instructional strategies, math content, math knowledge needed for teaching, AND curriculum use (procedural)
Moderately aligned	Mostly consistent messages about instructional strategies, OR content, OR curriculum use (procedural)
Somewhat aligned	Emphasis is mostly on curriculum use (procedural) or indirect messages about general instructional strategies absent specific references to content (i.e., instructional leadership advice about how to give feedback to teachers)

Alignment with other systems of instructional support. To assess the level of alignment between the districts' other systems of instructional support (e.g., tools to foster alignment, walkthroughs, professional learning communities) and the curricula, we drew on interview data, observations, and district documents. We investigated the ways in which these different systems of support were linked with one another, and the nature of the messages that they promoted about high-quality instruction in mathematics. We paid particular attention to the ways in which these systems were enacted in different divisions in the district and different levels of the system.

Research question 3: How have school leaders and teachers experienced districts' strategies? To address this research question, we analyzed interviews with school leaders and teachers as well as teacher survey responses. We combined these different data sources in the same analyses to assess similarities and differences across reported experiences of school leaders and teachers. We organized data analysis along the following main themes: cornerstones of math instruction, math professional development, principal support of math instruction, teacher collaboration around math instruction, and coordination of math instruction within and across grade levels. We also coded and summarized school leaders' views about their role and responsibilities in relation to pre-K and TK, the extent to which they felt well prepared to supervise pre-K and TK, and the supports available to them in relation to pre-K and TK.

Research question 4: What continuing challenges do district leaders face in their efforts to foster alignment and continuity in mathematics? To address this research question, we analyzed interviews with district leaders. We paid particular attention to a series of questions that we asked regarding what the district had gotten right in its efforts to foster pre-K to elementary alignment and continuity, and what challenges remained. We coded interviews for those factors that enabled their efforts and those that constrained their efforts. To address this research question, we focused on the challenges they identified at the district level. We supplemented interview data with reviews of relevant California state policy for preschool and elementary education. We reported findings across both districts because they were substantially similar. We noted occasions where the finding applied to one district, but not the other.

Lead Author Biography

Cynthia E. Coburn is a professor at the School of Education and Social Policy, Northwestern University. Coburn studies the relationship between instructional policy and teachers' classroom practices in urban schools. To date, Coburn has investigated this issue in a series of studies that tackle critical issues facing public schools: the relationship between reading policy and teachers' classroom practice, the scale-up of innovative mathematics curricula, data use at the district level, and the relationship between research and practice for school improvement. In 2011, Coburn was awarded the Early Career Award from the American Educational Research Association in recognition of her contributions to the field of educational research in the first decade of her career. Coburn has a BA in philosophy from Oberlin College, and a MA in Sociology and a PhD in Education from Stanford University.

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