



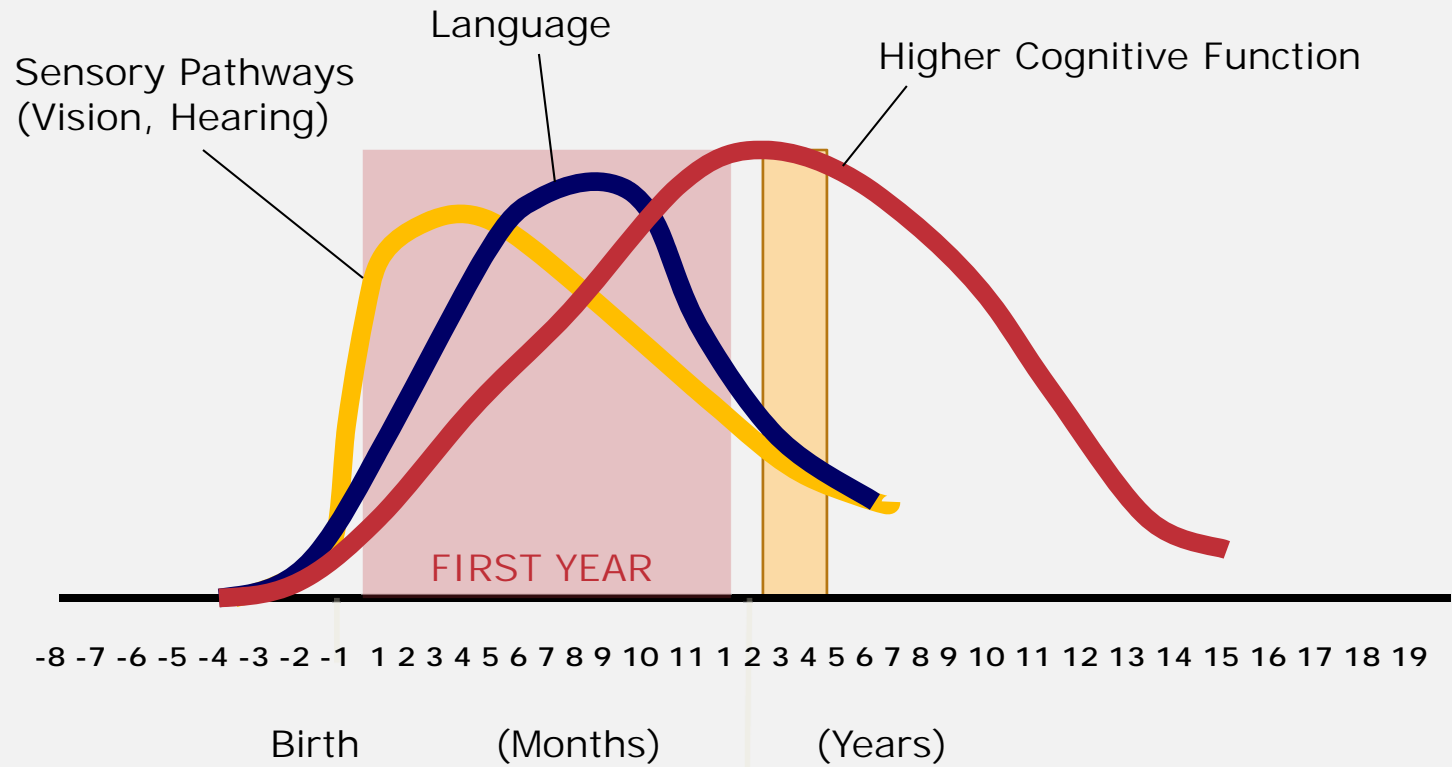
Development and Research on Early Math Education

DREME.STANFORD.EDU

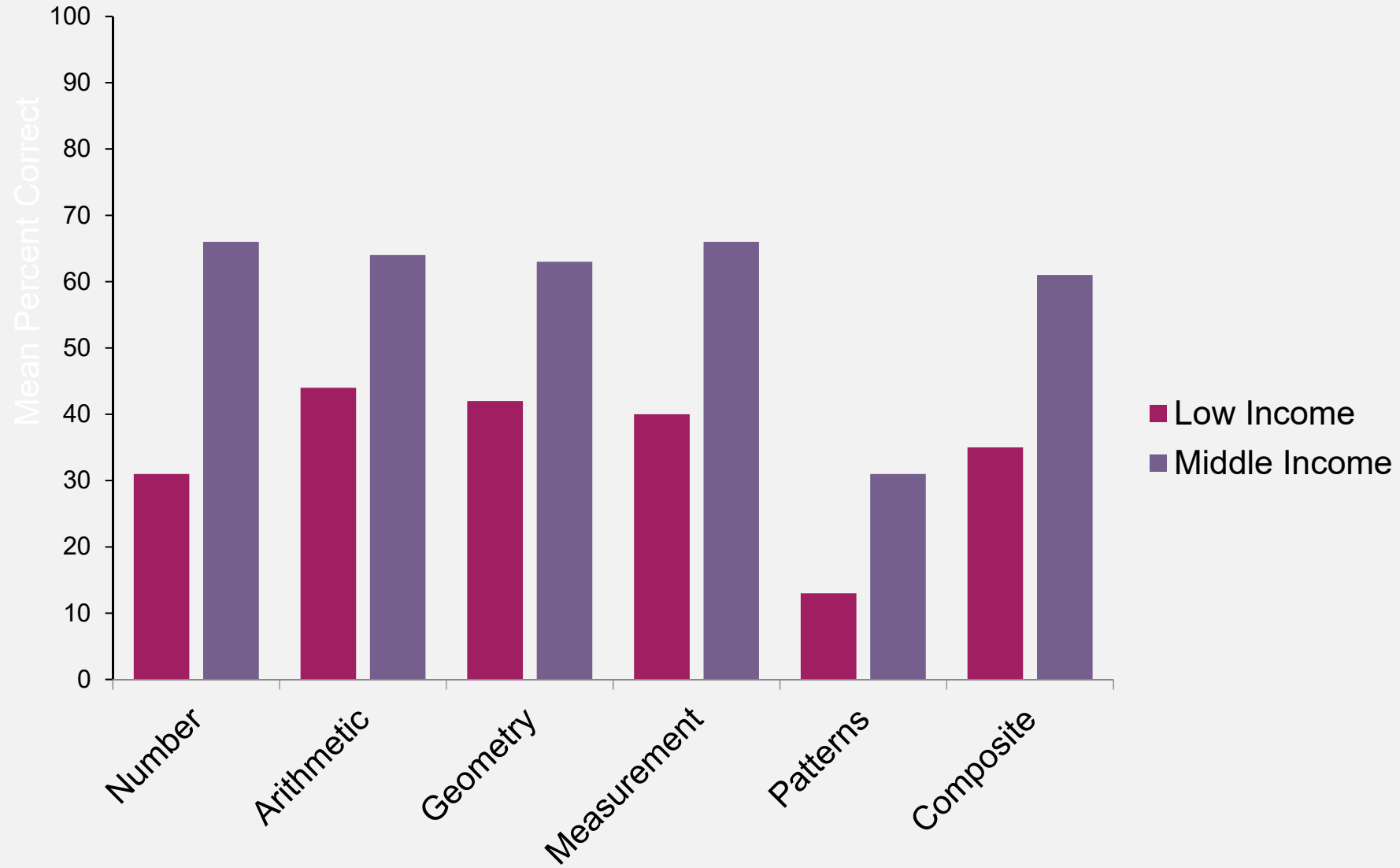
Teacher educator resources:

<http://prek-math-te.stanford.edu>

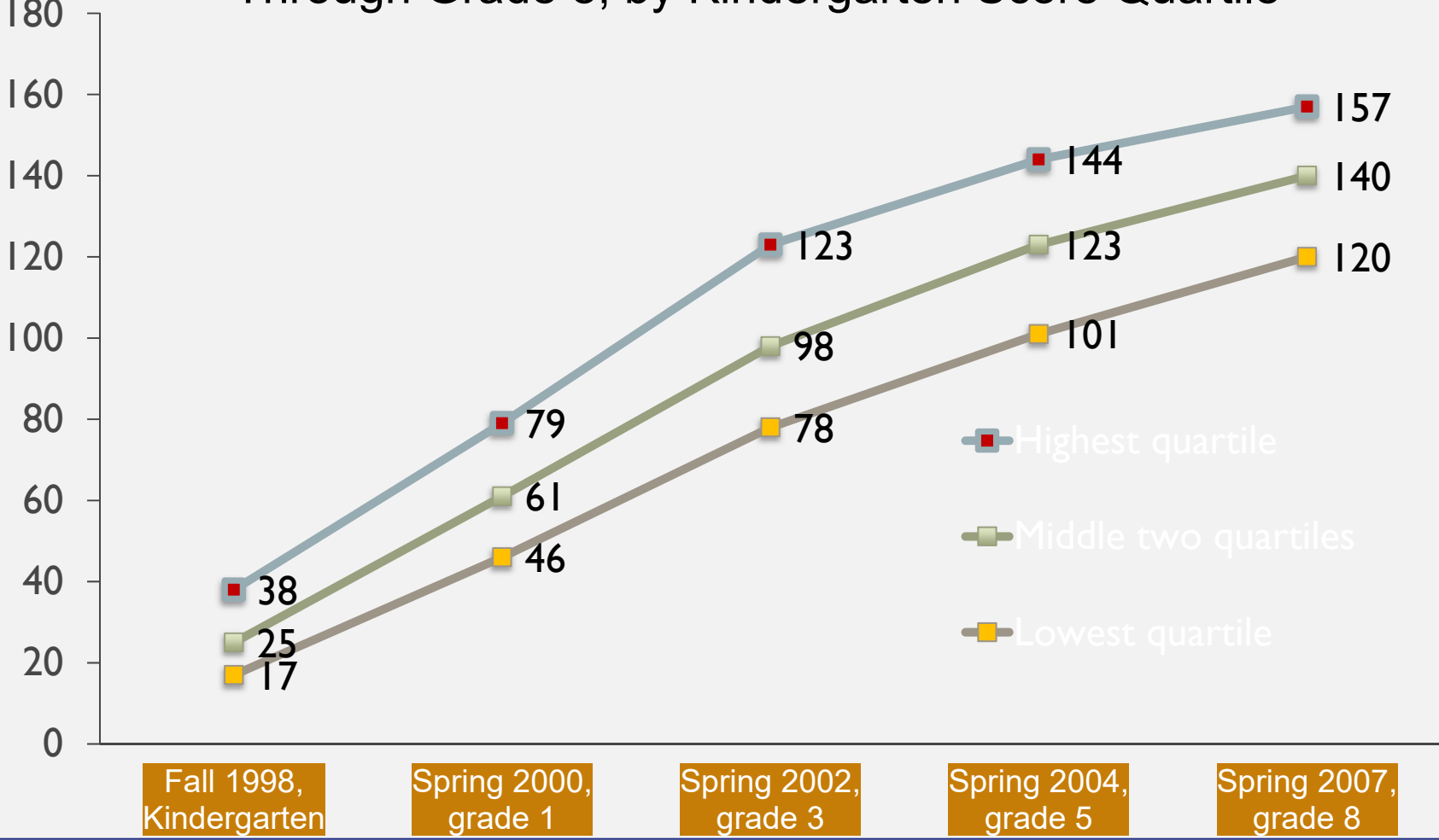
BRAIN DEVELOPMENT



Math Knowledge in American 4-yr-olds



Math Achievement Scores of Kindergartners Followed Through Grade 8, by Kindergarten Score Quartile



EXPANDING ACCESS TO EARLY LEARNING OPPORTUNITIES

State

- State Preschool
- TK & Expanded TK

Districts

- Using LCFF & Title I funds for prek

DISCONNECT

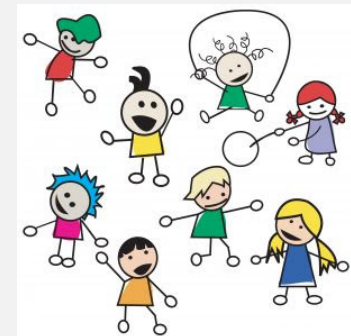
- Different curricular materials
- Different assessment instruments
- Different teacher preparation and support
- Different beliefs about how children learn

- As a result:
 - Instructional approach very different
 - Repetitive or skips steps

GOAL

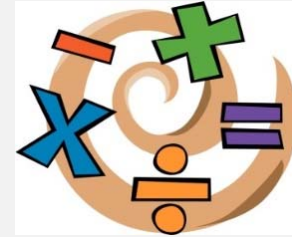
To identify policies and practices that support continuous improvements in learning from pre-K through the early primary grades

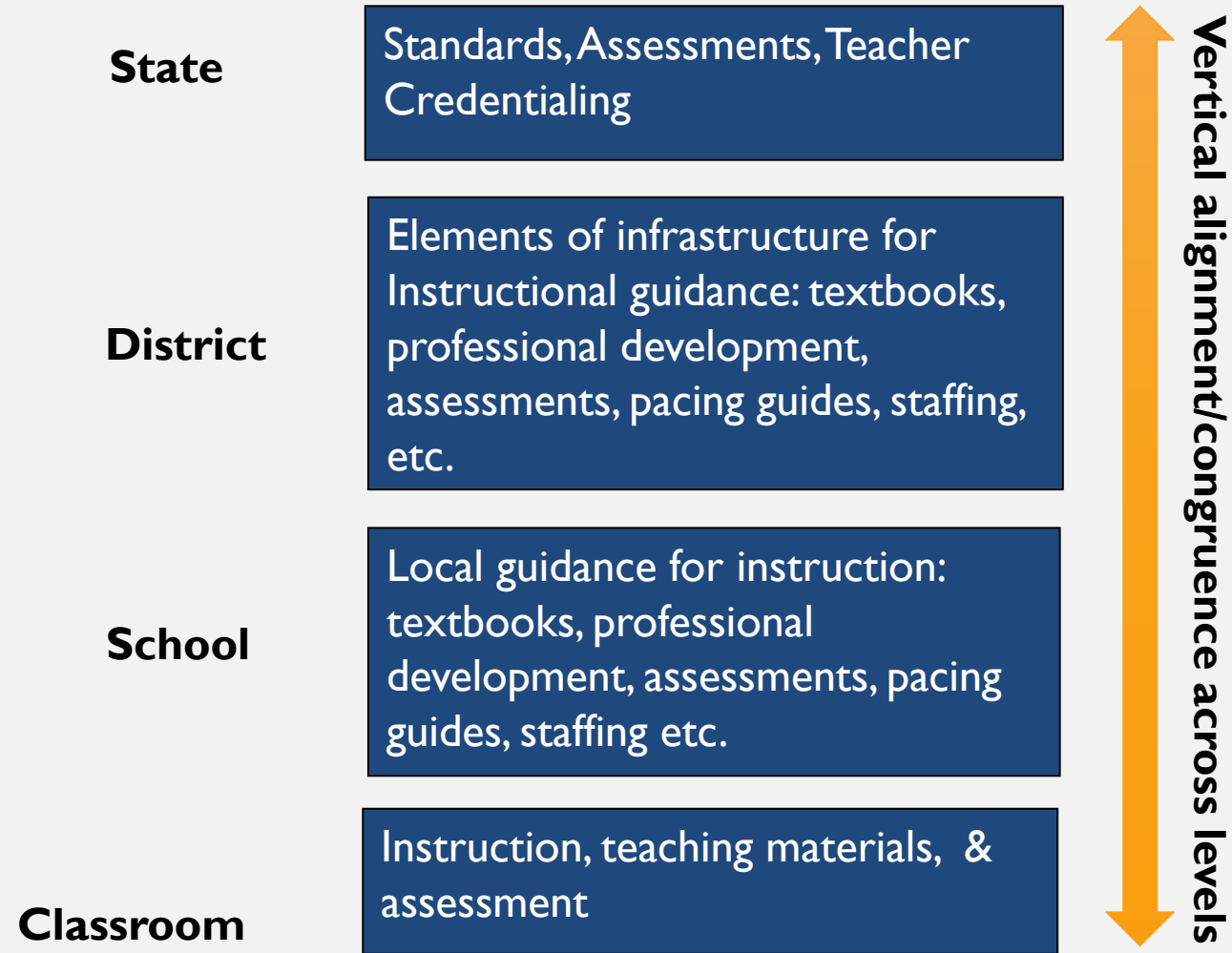
To provide children with a continuous, seamless education that will sustain the gains made in preschool and lead to better developmental and learning outcomes overall.



INSTRUCTIONAL COHERENCE

- Instruction in each grade builds on skills developed in previous grade
- Instruction:
 - is aligned with typical learning trajectories
 - is targeted just beyond students' skill level
- Connections are made between constructs and topics
- Students are given opportunities to broaden and deepen their skills by applying them in novel contexts





Horizontal alignment/congruence between elements at each level
Continuity across time and grade levels

**FOSTERING PREK – 3 ALIGNMENT AND
CONTINUITY IN MATHEMATICS:
LESSONS FROM TWO CALIFORNIA
SCHOOL DISTRICTS**

Cynthia E. Coburn, Northwestern University

COHERE STUDY: COLLABORATORS

- Principal Investigators: Cynthia Coburn (Northwestern), Megan Franke (UCLA), Deborah Stipek (Stanford), Dale Farran (Vanderbilt University), Doug Clements (University of Denver)
- Researchers: Graciela Borsato (Stanford), Seenae Chong (UC Berkeley), Abby Do (Vanderbilt), Adrienne Hu (Northwestern), Sonia Ibarra (UCLA), Natalie Jou (Northwestern), Juliet Lee (UCLA), Rebekah LeMahieu (Stanford), Kelly McMahon (Northwestern), Brandon McMillan (UCLA), Abby Stein (Northwestern), Heather Western (Fresno State), Brooke Berrios (Fresno State), Christy Macias (Fresno State)
- Funders: Heising-Simons Foundation, Evelyn and Walter Haas Jr Fund

THE COHERE STUDY

“Early education is not just in preK. Preschool to third grade alignment is bigger than Early Education [departments].”

THE COHERE STUDY

- Document efforts to create alignment and continuity between preK and elementary in mathematics at district and schools
- Investigate how these efforts are experienced by teachers and students
- Measure how these efforts influence students' learning opportunities, perceptions of mathematics, and proficiency

OUR STRATEGY

- Multi-level: District, School, Classroom, Student
- Longitudinal study
 - 2016-2017: Focus on PreK
 - 2017-2018: Follow students into TK or K
 - 2018-2019 (pending funding): Follow students into K or 1
 - 2019-2020 (pending funding): Follow students into 1 or 2

OUR METHODS

- District level: Two midsize California school districts
 - Interview district leaders in curriculum & instruction, early education, and leadership
 - Observe professional development in all three divisions
- School level: Three schools per district with PreKs on site, supervised by principals
 - Interview school leaders (principal, AP, coaches)
 - Interview and survey teachers PreK – 2
 - Survey teachers PreK – 2

OUR METHODS

- Classroom level: All PreK classes in 2016-2017; all TK and K classes in 2017-2018
 - Three classroom observations (Fall, winter, spring) + debrief interview
- Student level: All students with parental consent
 - Mathematics assessment fall and spring (REMA-SF)
 - Student interviews (winter)

TODAY'S PRESENTATION

- Data from 2016-2017 school year
- District level: interviews and observations
- School level: interviews and surveys
- Document analysis at all levels

FINDINGS

CONTRASTING STRATEGIES FOR FOSTERING
ALIGNMENT AND CONTINUITY IN
MATHEMATICS

CONTRASTING STRATEGIES FOR FOSTERING ALIGNMENT AND CONTINUITY IN MATHEMATICS

- **District A: Greater emphasis on instructional improvement systems and school leadership development**
- **District B: Greater emphasis on teaching and learning in mathematics**

DISTRICT A: EMPHASIS ON INSTRUCTIONAL IMPROVEMENT SYSTEMS AND SCHOOL LEADERSHIP

- Ongoing systems for instructional improvement
 - Regular walkthroughs
 - Instructional framework outlining districtwide and specific expectations for classroom practice
 - Professional learning communities
 - Interim assessments

DISTRICT A: EMPHASIS ON INSTRUCTIONAL IMPROVEMENT SYSTEMS AND SCHOOL LEADERSHIP

- Ongoing systems for instructional improvement
 - Regular walkthroughs
 - Instructional framework outlining districtwide and specific expectations for classroom practice
 - Professional learning communities
 - Interim assessments
- Investment in learning opportunities for school leaders
 - In depth professional development on learning and instruction in early childhood
 - Ongoing opportunities to learn through school leader PLCs and walkthrough structure

DISTRICT A: EMPHASIS ON INSTRUCTIONAL IMPROVEMENT SYSTEMS AND SCHOOL LEADERSHIP

- Ongoing systems for instructional improvement
 - Regular walkthroughs
 - Instructional framework outlining districtwide and specific expectations for classroom practice
 - Professional learning communities
 - Interim assessments
- Investment in learning opportunities for school leaders
 - In depth professional development on learning and instruction in early childhood
 - Ongoing opportunities to learn through school leader PLCs and walkthrough structure
- Many (not all) of these strategies were content neutral

DISTRICT A: LESS EMPHASIS ON MATHEMATICS TEACHING AND LEARNING

- Adopted three commercial mathematics curricula (PK,TK, and elementary); created scope and sequence to guide teachers in using curricula in ways that connected to standards
 - The three curricula, even with scope and sequence documents, had gaps and overlap, creating challenges to continuity
- Interim assessments well aligned in terms of content; less so in terms of cognitive demand
- Similar PD model across early education and elementary (especially PK,TK, and K), but limited focus on mathematics instruction

DISTRICT B: GREATER EMPHASIS ON TEACHING AND LEARNING IN MATHEMATICS

- Created own curriculum from preK through grade 8; similar structure, common high leverage pedagogical strategies across grades
 - High levels of continuity across grades in content and cognitive demand
- Moderate alignment between interim assessment and curriculum
- Professional development in early education and K-12 used different PD models, but had a common focus on the high leverage pedagogical strategies in mathematics

DISTRICT B: LEARNING FOR SCHOOL LEADERS NOT WELL CONNECTED TO EARLY EDUCATION OR MATHEMATICS

- Learning opportunities for school leaders fairly separate from early education and mathematics
- Targeted PD for school leaders on early education focused mainly on operational issues, rather than instructional ones

DISTRICT B: INSTRUCTIONAL IMPROVEMENT SYSTEMS WERE EMERGENT

- New walkthrough structure, but not frequent and did not involve widespread participation (e.g. rarely included members of other departments)
- Multiple strategies for professional learning communities at schools
- Range of ways that districts and schools used assessment data
- New focus on site-based instructional leadership teams

HOW WERE THESE STRATEGIES EXPERIENCED IN SCHOOLS?

- **District A: Stronger perceptions of alignment and continuity; principals felt prepared to supervise early education**
- **District B: Widespread understanding of pedagogical approaches in mathematics; perceptions of lack of alignment and continuity**

SCHOOL LEADERS

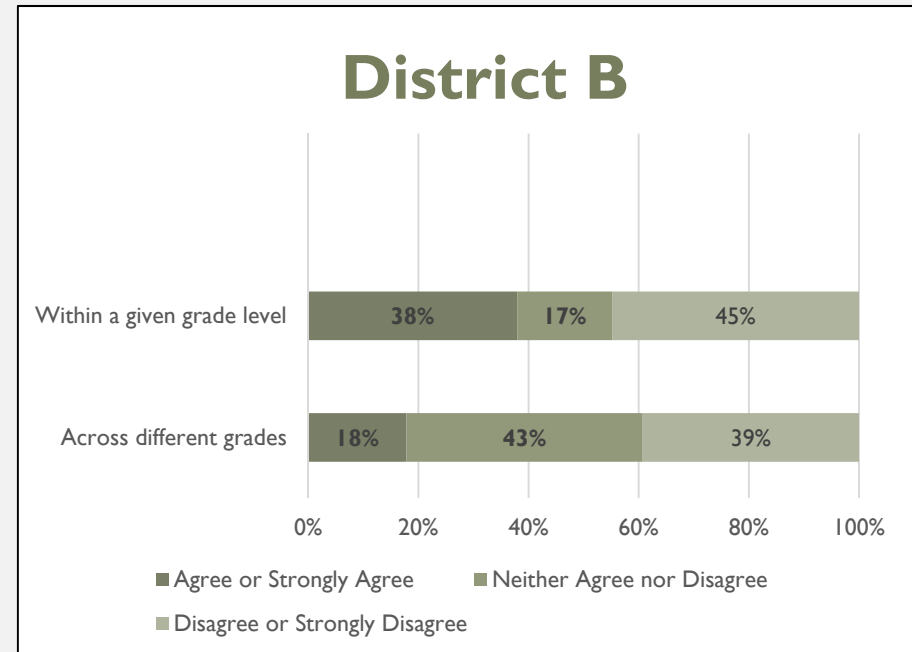
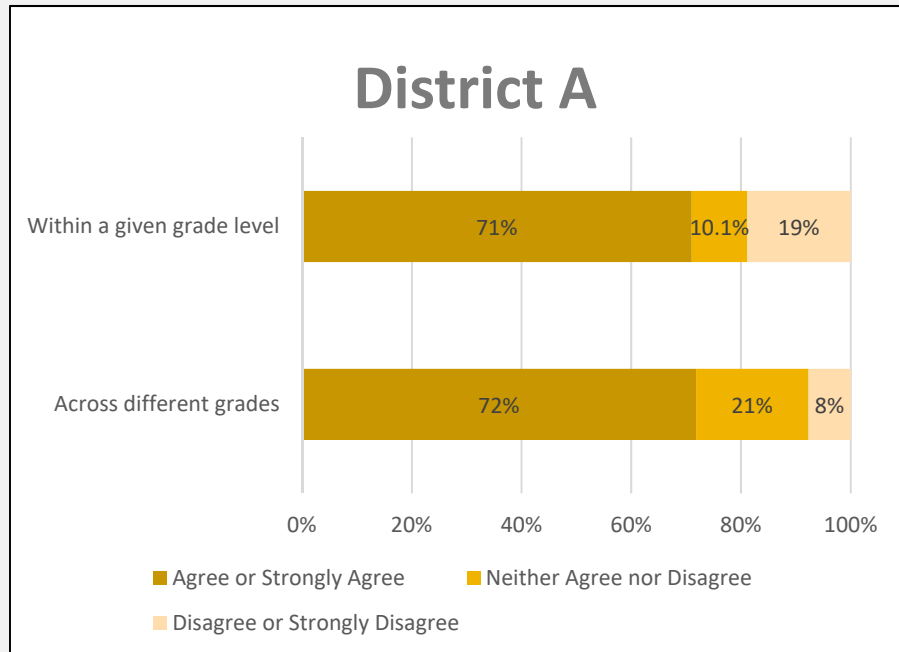
- District A

- School leaders report feeling supported by the district in their work with preK and TK classrooms
- Saw main responsibilities for preK and TK classrooms in instructional terms.

- District B

- School leaders did not feel prepared to supervise preK and TK classrooms on their campus
- Saw main responsibility for preK and TK in operational rather than instructional terms

TEACHERS' PERCEPTIONS OF ALIGNMENT AND CONTINUITY IN MATHEMATICS



MAIN INSTRUCTIONAL FOCUS IN THE SCHOOLS

- District A

- School leaders identified using the district-adopted curricula and aligning instruction to standards as their main instructional priority in mathematics
- Teachers echoed this when asked main emphasis in mathematics
- Less attention at the schools to specific instructional strategies, other than “hands-on instruction”

- District B

- School leaders identified several of the district’s high leverage pedagogical strategies as instructional priorities in mathematics
- Teachers also identified these strategies as main focus of their instruction in mathematics, not the curriculum (even though nearly all teachers used it)

CHALLENGES OF FOSTERING ALIGNMENT AND CONTINUITY IN MATHEMATICS

- At the district level:
 - Challenges of working across district departments
 - Impact of separate policy systems for early education and TK-12
 - Separate budgets
 - Separate regulations and accountabilities
 - Different training, pay, and schedules for PreK and TK-12 teachers
 - Other policy and funding constraints
 - PreK – 3 efforts generally funded by external grants, which come with strings
 - [In one district] Student placement policy creates mobility between PreK, TK, and K
 - Insufficient knowledge of early learning among district leaders
 - Challenge of getting mathematics onto district agenda

CHALLENGES OF FOSTERING ALIGNMENT AND CONTINUITY IN MATHEMATICS

- At the school level:
 - Two different sets of rules and regulations for school leaders to learn
 - Knowledge burden
 - Paperwork burden
 - Different schedules for preK and TK-12 teachers
 - Status issues that come from different credentialing and salary schedules for PreK compared to elementary teachers (including TK)
 - Physical separation of PreK from other grades (rooted in state regulations for early childhood education)
 - [In one district] Addition of PreK as part of school leaders' responsibilities brought additional responsibilities, but not additional administrative support
 - School emphasis on literacy instruction; limited focus on mathematics
 - Limited professional development in mathematics to support teachers

TAKE AWAYS

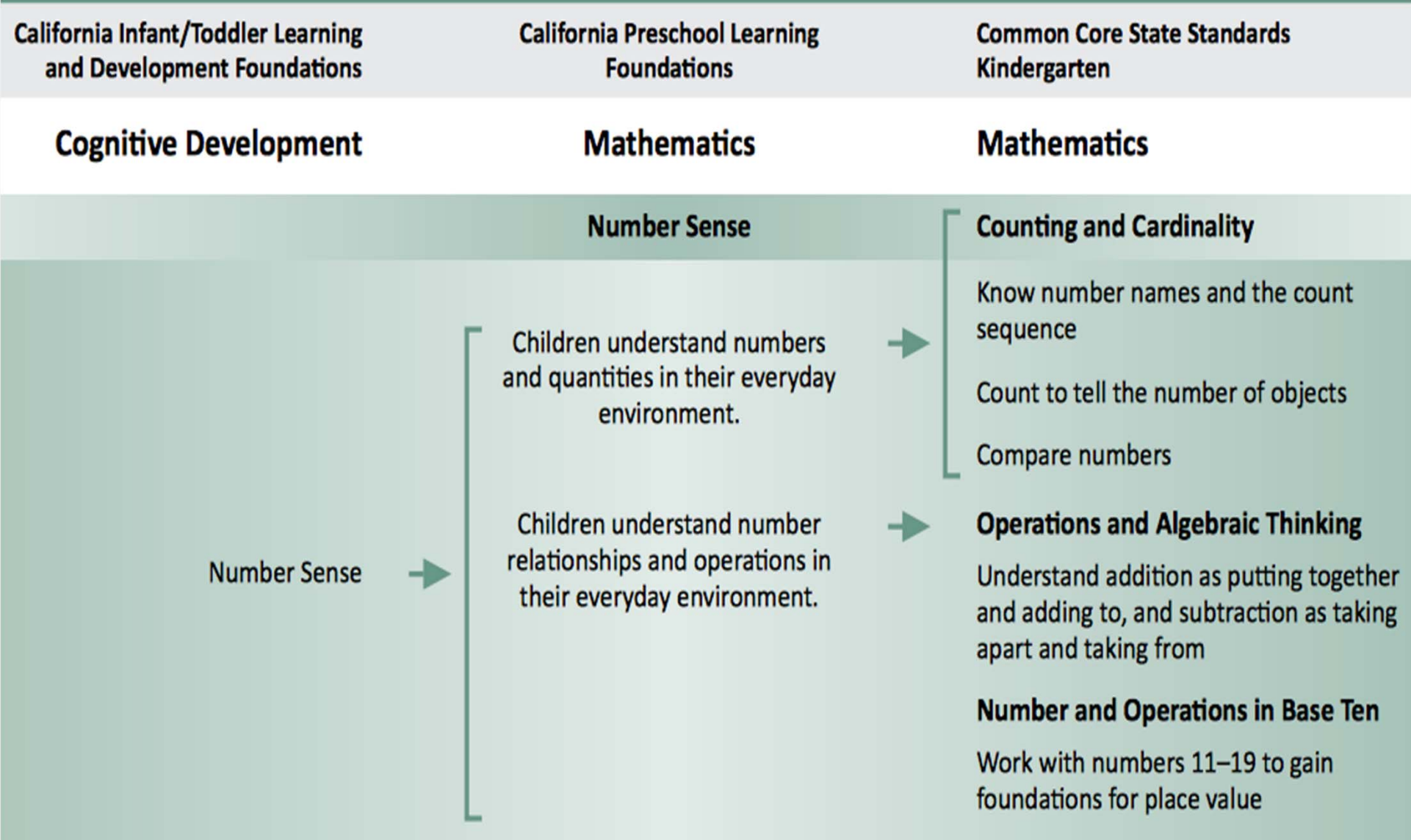
- District policy efforts to foster preK – 3 alignment and continuity matter for schools' efforts
- Focus on teaching and learning is important, but may need to sit within a larger system of instructional improvement
- School leaders are key, but need support in both operations and instruction to be positioned to foster preK – elementary alignment and continuity on the school site
- Content-neutral strategies tend to default to literacy, especially in early education

IMPLICATIONS FOR POLICY MAKERS

- Provide encouragement and support for focusing preK – elementary alignment efforts on mathematics
- Streamline funding for preK, and possibly connect to K-12
- Create greater alignment between preK and elementary school teacher preparation and pay
- Include early childhood as part of principal credentialing

EXTRA SLIDES

OUR APPROACH TO ANALYZING CURRICULA: CONTENT

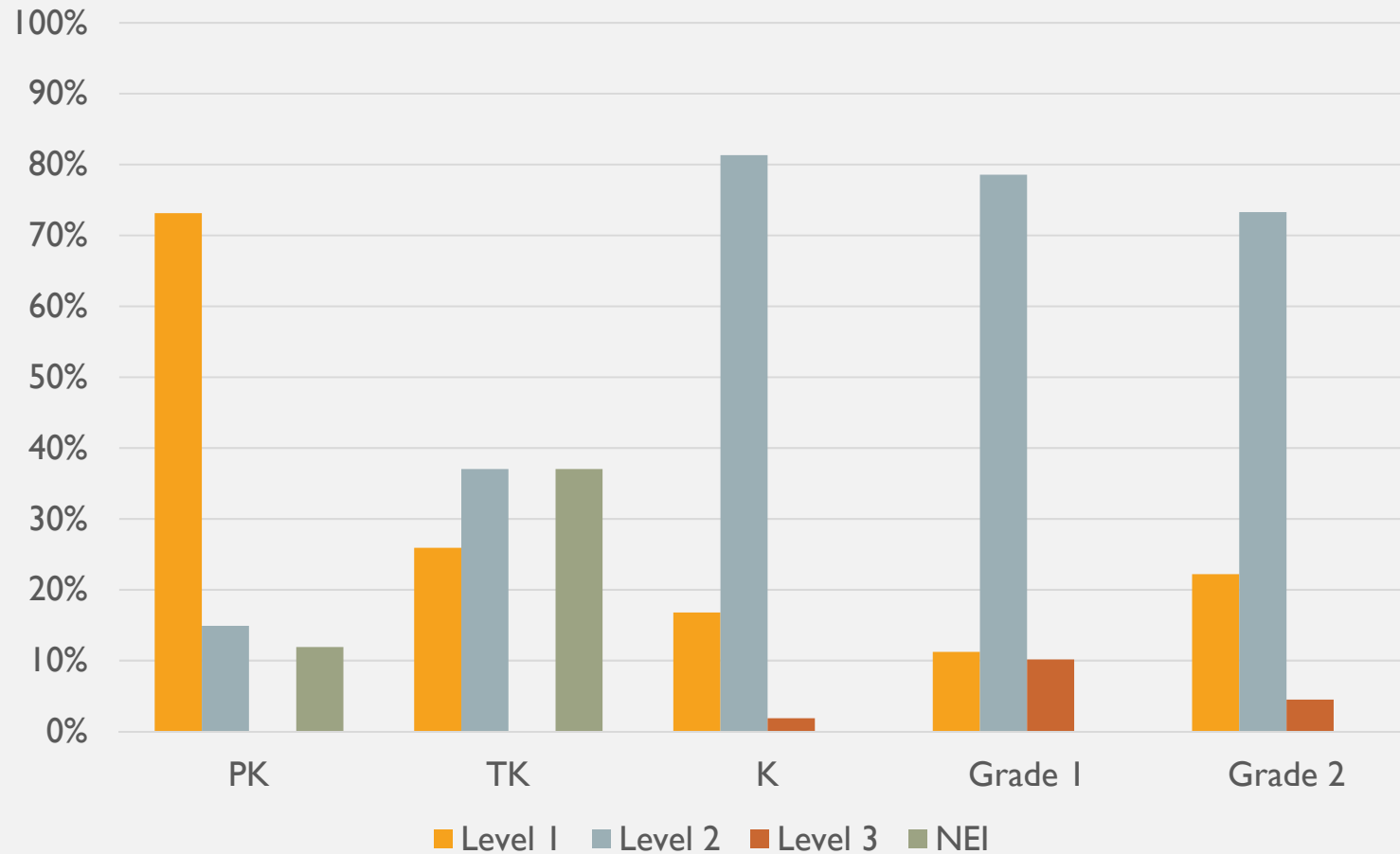


OUR APPROACH TO ANALYZING CURRICULA: COGNITIVE DEMAND

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 <i>and</i> 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.

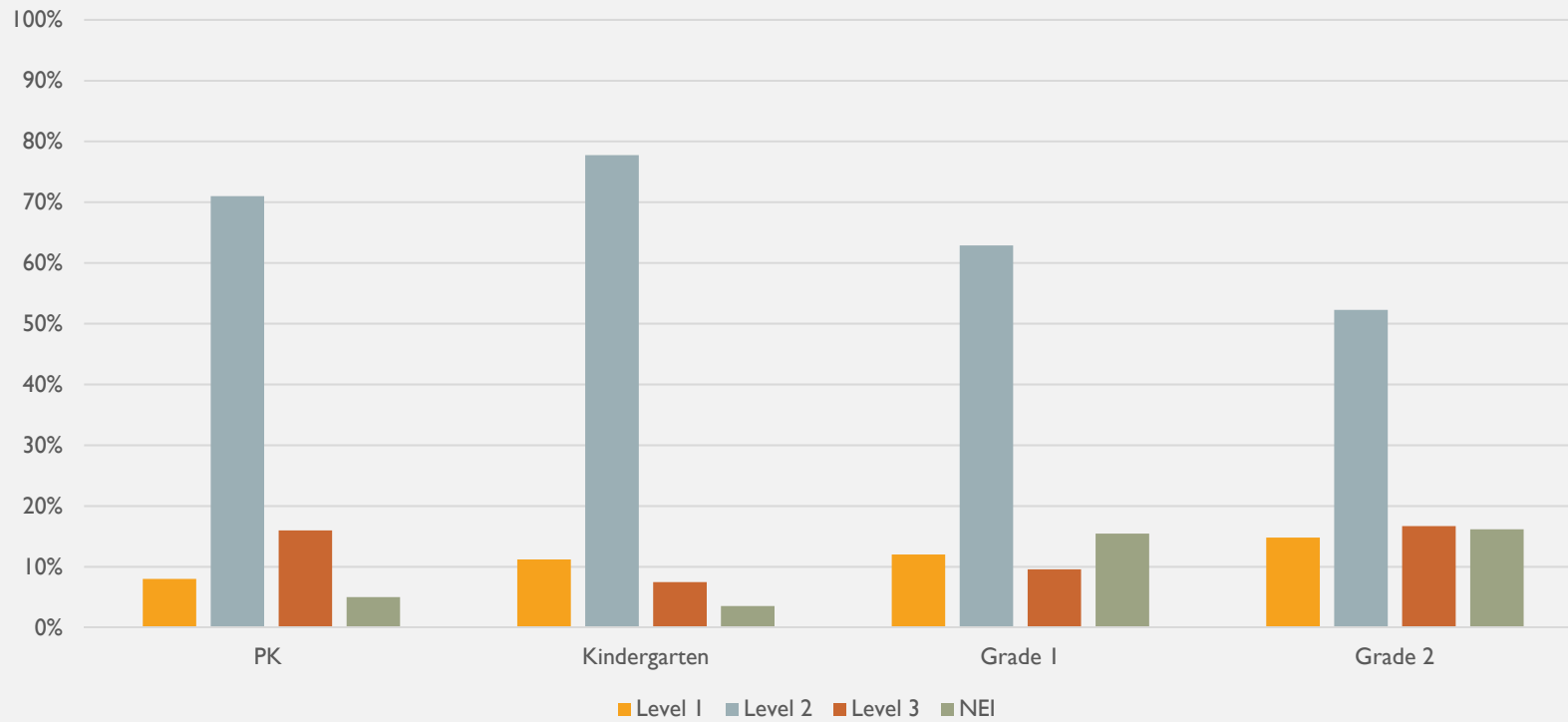
DISTRICT A: CONTINUITY OF COGNITIVE DEMAND

2016-2017



DISTRICT B: CONTINUITY OF COGNITIVE DEMAND

2016-2017



DISTRICT B: CONTINUITY OF COGNITIVE DEMAND +/- WORD PROBLEMS IN K, I, AND 2

