

California Learning Foundations and Curriculum Framework: **Focus on Measurement**

Outcomes

- Discover the research in early childhood mathematics in the classroom.
- Learn to use the Preschool Learning Foundations (PLF), Preschool Curriculum Framework (PCF), and other California Department of Education resources to support mathematical learning in the classroom.
- Promote the application of classroom practices and strategies that enhance children's mathematical growth and development.
- Explore strategies to support dual-language learners developing mathematics.

California's Early Learning and Development System

**Program
Guidelines
& Resources**

**Curriculum
Framework**

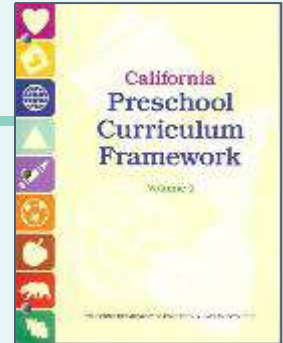
**Learning &
Development
Foundations**

**Professional
Development,
Supports, &
Competencies**

**Desired Results
Assessment
System**

Eight Overarching Principles

PCF, Vol. 1, pp. 5-8



1. Relationships are central.
2. Play is a primary context for learning.
3. Learning is integrated.
4. Intentional teaching enhances children's learning experiences.
5. Family and community partnerships create meaningful connections.
6. Individualization of learning includes all children.
7. Responsiveness to culture and language supports children's learning.
8. Time for reflection and planning enhances teaching.

How Did You Measure Up?



Enter your height range
in the POLL.

Why Math in Preschool?

Lessons learned from research:

- Gaps are striking
- Less is more
- Connect informal and school math
- Meet the needs of all learners
- Use developmental continuums

Hearing from the Experts

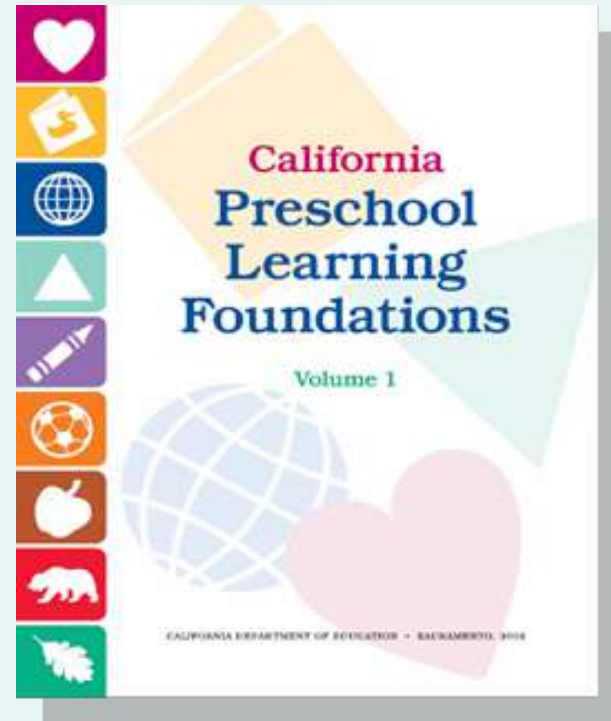


“Children possess and build mathematical competencies from their first year and keep on learning mathematical ideas throughout their preschool years.”

Clements, D.H. & Sarama, J.
“Creative Pathways to Math,”
Scholastic Early Childhood Today
Journal, 2003.

Mathematics Domain Strands: Measurement

- Number Sense
- Algebra and Functions
- **Measurement**
- Geometry
- Mathematical Reasoning

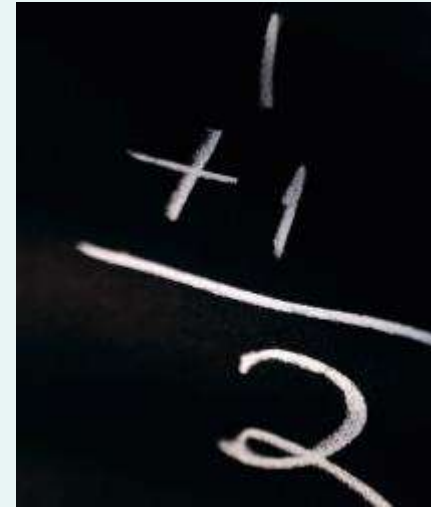


Connect Informal and Formal Math Poll



Informal

Knowledge based on everyday life experiences



Formal

School Math: Math symbols and their manipulation

Formal or Informal Math?

- Insert video clip from Science Inquiry

- 1.2

<https://wested.ent.box.com/s/loiizqglfw9c4tt41f32ixqorp109uj9>

Clip from 3:14 to 3:27

Formal or Informal Math? (2)

- Insert- Video from Mathematical Reasoning 1.1:
<https://wested.ent.box.com/s/sgidb67rjfcc7rtl297b5onudntfuvtw>
- Show from 5:05 to 6.12

Meeting the Needs of All Learners

“Children (with and without disabilities) have difficulty with math for different reasons.”

Insights into Math Learning Difficulties, June 27, 2011



Discover Ideas for Universal Design

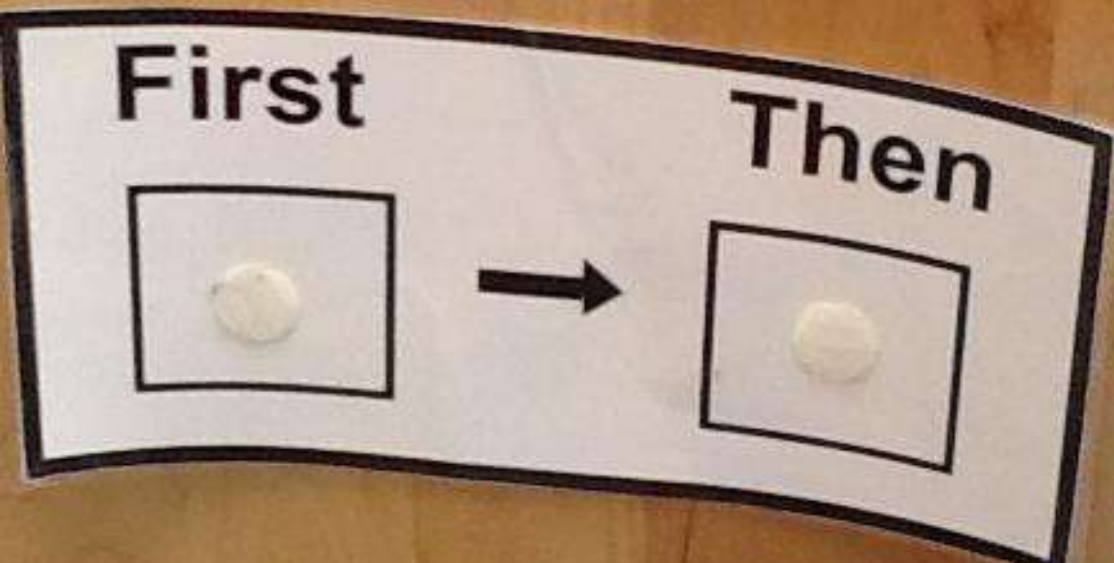


- Environments
- Building on children's play
- Materials
- Teacher-guided learning activities



Early intervention has positive outcomes for mathematics in kindergarten.

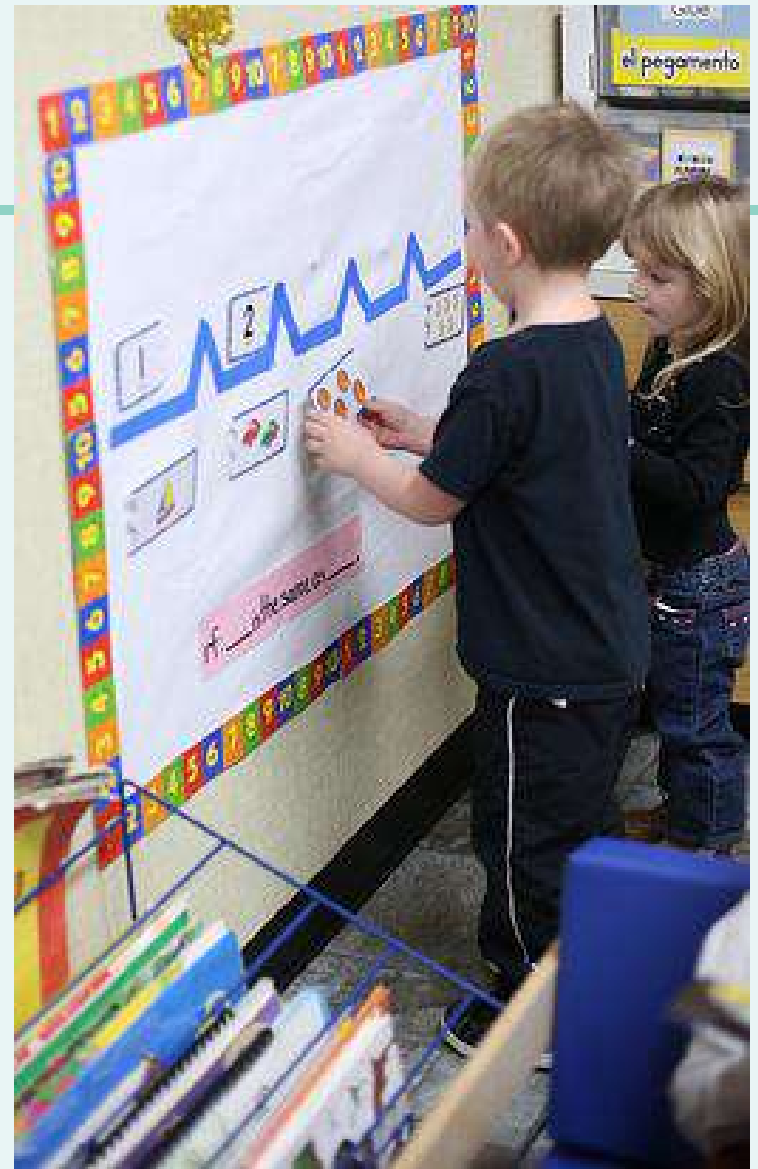
(The Outcomes of Early Intervention Early Intervention for Infants and Toddlers with Disabilities and their Families)



Measurement

“A mathematical process that involves assigning numbers to a set of continuous quantities”

(Preschool Learning Foundations, Vol.1, p. 163)



Map of the Foundations

Strand

Age

Foundation

Examples

Universal Design

Domain

Foundation

Measurement*	
At around 48 months of age	At around 60 months of age
<p>1.0 Children begin to compare and order objects.</p>	<p>1.0 Children expand their understanding of comparing, ordering, and measuring objects.</p>
<p>1.1 Demonstrate awareness that objects can be compared by length, weight, or capacity, by noting gross differences, using words such as <i>bigger, longer, heavier, or taller</i>, or by placing objects side by side to compare length.</p>	<p>1.1 Compare two objects by length, weight, or capacity directly (e.g., putting objects side by side) or indirectly (e.g., using a third object).</p>
<p>Examples</p> <ul style="list-style-type: none"> Communicates, "I'm big like my daddy." Communicates, "This one's heavier" when choosing from a variety of beanbags in a basket. Communicates, "He has more clay than me." Communicates, "Mine is longer than yours" when placing trains side by side to check which is longer. Builds a tower beside another child, attempting to make her tower taller. 	<p>Examples</p> <ul style="list-style-type: none"> Tries to determine if he is taller than another child by standing next to the child. Uses a balance scale to find out which of two rocks is heavier. Pours water into different size containers at the water table to find out which one holds more. Shows that the blue pencil is longer than the red pencil by placing them side by side. Compares the length of two tables by using a string to represent the length of one table and then laying the string against the second table. Uses a paper strip to mark the distance from knee to foot and compares it to the distance from elbow to fingertip.

* Throughout these mathematics foundations many examples describe the child manipulating objects. Children with motor impairments may need assistance from an adult or peer to manipulate objects in order to do things such as count, sort, compare, order, measure, create patterns, or solve problems. A child might also use adaptive materials (e.g., large manipulatives that are easy to grasp). Alternatively, a child might demonstrate knowledge in these areas without directly manipulating objects. For example, a child might direct a peer or teacher to place several objects in order from smallest to largest. Children with visual impairments might be offered materials for counting, sorting, or problem solving that are easily distinguishable by touch. Their engagement is also facilitated by using containers, trays, and so forth that contain their materials and clearly define their work space.

Kindergarten Connection

Strand: Measurement		Measurement and Data
At around 48 months	At around 60 months	By the end of kindergarten
1.0 Children begin to compare and order objects.	1.0 Children expand their understanding of comparing, ordering, and measuring objects.	Measurement and Data <ul style="list-style-type: none"> ▪ Describe and compare measurable attributes.
1.1 Demonstrate awareness that objects can be compared by length, weight, or capacity, by noting gross differences, using words such as bigger, longer, heavier, or taller, or by placing objects side by side to compare length.	1.1 Compare two objects by length, weight, or capacity directly (e.g., putting objects side by side) or indirectly (e.g., using a third object).	1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
1.2 Order three objects by size.	1.2 Order four or more objects by size.	2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/ "less of" the attribute, and describe the difference. <i>For example, directly compare the heights of two children and describe one child as taller/shorter.</i>
	1.3 Measure length using multiple duplicates of the same-size concrete units laid end to end.*	
		<i>4. Demonstrate an understanding of concepts time (e.g., morning, afternoon, evening, today, yesterday, tomorrow, week, year) and tools that measure time (e.g., clock, calendar). (CA-Standard MG 1.2)</i> <i>a. Name the days of the week. (CA-Standard 1.3)</i> <i>b. Identify the time (to the nearest hour) of everyday events (e.g., lunch time is 12 o'clock, bedtime is 8 o'clock at night). (CA-Standard MG 1.4).</i>

*The footnote that appears in the published version of this foundation has been omitted so that the alignment can be highlighted.

Stop and Jot

Three measurement concepts:

- Comparing
- Ordering
- Measuring

(PCF, Vol. 1, p. 273)



Measurement Strand

PLF, Vol. 1, p. 155

At around 48 months

1.0 Children begin to compare and order objects

1.1 Demonstrate awareness that objects can be compared by length, weight, or capacity, by noting gross differences, using words such as bigger, longer, heavier, or taller, or by placing objects side by side to compare length.

At around 60 months

1.0 Children expand their understanding of comparing, ordering, and measuring objects.

1.1 Compare two objects by length, weight, or capacity directly (e.g. putting objects side by side) or indirectly (e.g. using a third object).

Measurement Strand (continued)

At around 48 months

1.2 Order three object by size.

At around 60 months

1.2 Order four or more objects by size.

1.3 Measure length using multiple duplicates of the same-size concrete units laid end to end.

Let's Do Some Ordering and Comparing...

- Find three different size objects in your home and order them by size – you have 5 minutes!
- In your breakout group, share your objects.
- Discuss how you might create opportunities in your classroom for children to order and compare objects.

Developmental Continuums

- Are a natural developmental progression
- Support intentional planning to effectively guide children



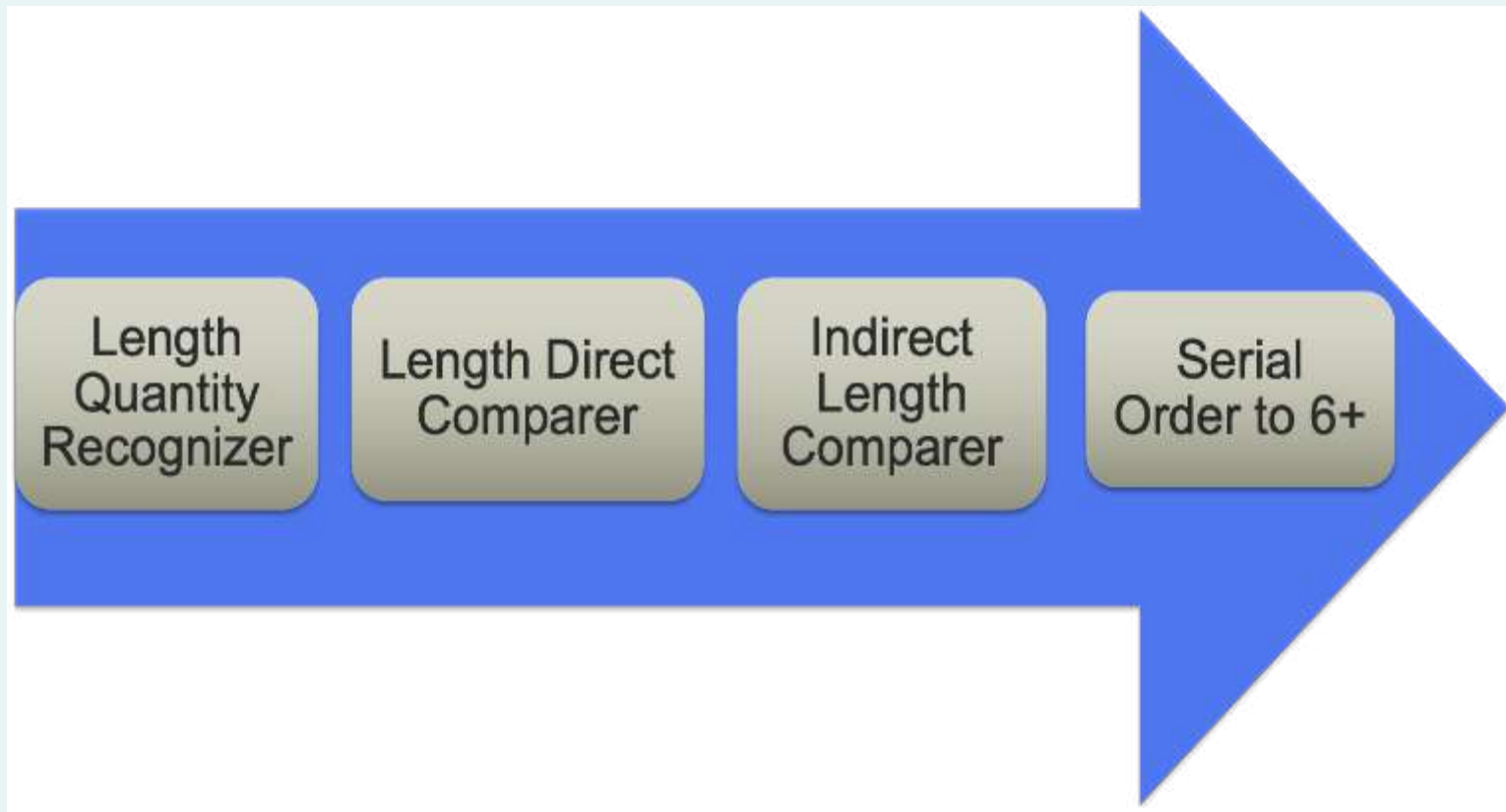
Learning Trajectories

Describe:

- The goals of learning
- The thinking and learning process of children at various levels
- Learning activities in which they might engage



Learning Trajectory for Measurement



Source: Doug Clements, Ph.D.

Developmental Continuum for Measurement

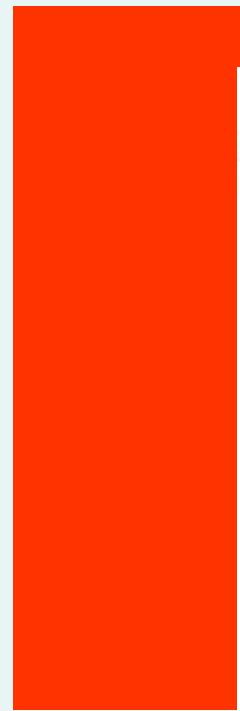
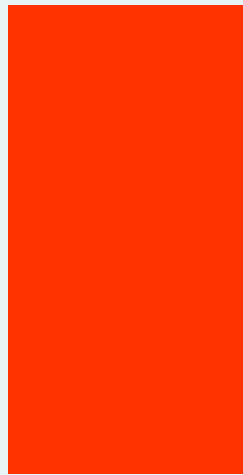
Length Quantity
Recognizer: “I’m tall,
see?”

(Building Blocks Real Math PreK
curriculum. Clements, D. H., &
Sarama, J.)



Developmental Continuum for Measurement (2)

**Length Direct
Comparer:**
“This one is bigger.”

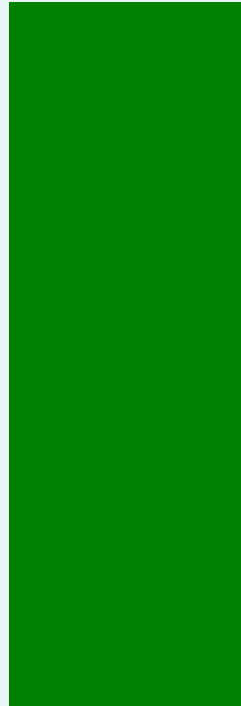


Developmental Continuum for Measurement (3)

Indirect Length

Comparer:

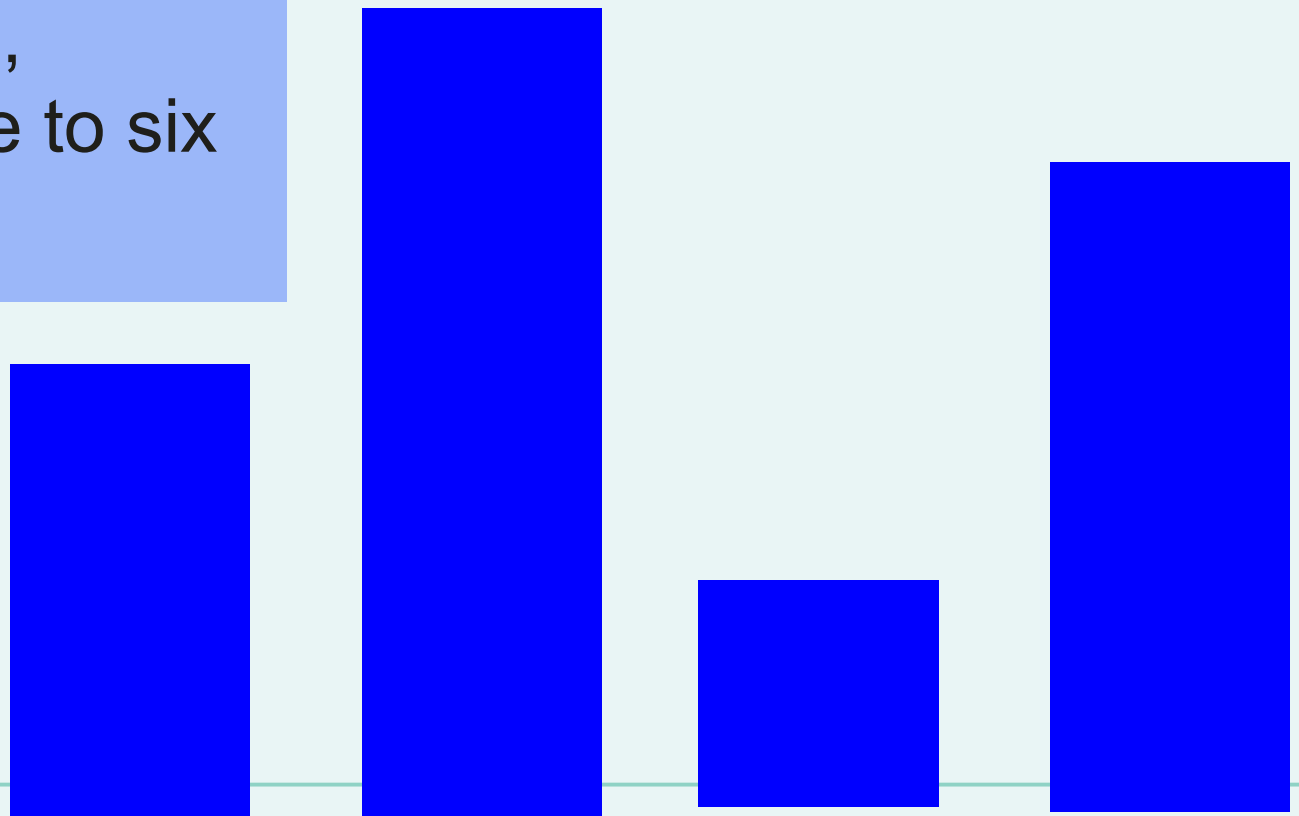
Compares the length of two objects by representing them with a third object



Developmental Continuum for Measurement (4)

Serial Order to 6+

Order lengths, marked in one to six units



The Curriculum Framework Strategies



- Developmentally appropriate
- Reflective of thoughtful observation and intentional planning
- Individually and culturally meaningful
- Inclusive of children with disabilities and other special needs

Vignettes



- Each chapter has numerous vignettes to illustrate typical classroom scenarios.
- Vignettes are in italicized typestyle and are identified in the column to the left with the word **VIGNETTE** in bold.

Interactions and Strategies

Interactions and strategies can be found in the paragraph immediately following each vignette.



Provide Safe Havens— Manipulatives

- ✓ Stage 1: Home Language
- ✓ Stage 2: Observational/Listening
- ✓ Stage 3: Telegraphic/Formulaic
- ✓ Stage 4: Fluid Use

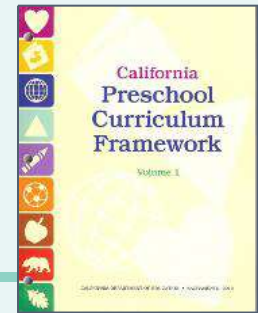


Small Blocks

Tabor, *One Child, Two Languages*, pp. 105-106; PEL Guide, p. 54.

Helpers/Buddies

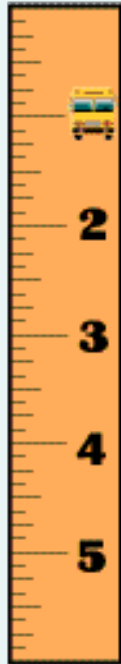




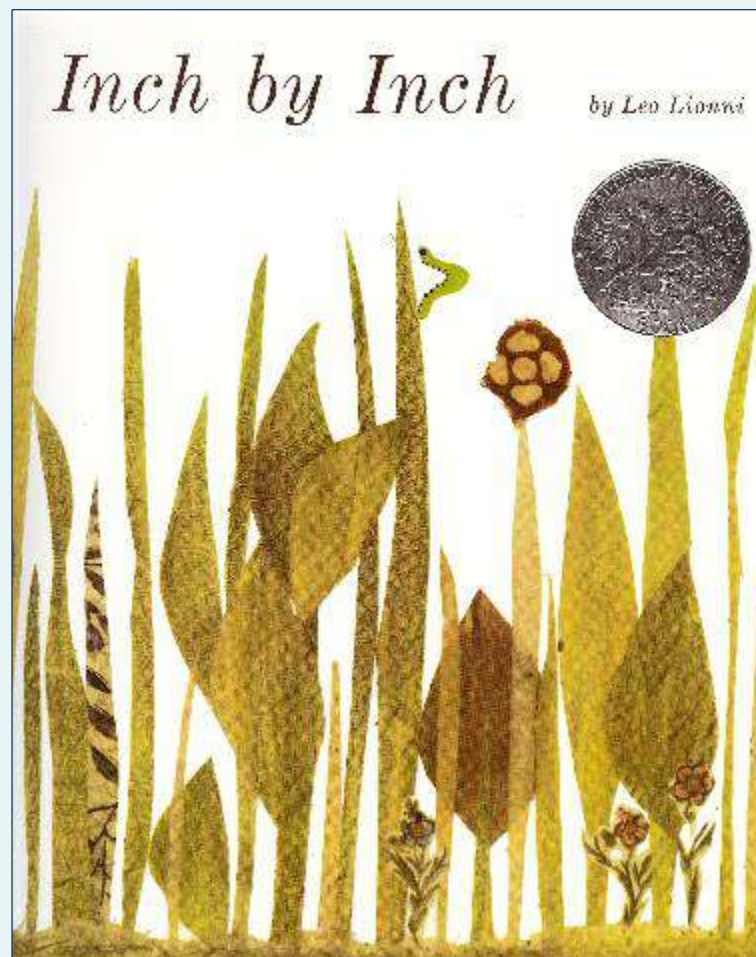
Interactions and Strategies

- Provide opportunities to promote measurement concepts in the environment. (p. 274)
- Observe preschool children’s measurement concepts in everyday play and routines. (p. 275)
- Facilitate and reinforce measurement concepts in everyday play and routines. (p. 276)
 - Build preschool children’s descriptive and comparison vocabulary.
 - Ask questions.
 - Challenge preschool children to use measurement to solve problems.

Standard/Non-Standard Measurement

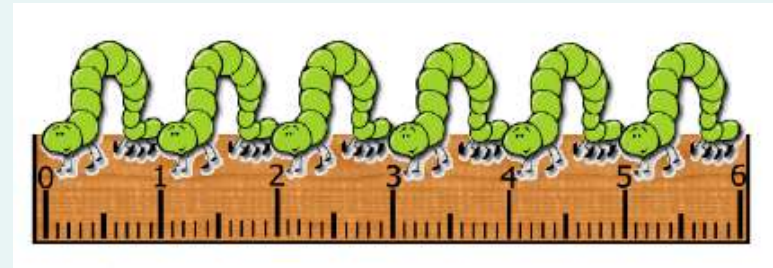


Example



Standard or Non-Standard

- Use the inch worm ruler and measure four or five objects.
- Use a non-standard measure and measure the same objects
- What did you notice?
- Share in your breakout room



The Importance of Questions

- Mathematics is about thinking, as well as doing something with manipulatives.
- How did you know ?
- Why did you do it that way?
- How did you figure that out?
- What else would work like this?
- What would happen if?





**Thank You for Coming!
Happy Measuring!**