Early Math Matters

1. Brain development before children begin school is rapid and provides the foundation for future learning.
2. The achievement gap in math exists before children enter kindergarten.
3. The math skills children enter kindergarten with are highly predictive of later achievement.
4. Kindergarten standards have risen.
5. Young children can and love to do math activities.

Growth in Brain Development

https://dreme.stanford.edu
Effect of Persistent vs. No Problems at Ages 6, 8, and 10 on High School Completion and College Attendance

<table>
<thead>
<tr>
<th>Persistent Problems in...</th>
<th>High School Completion</th>
<th>College Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>-.05</td>
<td>-.06</td>
</tr>
<tr>
<td>Math</td>
<td>-.13*</td>
<td>-.29**</td>
</tr>
<tr>
<td>Antisocial Behavior</td>
<td>-.10***</td>
<td>-.24*</td>
</tr>
</tbody>
</table>

https://dreme.stanford.edu

Common Core Kindergarten Standards

• Count to 100 by ones and by tens
• For any number from 1 to 9, find the number that makes 10 when added to the given number
• Compose and decompose numbers from 11 to 19 into ten ones and ones
• Describe measurable attributes of objects, such as length or weight.
• Compose simple shapes to form larger shapes.
• 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.

POLL
Kindergarten is the New First Grade

But not much Math Happening in Preschools

POLL
Math activities are age-appropriate for preschoolers.

Platas, 2011

https://dreme.stanford.edu

POLL

Complaints about Standards

1. Focus attention on basic academic skills and away from other important dimensions of development

2. Encourage developmentally inappropriate teaching

3. Undermine the joy of learning
No Standards?

• If we don’t know our destination, how do we know how to get there?
  — How do we determine whether children are making progress?

Standards can be useful if they...

• guide but don’t dictate instruction
  — Standards provide the long-term goals; the short-term goals (in route) are based on what children know and understand

• inform assessments used to track children's progress

• inform choice of curriculum used to provide scope and sequence for learning
  — Rebel against strict pacing!!

But what about “teaching”?
“Teaching” has a bad rap

- associated with teacher-directed, didactic instruction—flash cards and worksheets
- believed to interfere with children’s natural curiosity and joy of learning
- and competes with:
  - time for play
  - opportunities to develop social-emotional skills

Theories of Teaching

- **Child-Centered** (constructivist)
  - Children discover through direct experience
  - Children choose
  - Process stressed
  - Play

- **Teacher-Directed** (learning theory)
  - Children learn what teachers teach
  - Teachers choose
  - Performance stressed
  - Work

POLL
What is not included

- Rote counting
- Calendar
- Worksheets
- Macaroni math

Effective, Playful Math Instruction

- Teacher plans activities with clear learning goals
- Identifies, designs, and prepares materials
- Provides direction
- Engages children in conversation
- Assesses learning
- Designs individual & group interventions

Teacher Verbal Behavior

(talk by teacher during the 3:25 hour learning opportunity)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Talking or Listening</td>
<td>20%</td>
</tr>
<tr>
<td>Talking</td>
<td>71%</td>
</tr>
<tr>
<td>Listening</td>
<td>9%</td>
</tr>
<tr>
<td>To Child</td>
<td>35%</td>
</tr>
<tr>
<td>To Small Group</td>
<td>7%</td>
</tr>
<tr>
<td>To Whole Group</td>
<td>25%</td>
</tr>
<tr>
<td>To Self</td>
<td>1%</td>
</tr>
<tr>
<td>To Parent/External Adult</td>
<td>1%</td>
</tr>
<tr>
<td>To Teacher</td>
<td>2%</td>
</tr>
</tbody>
</table>

Farran, ECMC
Child Verbal Behavior
(Talk by children during the 3.25 hour learning opportunity)

- Listening: 66%
- Fuss/Cry: 1%
- Not Talking or Listening: 33%

All Classrooms: Children Talking and to Whom

- To Teacher: 4%
- To Child: 9%
- To Small Group: 1%
- To Whole Group: 4%
- To Self: 6%

Talking: 24%

Other Activities

- Letters in name
- Shape hunt
- Map of classroom
- Store

• [http://pbskids.org/lab/activity/shoesorting/](http://pbskids.org/lab/activity/shoesorting/)
Making Counting Fun

Using Picture Books

Describe, Draw, Describe
Games

Teachable Moments

• Take advantage
• But not sufficient
  – depends too much on chance
To learn more about our research and development in early math, visit our website at
https://dreme.stanford.edu

To access our free early math resources for teacher educators (videos, articles, activities), visit DREME TE at
http://prek-math-te.stanford.edu