Teaching Math to Young Children: Using the IES Practice Guide in the Early Childhood Classroom

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Handout at http://www.psy.cmu.edu/cs/educators/index.html

“Leadership tomorrow depends on how we educate our students today —especially in science, technology, engineering and math.”

- President Obama

STEM OFFICE MISSION:
Promote student achievement, success, and life-long learning in a dynamic 21st century STEM economy by:

- Maximizing opportunities to excel in STEM education for all students, including preschool and post-secondary students;
- Inspiring students to pursue STEM careers, including women, minorities, and special needs populations; and
- Fostering innovation in STEM education to produce scalable approaches to improve formal and informal learning environments.
Institutes of Higher Education
Learner centric Out-of-School Programs
Formal P-12 Education
Family STEM-Rich Institutions
Business Community

• Office of Early Learning /STEM Office collaboration
  • Strategies and practices for Science, Technology, Engineering and Math

• Across ED
  • RTT-ELC (Race to the Top – Early Learning Challenge)
  • Preschool Development Grants
  • Ready to Learn
  • I3 (Investing in Innovation)
  • Teacher Quality Partnerships

• Highlighting “Teaching Math to Young Children” practice guide

• Teachers’ use of structured curricula can improve young children’s math achievement.
• Targeted interventions can significantly improve young children’s number sense.
• Science and literacy instruction can be integrated in ways that improves children’s motivation towards science.
• Response to intervention may be applicable to supporting early math development in children at risk.
• There are significant relations between mathematics difficulties in kindergarten and the primary grades.
• Young children may require a lengthy period of instruction to learn some key math concepts.
MATH ACHIEVEMENT GAP SHOWS UP BEFORE KINDERGARTEN


MEANINGFUL MATHEMATICS IN EARLY CHILDHOOD
ACROSS ALL 5 DOMAINS OF MATHEMATICS

Why?
- To build knowledge, skills, and dispositions towards mathematics for strong lifelong and life-wide learning

How?
- Greater INTENTIONALITY regarding meaningful math
- Clearer LANGUAGE of MATHEMATICS
- Use of one new resource - a research-based practice guide
TEACHING MATH TO YOUNG CHILDREN
INSTITUTE OF EDUCATION SCIENCES (IES) PRACTICE GUIDE, NOVEMBER 2013

Practice Guide Goal
- To help educators “capitalize on children’s natural interest in math to make their school experience more engaging and beneficial.”

Practice Guide Process
- Panel of Researchers & Practitioners offer expertise and experience
- Support Staff for systematic review of available literature
- Iterative collaboration to develop and rate recommendations

Follow Developmental Progressions (Recommendations 1-3)
- “Teach number and operations using a developmental progression.”
- “Teach geometry, patterns, measurement, and data analysis using a developmental progression.”
- “Use progress monitoring to ensure that math instruction builds on what each child knows.”

Live Math Daily (Recommendations 4&5)
- “Teach children to view and describe their world mathematically.”
- “Dedicate time each day to teaching math, and integrate math instruction throughout the school day.”

Table 2. Recommendations and corresponding levels of evidence

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Strong Evidence</th>
<th>Moderate Evidence</th>
<th>Minimal Evidence</th>
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</table>
FOLLOW DEVELOPMENTAL PROGRESSIONS

RECOMMENDATION #1

“Teach number and operations using a developmental progression.”

- Recognize small collections (subitize)
- Count with one to one correspondence to determine the total number
- Use number and counting to compare quantities
- Label collections with number words and numerals
- Solve basic math problems

RECOMMENDATION #2

“Teach geometry, patterns, measurement, and data analysis using a developmental progression.”

- Help children to recognize, name, and compare shapes, and then teach them to combine and separate shapes.
- Encourage children to look for and identify patterns, and then teach them to extend, correct, and create patterns.
- Promote children’s understanding of measurement by teaching them to make direct comparisons and to use both informal or nonstandard (e.g., the child’s hand or foot) and formal or standard (e.g., a ruler) units and tools.
- Help children to collect and organize information, and then teach them to represent that information graphically.
**FOLLOW DEVELOPMENTAL PROGRESSIONS**

**RECOMMENDATIONS #1 & #2**

- Developmental progression = natural sequence of skills / concepts
  - Recommendation #1 re: Number & Operations
  - Recommendation #2 re: Other 4 Domains of Math

- Observe children's current levels on the progression.

- Introduce opportunities to learn the skills and concepts that naturally develop next.

- Sample Learning Trajectories
  - (Building Blocks curriculum for all 5 domains of Math)
FOLLOW DEVELOPMENTAL PROGRESSIONS

RECOMMENDATION #3

- “Use progress monitoring to ensure that math instruction builds on what each child knows.”
- Use introductory activities, observations, and assessments to determine each child’s existing math knowledge, or the level of understanding or skill he or she has reached on a developmental progression.
- Tailor instruction to each child’s needs, and relate new ideas to his or her existing knowledge.
- Assess, record, and monitor each child’s progress so that instructional goals and methods can be adjusted as needed.
FOLLOW DEVELOPMENTAL PROGRESSIONS

RECOMMENDATION #3

- “Use progress monitoring to ensure that math instruction builds on what each child knows.”

YES – BOTH PROGRESSIONS / TRAJECTORIES AND STANDARDS!

FOLLOW DEVELOPMENTAL PROGRESSIONS

- Standards set expectations for grade level benchmarks.
- Trajectories emphasize the sequence of development.
- Trajectories also help educators challenge children who are already above the expected standard for the grade level.

References for research-based progressions:

TEACHING MATH TO YOUNG CHILDREN

PRACTICE GUIDE EMPHASES

• Follow Developmental Progressions (Recommendations 1-3)
• Live Math Daily (Recommendations 4&5)
  • “Teach children to view and describe their world mathematically.”
  • Use informal methods to represent math
  • Link with formal math vocabulary, symbols & procedures
  • Use open-ended questions to prompt applying math knowledge
  • Encourage recognition and discussion of everyday math
  • “Dedicate time each day to teaching math, and integrate math instruction throughout the school day.”
• Overall – daily instruction in a math rich environment with consistent routines and activities, emphasis across the curriculum, and practice opportunities via games

LIVE MATH DAILY

NOTICE MATH ALL AROUND YOU (RECOMMENDATION #4D)

• Math abounds, any place, any time!
• Start with the classroom opportunities to explore How many? What shape? What patterns? How big? How frequent?

LIVE MATH DAILY

NOTICE MATH ALL AROUND YOU (RECOMMENDATION #4D)

• Aim for automatic recognition and discussion of math.
• Practice early, often, at school and at home.
  • (Example re: Lucia’s Walk)
LIVE MATH DAILY
NOTICE MATH ALL AROUND YOU (RECOMMENDATION #4D)
• Try it YOURSELF!


LIVE MATH DAILY
NOTICE MATH ALL AROUND YOU (RECOMMENDATION #4D)
• Consider where you live and learn.


LIVE MATH DAILY
GO DEEPER VIA OPEN-ENDED QUESTIONS (RECOMMENDATION #4C)
• Aim to cultivate flexibility in solution strategies.
  • Focus on problems with multiple solutions.
  • Share alternate strategies for finding answers.
  • Try multiple representations.
  • Offer manipulatives that highlight diverse possibilities.
**LIVE MATH DAILY**

**EXPRESS MATH INFORMALLY (RECOMMENDATION #4A)**

- Begin with words, gestures, and other representations that are familiar to children based on what they naturally use to describe math ideas.

**INTEGRATE FORMAL VOCABULARY, SYMBOLS & PROCEDURES (REC #4B)**

- Gradually introduce the formal terms, symbols, and other representations as the children progress.
- Be sure to link informal and formal representations.

**PLAN DAILY INSTRUCTION (RECOMMENDATION #5A)**

- Introduce new topics to the whole group via circle time, story time, and again to small groups during teacher-led activities.
LIVE MATH DAILY
BUILD A MATH-RICH ENVIRONMENT (RECOMMENDATION #5D)

- Reinforce concepts and skills via open-ended explorations indoors and outdoors.

LIVE MATH DAILY
ESTABLISH CONSISTENT ROUTINES (RECOMMENDATION #5B)

- Build natural, spaced practice into the routines of the day, including circle time, as well as into the weekly schedule.
LIVE MATH DAILY
ESTABLISH CONSISTENT ROUTINES (RECOMMENDATION #5B)

- Build natural, spaced practice into the routines of the day, including circle time, as well as into the weekly schedule.

LIVE MATH DAILY
ESTABLISH FOCUSED ACTIVITIES (RECOMMENDATION #5B)

- Engage children in focused practice through structured individual and small group activities and learning centers.

LIVE MATH DAILY
ESTABLISH CONSISTENT ROUTINES & FOCUSED ACTIVITIES (REC #5B)

- Make the most of all the experiences by including discussion and reflection, which provides additional support for the child's learning AND evidence for the educator's progress monitoring.
LIVE MATH DAILY
REFLECTION RE: STRENGTHENING PRACTICE

- Now think about your age level and context. How can you strengthen the early math aspects of your …
  - Circle Time / Story Time?
  - Teacher-Led Activities?
  - Indoor Exploration?
  - Outdoor Exploration?
  - Daily Routines (entry, cleanup, snack, etc.)?
  - Weekly Routines?
  - Structured Activities / Learning Centers?
  - Monthly Specials?
  - Other Ideas?

LIVE MATH DAILY
PRACTICE MATH VIA GAMES (RECOMMENDATION #5E)

- Play games to automatize skills and refine strategies.
  - Research Example re: Color vs. Number Game

- Be sure to scaffold the play in ways that emphasize the particular skills and strategies you want the children to learn.
LIVE MATH DAILY
EMPHASIZE MATH ACROSS THE CURRICULUM (RECOMMENDATION #5C)

- The Math of Celebrations
  - Young children love celebrations, so consider highlighting math as they celebrate.
  - Our favorite is 100 Day!

- The Math of Collections
  - Young children love collections, so consider engaging them in both group collections based on your priorities and individual ones based on their interests.
  - Collections emphasizing citizenship and community might focus on sharing what we have with others.

- Collections emphasizing natural objects (organisms) or cultural artifacts (matter) invite scientific inquiry.
LIVE MATH DAILY
REFLECTION RE: STRENGTHENING PRACTICE

- The Math of Collections
  - Leaves from a Preschool Trees Unit
    - Number & Operations
      - Sort the leaves by species & Count each set.
    - Geometry
      - Identify the shapes of the leaves, particularly to draw the children’s attention to coniferous vs. deciduous types.
    - Patterns
      - Arrange the leaves to make patterns that repeat or grow.
  - Measurement
    - Arrange the leaves in order of size, cluster ft, in of points, etc.
  - Data Analysis
    - Sort the leaves in many different ways (as above) and record which groups have more, fewer, or the same number.

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LIVE MATH DAILY
EMPHASIZE MATH ACROSS THE CURRICULUM (RECOMMENDATION #5C)

- Math in ALL Units of Study
  - Go deeper with applying and integrating math concepts and skills by engaging children in meaningful exploration related to topics of study in the classroom.
  - One common example for the beginning of the year involves a study of Me and My Class, which fits with the social studies topics of identity, as well as the life science topic of human body.
  - Natural context for emphasizing Number & Operations, plus Measurement and Data Analysis regarding Names, Birthdays and Ages, Physical Characteristics, Families, Experiences, Preferences …
  - For all aspects, Observe -> Identify -> Synthesize -> Compare.
  - For advanced learners, extend comparison across classes or subgroups of classes.
  - Some possibilities for Geometry and Patterns.

LIVE MATH DAILY
EMPHASIZE MATH ACROSS THE CURRICULUM (RECOMMENDATION #5C)

- Me and My Class
  - Example of Eye Color re:
    - Observe -> Identify -> Synthesize -> Compare.
  - More independent Activity with Graphing for Kindergarten
LIVE MATH DAILY
EMPHASIZE MATH ACROSS THE CURRICULUM (RECOMMENDATION #5C)

- Me and My Class
  - Example of Birthday re: Identify -> Synthesize -> Compare.

LIVE MATH DAILY
REFLECTION RE: STRENGTHENING PRACTICE

- Me and My Class
  - How: Think about your age level and context. How might you engage your learners in an extended exploration regarding their...
    - Names?
    - Physical Characteristics?
    - Families?
    - Experiences?
    - Preferences?
    - Other ideas?

  - How might you incorporate Geometry and Patterns?

LIVE MATH DAILY
EMPHASIZE MATH ACROSS THE CURRICULUM (RECOMMENDATION #4C)

- Math in a Building Unit
  - The children were given the building blocks and challenged to build a house. They were given a set of rules to follow, including:
    - Use the building blocks to create a house.
    - Use the blocks to create a roof.
    - Use the blocks to create a door.
    - Use the blocks to create a window.
  - The children were given 10 minutes to build a house using the rules provided. The house was judged based on creativity and adherence to the rules.
  - How might you incorporate Geometry and Patterns?

...
LIVE MATH DAILY

REFLECTION RE: STRENGTHENING PRACTICE

- Math in All Units of Study
  - Be opportunistic and link math with units of study.
- Now think about your age level and context. Which of your other subjects would be most conducive to math explorations – Social Studies, Science, Literature, Arts?
  - Consider all 5 domains of math.
  - Start with introductory activities that fit with the expected developmental progressions for the time of year in which you plan to do the unit.
  - Remember to think in advance about the ways you can monitor children’s math progress so that you have documentation forms available to record individual data.

LIVE MATH DAILY

REFERENCES FOR TEACHING EARLY MATH

- NAEYC References
  - The Intentional Teacher: Choosing the Best Strategies for Young Children’s Learning (2009)
    - By Ann S. Epstein
    - About overall intentionality in teaching, with one chapter on Math
  - The Young Child and Mathematics (2nd Edition includes a DVD)
    - By Juanita V. Copley
  - Exploring Math & Science in Preschool (TYC Compilation, 2015)

TEACHING MATH TO YOUNG CHILDREN

REFLECTIONS ON TODAY’S SESSION

- What energizes you about the prospect of engaging children in more math explorations?
- What causes you to hesitate?
- What questions did the session raise for you?
Meaningful Math for Young Children

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Concept Areas of Math for Emphasis in Early Childhood

1) **Number & Operations** *(Arithmetic)*

Includes:
- Counting
- Comparing & Ordering Numbers
- Recognizing Number & Subitizing
  (visually perceiving the quantity)
- Composing and Decomposing Numbers
- Adding & Subtracting
- Multiplying & Dividing

2) **Patterns, Functions & Algebra**

Includes Identifying Patterns and Describing Change

3) **Geometry & Spatial Sense**

Includes:
- Recognizing & Forming Shapes
  (individually and in combination)
- Describing Locations, Directions, and Coordinates
- Transforming & Creating Symmetry
- Visualizing & Reasoning Spatially

4) **Measurement**

Includes both Comparing Attributes Using Units
and Specific Techniques & Tools

5) **Data Analysis & Probability** *(Statistics)*

Includes Classifying & Organizing Data Using Varied Representations, then Using the Information to Make Decisions
### Live Math Daily

**Name:**

**Grade Level Focus:**

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Number &amp; Operations</th>
<th>Geometry, Patterns, Measurement &amp; Data Analysis</th>
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<td>Other Ideas</td>
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</table>
Integration of Math Domains in Preschool and Kindergarten
Sample Opportunities, Books & Games from the CMU Children’s School

1) Number & Operations (Arithmetic)

3’s  Identifying numbers at centers, on the calendar, on the timer, etc.
     Counting friends, items at snack, steps, etc.
     Doing number puzzles
     Partitioning items for equal sharing

4’s  Counting days of school, up to 100, by 10’s, etc.
     Table setting practices one-to-one correspondence
     Guessing jar emphasizes estimation
     Recognizing and writing printed numbers for signs, labels, etc.

K  Being the Number Helper (Math Spinner)
    Experimenting with Bean Counters (different colors on each side,
     shake to see how many of each color you get, then write the
     equation 3 B plus 2 W = 5 beans)
    Exploring money and the relationships between coins

Book Samples:

Who’s Counting
Feast for 10
Two Ways to Count to Ten
One Hundred Hungry Ants
How Many is a Million?
How Many Legs in All
The Doorbell Rang
Two Greedy Bears

Game Samples:

Snail’s Pace Race
Number Bingo
Uno
Tip Top Tally

2) Patterns, Functions & Algebra

3’s  Noticing patterns on clothing, in the weather for the week, in stories or
     songs, in the routine of the day, etc.
     Predicting what will happen in a story, song, routine, etc. based on the
     pattern so far

4’s  Recognizing and extending simple patterns of objects, on the calendar,
     when stringing beads, etc.
     Noticing naturally occurring patterns on clothing, buildings, objects, but
also in nature
Playing games with patterns of children (e.g., sitting, standing, kneeling, sitting, standing …) and with patterns of actions (head, shoulders, knees & toes)

K Extending patterns to materials including classmates faces, theme-related materials, etc. with longer and more complex combinations of elements
Using computer art programs, such as KidPix, to explore and create graphic patterns

Book Samples:
What is the Pattern?
Posy’s Patterns
The Hungry Caterpillar
One, Two, Skip a Few

Game Samples:
Lacing Patterns
Memory Game Sets can be used for patterns (parent-child, front-back)
What’s Next? Puzzles emphasize patterns of change
Rivers, Roads & Rails

3) **Geometry & Spatial Sense**

3’s Cutting playdough shapes
Drawing or painting shapes
Making tracks with tape
Noticing shapes while building with blocks, magnet tiles, etc.
Emphasizing behind & in front of when lining up

4’s Putting puzzled together using visual strategies
Using clipboard with paper to draw constructions
Making designs with tangrams and other manipulatives
Mapping the classroom

K Emphasizing combining shapes to draw common objects
Creating symmetry in art (e.g., bilateral in totem pole, radial in “surround patterns”

Book Samples:
Bear in a Square
Right Down the Middle
Mapping Penny’s World

Game Samples:
Shapes Up
Castle Logic
Blokus
4) **Measurement**

3’s  Comparing people and objects by size  
Noticing cups that are full, half full, empty

4’s  Using measurement tools at the woodworking center  
Creating equal weight on a balance scale

K  Comparing distances by counting steps to get there  
Using unifix cubes to measure objects using standard units  
Beginning to emphasize time and timing

Book Samples:  
My First Look at Sizes  
How Do We Measure?  
Inch by Inch  
Measuring Penny

Game Samples:  
Tall Bird, Short Bird  
Measure for Treasures

5) **Data Analysis & Probability (Statistics)**

3’s  Sorting toys for storage (blocks vs. play food, different types & shapes of blocks)  
Learning who’s a 3’s friend vs. 4’s friend, blue vs. red room, etc.

4’s  Using graphing strategies to organize birthday, name length, family size, and other data about the friends in each class

K  Playing “How many in a Handful”  
Answering the Question of the Day, then comparing responses  
Being the Clipboard Helper – Take a Survey  
Graphing the weather each month and then keeping a record to compare months

Book Samples:  
Just Enough Carrots  
Is It Likely to Happen?  
It’s Probably Penny

Game Samples:  
Color & Shape Bingo  
Pet Hunt  
Guess Who
CMU Children’s School
Ideas for Family Math at Home

1) **Number & Operations (Arithmetic)**
2) **Patterns, Functions & Algebra**
3) **Geometry & Spatial Sense**
4) **Measurement**
5) **Data Analysis & Probability (Statistics)**

[NOTE: All five math domains can be emphasized in the context of each activity.]

**• Card Playing:** Concentration & Kings Corner Emphasize Multiple Skills
  1) Learn the sequence of numbers & face cards, count cards or matches, etc. (Play Who has More?).
  2) Alternate suits or colors.
  3) Recognize spades, hearts, clubs & diamonds.
  4) Arrange items by value, compare different decks by size, etc.
  5) Consider chances of getting a certain card (vs. rolling a certain number on a die for example).

**• Household Help**

**Table Setting:**
  1) Count the correct number of plates, utensils, etc.
  2) Find patterns in napkins, tablecloths, baskets, etc.
  3) Use spatial arrangement terms - above, next to, on top of, to the right of, etc.
  4) Notice size relations between multiple plates, forks, etc.
  5) After washing the dishes, sort everything and put it away!

**Laundry:**
  1) Count the items.
  2) Notice patterns in the fabric, match the pairs, etc.
  3) Identify shapes in the designs.
  4) Arrange items by size (also identifies whose they are).
  5) Sort items by type (also determines where they are stored).

**Recycling:**
  1) Count the items of paper, plastic, metal, etc.
  2) Notice patterns in the materials, consider changes in the materials when prepared for recycling, etc.
  3) Find the 3-dimensional shapes vs. 2-dimensional.
  4) Arrange items by size, weight, or weigh the recycling vs. the trash each week.
  5) Graph the weight of the recycled materials vs. the trash to find the patterns over time.

**• Cooking:**
  1) Count helpers, aprons, cups of ingredients, etc.
  1) Do operations with how much more do I need, multiplying a recipe,
dividing equal shares, etc.

2) Emphasize patterns in recipe steps (add, stir, add, stir) or in layering (such as with lasagna).

3) Notice shapes and symmetry of utensils (e.g., apple cutter, funnel).

3) Cut biscuits, make pancakes, etc. into shapes.

3) Combine shapes to make a larger object (e.g., pineapple turkey).

4) Use measuring spoons & cups, emphasizing the relative size.

4) Compare the size of bowls, utensils, etc.

4) Use a scale to weigh food & compare (e.g., weight of a lemon before & after squeezing).

4) Use the oven timer according to the recipe.

5) Sort ingredients by food groups.

5) Do taste tests and compare preferences, etc.

### Ideas for Family Math in the Neighborhood

- **Start a Collection:**

  1) Count the items in your collection.
  2) Arrange the items to make patterns that repeat or grow.
  3) Identify the shapes in your collection.
  4) Arrange the items in order of size, thickness, weight, etc.
  5) Sort the items in many different ways and record which groups have more, fewer, or the same number.

- **Play I Spy Math when Walking or Driving:**

  1) Find singles, pairs, triples, etc., as well as finding numerals on signs, license plate with 2’s in them, etc.
  2) Look for patterns on buildings (e.g., window, door, window, door or pillar, space, bench, space, pillar, space …). Also consider “growing or shrinking patterns”, such as 2 steps then 4 steps then 6 steps or 5 bricks then 4 bricks then 3 bricks, etc.
  3) Locate the shapes and symmetries in both natural and artificial objects
  4) Notice objects that are big & small, moving fast or slowly, that appear heavy or light, etc. and then estimate height, speed, weight, etc.
  5) Using a clipboard, keep a tally of the number of different color, type or size of vehicles, or any other items that can be categorized, and then make predictions about what you’re most likely to encounter next
## Meaningful Math for Young Children
### The Math of Collections

**Name:**

**Grade Level Focus:**

**Collection Type:**

<table>
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<tr>
<th>Math Opportunities</th>
<th>Typical Developmental Level for Introductory Activities</th>
<th>Possible Challenges for Advanced Students</th>
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<tbody>
<tr>
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<td><strong>Data Analysis</strong></td>
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## The Math of Me & My Class

### Math Opportunities

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<th>Characteristics to Count</th>
<th>Characteristics of Individuals</th>
<th>Type of Recording and Data Analysis</th>
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<td>Characteristics to Measure (and tools for doing so)</td>
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<tr>
<td>Ways to incorporate Geometry and Patterns</td>
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### Meaningful Math for Young Children

#### Math in All Units of Study

**Name:**

**Grade Level Focus:**

**Topic of Study:**

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<th>Affordances for Progress Monitoring</th>
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Director’s Corner: Math & Building

This year, we are intentionally emphasizing all five concept areas of math within our preschool and kindergarten curriculum, and we chose our whole school theme of BUILDING because it affords many opportunities to foster broad explorations of important mathematical concepts, both in terms of the children’s building with a variety of materials and in terms of learning about the buildings in our environment and how they are constructed.

During our Family Math discussion last week, we offered suggestions for emphasizing the mathematics involved in everyday activities like cooking, laundry, recycling, taking a drive or playing games. You can also help engage your children in noticing interesting mathematical features of their own constructions and the buildings surrounding them. In these ways, you will strengthen the foundations for their understanding of both mathematics and building.

Let me suggest that you start with your own home and neighborhood. Our architecture consultant for the unit, Kelly Lyons, suggests having a sketchbook or clipboard available so that children can record their observations. You could also use a digital camera and then discuss the photographs you take.

1) Number & Operations (Arithmetic)
• Includes counting, comparing & ordering, recognizing number & subitizing (visually perceiving the quantity), composing and decomposing numbers, adding & subtracting, and multiplying & dividing
• Count doors, windows, rooms, floors, etc. and then consider how many more there would be if you included your neighbor’s apartment or added another floor to your house.

2) Patterns, Functions & Algebra
• Includes identifying patterns and describing change
• Notice the pattern on a railing (post, space, spindle, space, post, etc.) or the pattern of alternating brick orientation, as well as whether any patterns change as the building gets taller.

3) Geometry & Spatial Sense
• Includes recognizing & forming shapes (individually and in combination), describing locations, directions, and coordinates, transforming & creating symmetry, visualizing & reasoning spatially
• Observe the overall shape of the building in which you live, as well as the component shapes of windows, roof, etc.; then consider the symmetries and the surroundings beside, in front of, behind …

4) Measurement
• Includes both comparing attributes using units and specific techniques & tools
• Consider relative sizes (taller, wider, etc.), weights, textures and strength of materials, etc.

5) Data Analysis & Probability (Statistics)
• Includes classifying & organizing data using varied representations, then using the information to make predictions & decisions
• Classify buildings in the neighborhood by type, size, surface material, function and notice patterns like more living spaces than restaurants, more materials appropriate for cold winter, etc.

Future newsletters will include more ideas for exploring building & buildings as a family. Enjoy!!