Guided Math in Kindergarten

National Council of Teachers of Mathematics Annual Meeting
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Presenters

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Points Discussed in this Presentation

- Culture of Math Workshop—Shared Philosophy, Different Teaching Styles
- 3 Elements of Our Shared Philosophy in Practice
  - ❖ Math is storytelling.
  - ❖ Kindergartners are powerful mathematicians.
  - ❖ Teaching is responsive to student learning.

Math Exchanges

1) Short, focused sessions that bring all mathematical minds together
2) Responsive to the needs of the specific group of mathematicians
3) Designed for meaningful, guided reflection

Resources

Carpenter, Thomas P., Elizabeth Fennema, Megan Loef Franke, and Linda Levi. 1999. *Children's Mathematics: Cognitively Guided Instruction.* Portsmouth, NH: Heinemann.

Devlin, Keith. 2000. *The Math Gene: How Mathematical Thinking Evolved and Why Numbers Are Like Gossip.* New York: Basic Books.

Johnston, Peter H. 2012. *Opening Minds: Using Language to Change Lives.* Portland, ME: Stenhouse.

Fosnot, Catherine Twomey and Maarten Dolk. 2001. *Young Mathematicians at Work: Constructing Number Sense, Addition and Subtraction.* Portsmouth, NH: Heinemann.

Omohundro Wedekind, Kassia. 2011 *Math Exchanges: Guiding Young Mathematicians in Small-Group Meetings.* Portland, ME: Stenhouse.

O'Neill, Daniela K., Michelle J. Pearce, and Jennifer L. Pick, "Preschool children's narratives and performance on the Peabody Individualized Achievement Test – Revised: Evidence of a relation between early narrative and later mathematical ability." http://www.arts.uwaterloo.ca/~doneill/papers/Storytelling%20and%20math.pdf

Promoting a Climate of Rigor, Inquiry, and Intimacy

As you reflect on what you want math workshop to look like, sound like, and feel like in your own classroom, this outline of the role of the teacher and the student in the math community may be helpful:

Teachers	Students
Identify themselves as mathematicians who are continually growing and learning	See teachers not as the source of all mathematical knowledge but as fellow mathematicians who are continuing to learn both inside and outside the workshop
Believe that all students are powerful mathematicians and treat them as such	Identify themselves as mathematicians who have valuable ideas to contribute to the field of mathematics
Create a predictable daily math workshop structure in which there is extended time for independent and collaborative exploration and application of mathematical ideas	Take responsibility for the independent and collaborative choices they make that will promote growth as mathematicians; feel a sense of purpose in their work
Facilitate learning and coach learners rather than view learners as "empty slates" to be written upon	View peers as valuable resources for greater mathematical understanding; view teachers as sources of mathematical collaboration rather than just the source of the "correct answer"
Teach important concepts in depth over a significant amount of time	Explore and apply important concepts throughout the math curriculum
Create time for small-group math exchanges, time in which groups of diverse mathematicians gather to problem solve collaboratively	Work with peers to understand, experiment with, and apply a variety of problem-solving strategies, and identify effective and efficient strategies
Present rich, contextually authentic problem solving to students	Realize the usefulness of math and extend their knowledge of and interest in math beyond the confines of the workshop
Create a culture of joyful rigor	Challenge themselves, take risks, and explore their own questions and wonderings
Facilitate rich reflection among students through discussion, sharing student work, and creating visual anchors of student thinking to which children and teachers can refer and which serve as footprints of learning	Understand, engage in, and grow from the collective work of the mathematical community

MATH WORKSHOP ESSENTIALS

	Week of: _____	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Link	SOL focus					
Engage & Educate	Opening (whole group)					
Engage & Educate	Focus Lesson (whole group)					
Active Learning	Small Group/ Individual Practice					
Active Learning	Guided Math (small group)					
Reflect	Reflection (whole, small or individual)					

- **This format is intended as an optional resource for planning in meeting the essential math workshop elements at Bailey's.**

Created by the Bailey's Elementary School for the Arts & Sciences Math Team 4/24/2012

MATH WORKSHOP ESSENTIALS (TIER 1)

The Math block needs to be at least 1 hour every day of the week (except for occasional interruptions beyond the teacher's control) with the following components:

Opening (Link) (5-10 minutes) – Time to engage your whole class in mathematical thinking. It may start by getting the students to work independently on a short warm-up, with specific goals for certain strategies. (i.e. problem of the day, math message, SOL type question, daily routine (count around the room), vocabulary development or a connection to previous lessons)

Focus Lesson (10-15 minutes) –This time sets the stage for the day's lesson. The lesson is always tied to a specific standard and launches students into a discovery of that standard or concept. (may include real life applications, questioning or the building of content)

Math Workshop/Centers (20-40 mins)

Small group/Individual Practice – Students are working in small groups, pairs, or independently on an effective mathematical task, Math Boxes, targeted games, story problems or in the math journal with the teacher walking around questioning for student understanding or working with students in Guided Math. Flexible groups and modified assignments provide opportunities for enrichment and remediation.

Guided Math - The teacher uses assessment data to identify focus for differentiated instruction for groups of students. The topic/concept should be based on student need. The topic can be the same (or different) for all groups, but focus points may differ. *Need not be 5 days/week.*

Reflection (5-10 minutes)- Student are sharing and/or solidifying their understanding of the concept/standard. This could be done in a whole group discussion, individual exit tickets, journal writing, carousel responses, or a think-pair-share.

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Figure 2.6 Classification of Word Problems

PROBLEM TYPE

JOIN	**Result Unknown** Connie had 5 marbles. Juan gave her 8 more marbles. How many marbles does Connie have altogether?	**Change Unknown** Connie has 5 marbles. How many more marbles does she need to have 13 marbles altogether?	**Start Unknown** Connie had some marbles. Juan gave her 5 more marbles. Now she has 13 marbles. How many marbles did Connie have to start with?
SEPARATE	**Result Unknown** Connie had 13 marbles. She gave 5 marbles to Juan. How many marbles does she have left?	**Change Unknown** Connie had 13 marbles. She gave some to Juan. Now she has 5 marbles left. How many marbles did Connie give Juan?	**Start Unknown** Connie had some marbles. She gave 5 to Juan. Now she has 8 marbles left. How many marbles did Connie have to start with?
PART-PART-WHOLE	**Whole Unknown** Connie has 5 red marbles and 8 blue marbles. How many marbles does she have?	**Part Unknown** Connie has 13 marbles. Five are red and the rest are blue. How many blue marbles does Connie have?	
COMPARE	**Difference Unknown** Connie has 13 marbles. Juan has 5 marbles. How many more marbles does Connie have than Juan?	**Compare Quantity Unknown** Juan has 5 marbles. Connie has 8 more than Juan. How many marbles does Connie have?	**Referent Set Unknown** Connie has 13 marbles. She has 5 more marbles than Juan. How many marbles does Juan have?
Multiplication and Division	**Multiplication** Connie has 4 bags. She put 5 marbles in each bag. How many marbles does Connie have?	**Measurement Division** Connie has 12 cookies. She wants to put 3 cookies on each plate. How many plates will she need?	**Partitive Division** Juan has 15 apples. He wants to put the same number of apples in each of his 5 baskets. How many apples will he put in each basket?

Adapted from: T.P.Carpenter, E.Fennema; M.L. Franke; L.Levi; S.B. Empson: *Children's Mathematics; Cognitively Guided Instruction*

CGI Workshop: Teachers Development Group

Kindergarten Problem Solving Assessment

Name _____ **Date** _____

Materials: Pictures for problems, Unifix cubes, number grid (0-50), paper and pen/pencil.

Join Separate Result Unknown

1) REED had 2 Legos. HEIDY gave him/her 5 more Legos. How many Legos does REED have now?

Score: ____

Separate Result Unknown

2) ALEJANDRO had 9 cookies. He ate 6 of them. How many cookies does ALEJANDRO have now?

Score: _____

Multiplication

3) We have 4 baskets. Ms. WEDEKIND puts 2 books in each basket. How many books do we have?

Score: _____

Join Change Unknown

4) I had 2 rocks. I picked up some more on the way home. Now I have 5. How many rocks did I pick up on the way home?

Score: _____

Total Points: _____/16

Scoring Rubric for Problem Solving Assessment:

0—No attempt, plays with materials, guesses/repeats number

1—Incorrect strategy (a strategy that doesn't make sense for problem type), incorrect answer

2—Uses a strategy that could result in correct answer, but either 1) doesn't get correct answer or 2) cannot explain answer

3—Uses a modeling strategy that results in a correct answer and can explain what he/she did

4—Uses multiple strategies or uses a more sophisticated strategy (counting, facts, derived facts, invented) to solve the problem