

Rocking and Rolling. Exploring Math with Infants and Toddlers: The Joys and Benefits of Math-Based Books and Language

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Ms. Luz and her coteacher, Ms. Andria, choose the book *One Duck Stuck* by Phyllis Root for their class of 2-year-olds. As Ms. Luz reads, she occasionally pauses and asks the children, “Do you see one duck stuck on this page?” Ms. Luz points to the duck and says, “Oh, that is one duck, and she is stuck!” When the story is done, Ms. Luz and Ms. Andria show the children a new game. They have laminated pictures of one and two ducks and taped the pictures to the floor. Ms. Luz points to the picture of one duck: “I see one duck! One!” She then looks at the picture of two ducks, pointing carefully to each duck: “One, two. I see two ducks!” She explains the game *One Duck* to the children: they will step or hop on each picture that has just one duck. The children laugh and quack as they hop on the one duck pictures.

At snack time, Ms. Luz asks the children if they want to start with one cracker or two crackers, and at closing circle, she asks the class if they want to sing their goodbye song one time or two times. When Ms. Luz and Ms. Andria first shared *One Duck Stuck* with the children a couple of weeks ago, they were inspired by the rhymes and thought of the book as a fun way

to foster phonological awareness. Now, they are pleasantly surprised to find that it works well for exploring the early math concepts of one and two.

Early math skills, like early language skills, develop through everyday interactions and experiences with teachers and families, as evidenced by the children in Ms. Luz and Ms. Andria's class. Building young children's understanding of early math is a growing field of research, especially when it comes to infants and toddlers. Still, there is much we already know about how to ensure that early childhood settings offer rich learning opportunities in all areas, including math.

Why focus on early math in the first five years of a child's life? Research finds that math skills at school entry are very strong predictors of overall school achievement (Duncan et al. 2007). However, it is important to keep in mind that children from low-income families generally "begin school with much less mathematical knowledge than their wealthier peers" (Siegler 2009, 118). This difference in math knowledge appears to result from less exposure to mathematical activities and language related to mathematics at home, in early education programs, and/or in caregiving settings (Siegler 2009). Exposure to math-based language may be especially important. For example, how frequently children hear number words throughout their early years predicts their understanding of the cardinal meaning of number words at 46 months old (Levine et al. 2010; Levine & Baillargeon 2016).

Using books as inspiration for nurturing children's early math language and understanding of math concepts is a natural fit for early education settings. Sharing stories like *One Duck Stuck* invites the use of math language. Even better, extending a book's math concepts into enjoyable activities and routines, as Ms. Luz and Ms. Andria did, helps children master words and concepts through repeated practice, consistent use of language, and engaging activities.

There are six domains of early math: (1) number concepts and counting; (2) calculations (adding and subtracting); (3) spatial awareness; (4) patterns; (5) measurement; and (6) shapes. (For more information and videos on each of the six domains, visit www.zerotothree.org/earlymath.)

While counting and shapes books are common in infant and toddler settings, some of the other math concepts may seem beyond the abilities of very young children. But if you think of early addition, for example, as the idea of "one more," you will find many

opportunities for exploring *more* in the infant and toddler setting (at mealtime, ask “Do you want more milk?” or “Do you want one more cracker?”). Even before a year, some infants use the sign for *more* and understand its meaning.

Teachers often explore spatial awareness through activities that build on young children’s growing abilities to recognize and match shapes, such as comparing the different shapes and sizes of objects. But spatial awareness can also be nurtured by introducing position language, such as *in*, *on*, *next to*, *on top of*, *below*, *behind*, and *in front of*. Dressing children is just one of many great opportunities during the day to use phrases with spatial words, such as “I’m putting your diaper *on*” and “I’m going to pull your hat *over* your ears.” Early educators can also intentionally use spatial language when narrating children’s activities in a caregiving setting: “You’re putting the block *on the very top*,” “You are standing *next to* Hayley.”

Patterns are found in many stories, songs, and rhymes, and they emerge through children’s exploration of materials (for example, “You put the blocks in a special order—blue, red, blue, red.”). Adults can also observe patterns in children’s environments: “Look at your shirt; I see a yellow stripe, a blue stripe, and another yellow stripe.”

Using math language helps children begin to develop foundational understandings they will build on in preschool and beyond.

Measurement is a complex concept, but there are many opportunities for using measurement descriptions with young children: “How *big* is the baby? SO big!” “Look at my shoes; they are *bigger* than yours.” “The oatmeal is too *hot* to eat; let’s blow on it.” “Those are *heavy* blocks you are carrying!” Using math language helps children begin to develop foundational understandings they will build on in preschool and beyond.

Think about it

- What were your experiences with math in school? Starting with your own beliefs and feelings about math instruction is important, as most early educators report feeling confident about teaching language and literacy topics but less confident teaching math topics (Gerde et al. 2017).
- How frequently do you introduce math-based activities to children? What have been some successes? Lessons learned?

- What types of math language do you currently use with children? What types of math language and specific math words could you use more of during daily routines?

Try it

- Ask a colleague or coteacher to observe you at a few specific times during the day and keep track of the math language you use with children. What types of math language did you use? Are there opportunities to expose children to more, and different, kinds of math language?
- As you plan your week, choose a story that touches on a domain of early math. (See “Books that Address Early Math.”) Identify and preteach any vocabulary related to the targeted math concept. Think about how to extend this concept through a play-based activity with children.
- Choose a daily routine and think about how you might use math language as you complete it with children. Write the words you have selected on an index card and post it somewhere visible to remind yourself to try using this vocabulary.

While adults recognize these activities and concepts as early math, children simply experience them as joyful play. With caring educators as guides, children develop the foundations of math concepts that position them for success in school and beyond, preparing them to enter a world that is increasingly reliant on math, science, and technology.

Books that Address Early Math

Number Concepts and Calculations:

Concept of more:

More, More, More Said the Baby,

by Vera B. Williams (1990)

Number 1:

One Duck Stuck, by Phyllis Root, illus. by Jane Chapman (2001)

Number 2:

Two of Everything,

by Lily Toy Hong (1993)

Number 3:

The Three Bears,

by Paul Galdone (1972)

The Three Little Pigs,

by Patricia Seibert, illus. by

Horacio Elena (2002)

The Three Billy Goats Gruff,

by Jerry Pinkney (2017)

Three Little Kittens,

by Paul Galdone (1986)

Counting beyond 3:

One, Two, Three!,

by Sandra Boynton (1993)

Quack and Count,

by Keith Baker (1999)

How Do Dinosaurs Count to Ten?,

by Jane Yolen, illus. by Mark Teague (2004)

One Gorilla: A Counting Book,

by Anthony Browne (2015)

Ten Tiny Babies,

by Karen Katz (2008)

Ten Black Dots, by Donald Crews (1968)

Ten Flashing Fireflies,
by Philemon Sturges, illus. by Anna Vojtech (1997)

Rooster's Off to See the World,
by Eric Carle (1972)

Spatial Awareness:

Rosie's Walk,
by Pat Hutchins (1968)

Up, Down, and Around,
by Nadine Bernard Westcott, illus. by Katherine Ayers (2008)

Piggies in the Pumpkin Patch,
by Mary Peterson and Jennifer Rofe (2010)

Over, Under & Through,
by Tana Hoban (1973)

The Berenstain Bears Inside Outside Upside Down,
by Stan Berenstain, illus. by Jan Berenstain (1968)

Shapes:

Mouse Shapes,
by Ellen Stoll Walsh (2001)

Perfect Square,
by Michael Hall (2011)

Round Is a Mooncake: A Book of Shapes,
by Roseanne Thong, illus. by Grace Lin (2000)

Round Is a Tortilla: A Book of Shapes,
by Roseanne Thong, illus. by John Parra (2013)

Shapes, Shapes, Shapes,
by Tana Hoban (1986)

Skippyjon Jones Shape Up,
by Judy Schachner (2008)

Measurement:

You Are (Not) Small,
by Anna Kang, illus. by Christopher Weyant (2014)

Actual Size,
by Steve Jenkins (2004)

Big Bug,
by Henry Cole (2014)

Just a Little Bit,
by Ann Tompert, illus. by Lynn Munsinger (1993)

How Big is the Lion? My First Book of Measuring,
by William Accorsi (2010)

Patterns:

Who Sank the Boat?,
by Pamela Allen (1982)

The Napping House,
by Audrey Wood, illus. by Don Wood (1984)

Goodnight Moon,
by Margaret Wise Brown, illus. by Clement Hurd (1947)

Brown Bear, Brown Bear, What Do You See?,
by Bill Martin Jr. and Eric Carle (1967)