

Get the Picture: Connecting Young Children to Mathematics Through Books

Eula Ewing Monroe-Brigham Young University, Emeritus, Eula.Monroe@gmail.com

Carrie S. Cutler-University of Houston, carriecutler@hotmail.com

NCTM Annual Conference, April 2018

Why Use Books in Math?

- Books with contexts rich in number, measurement, geometry, and problem solving connect to children's interests, prior knowledge, and new schema for mathematics content, vocabulary, and processes.
- Young children don't differentiate between math time and reading time.

Using Literature Improves Young Children's:

- Mathematical understanding (Casey, Kersh, & Young 2004; Marston, Muir, & Livy 2013; van den Heuvel-Panhuizen, Elia, & Robitzsch 2016)
- Mathematical vocabulary (Roskos & Burstein 2011; Anderson, Anderson, & Shapiro, 2005)
- Discourse (Hojnoski, Columba, and Polignano 2014)
- Subitizing (Anderson, 1997)
- Measurement (van den Heuvel-Panhuizen & Elia 2011)
- Geometry (Skoumpourdi & Mpakopoulou 2011)
- Classification (Hong 1996)
- Numeracy (Young-Loveridge 2004)
- Cognitive-mathematical thinking (Elia, van den Heuvel-Panhuizen, & Georgiou 2010)
- Cognitive engagement (van den Heuvel-Panhuizen & van den Boogaard 2008)

Book Titles, Mathematics Concepts, and Teaching Suggestions

Source: "Get the Picture: Connecting Young Children to Mathematics through Books," by Carrie Cutler, in *Deepening Children's Mathematical Understanding with Children's Literature* Monroe, Young, Fuentes, Dials (Eds.), NCTM, forthcoming

Suggested Books to Teach and Practice Counting

Book	Brief Summary	Mathematics Teaching Idea
Bajaj, Varsha. <i>How Many Kisses Do You Want Tonight?</i> illust. Ivan Bates. New York: LB Kids, 2007.	COUNTING SEQUENCE This book counts from 1 to 10 as animal children request bedtime kisses from their parents. Readers might be surprised by the number of kisses requested by the human children in the story.	Children put bright colored lip balm on their lips, kiss an index card, and count the kisses.
Franco, Betsy. <i>Zero Is the Leaves on the Tree.</i> illus. Shino Arihara. Berkeley: Tricycle Press, 2009.	This book shows the concept of zero: the absence of sound when a snowflake lands or the empty bike rack when school is over for summer.	Send children on a classroom hunt for items easily counted (e.g., chairs). Count these. Then ask them to identify something that would be counted as 0 in their classroom (e.g., tigers)
Hindley, Judy. <i>Eyes, Nose, Fingers and Toes: A First Book All About You</i> , illus. Brita Granström. Cambridge, MA: Candlewick, 1999.	Using rhyme and large graphic illustration, this book shows the purposes for different body parts.	Point out body parts that are singles, pairs, and other sets. Count the children's noses, eyes, and fingers. Play "Simon says" with counting instructions (e.g., clap your hands 3 times; stomp your left foot 5 times.)
Gayzagian, Doris K., <i>One White Wishing Stone: A Beach Day Counting Book</i> , illus. Kristina Swarner. Washington, DC: National Geographic, 2006.	A girl gathers items at the beach to decorate her sand castle. Waves wash away her castle, but she saves a few treasures to take home.	Fill the sensory table with sand and hide beach-themed objects in it (e.g., small shells, pebbles, feathers). Have children find the items and count them, then use them to decorate a sand castle art project made by adding sand to poster paint.

Jay, Alison. <i>1 2 3: A Child's First Counting Book</i> . New York, NY: Dutton children's Books, 2007.	Illustrated with scenes from familiar fairy tales, this book counts from 1 to 10 and back again and connects mathematics to stories children know well.	Identify numbers in favorite nursery rhymes and fairy tales. Make a class book called <i>Numbers in Nursery Rhymes</i> .
Maloney, Peter, and Felicia Zekauskas. <i>One Foot Two Feet: An Exceptional Counting Book</i> . New York: G.P. Putnam's Sons, 2011.	This counting sequence has a twist: a die-cut window framing a single object that, when the page turns, becomes a common irregular plural noun (e.g., mice, dice, oxen or octopi).	Have children make mice by pressing their thumb onto an ink pad and adding ears, eyes, and tail with a marker. Children can count to see how many mice fit on an index card.
Rubinger, Ami. <i>Dog Number 1. Dog Number 10</i> . New York: Abbeville Kids, 2011.	During a read aloud, preschoolers can call out the missing numbers in this rhymed counting book.	Make up a rhyme that children complete using a number: for example, A dog like me can itch a flea. I am dog number ____.
Carle, Eric. <i>Ten Little Rubber Ducks</i> . New York: Harper Collins, 2005.	ORDINAL NUMBERS Based on a true story, ten ducks fall from a ship during a storm and drift off in different directions.	With string mark a finish line across the end of the sensory table. Add water and rubber ducks. With straws children blow the ducks toward the finish line. Note which duck crosses first, second, third, etc.
Larios, Julie Hofstrand. <i>On the Stairs</i> , illus. Mary Hofstrand. Ashville, NC: Front Street, 1999.	Rhyming text introduces twelve activities mouse siblings do on the steps leading to the second floor of their home.	Children describe favorite activities they can do in a certain order. Make a rebus story to show the sequence.
Martin, Bill, Jr. <i>Ten Little Caterpillars</i> , illus. Lois Ehlert. New York: Beach Lane Books, 2011.	The first through ninth caterpillars make their way across a garden, but the tenth caterpillar climbs a tree and waits patiently for something amazing to happen.	Write the ordinal numbers on clothespins. Children color caterpillars to match those in the book, then hang them on a clothesline with the clothespins matching their order in the story.
Robinson, Michelle. <i>How to Wash a Woolly Mammoth</i> , illus. Kate Hindley. New York: Henry Holt, 2013.	Follow ten steps to a sparkling clean woolly mammoth.	Children re-word the text replacing Step 1 with <i>first</i> , Step 2 with <i>second</i> etc. They create their own step-by-step process for a familiar activity like getting ready for bed or making a sandwich.

Books Recommended for Teaching About Shapes

Book	Brief Summary	Mathematics Teaching Idea
Bertier, Anne. <i>Wednesday</i> . New York: Enchanted Lion Books, 2014.	GEOMETRIC SHAPES Friends Little Round and Big Square decompose and join together to make interesting images.	Help children cut apart circles and squares to make designs. Glue the shapes onto paper, laminate, and use to illustrate a class book.

Carter, David, A. <i>Whoo? Whoo?</i> New York: Simon and Schuster, 2007.	Children lift flaps of cut-out shapes to discover animals made from them.	Children use pattern blocks or tangrams to create animal shapes.
Hall, Michael. <i>Perfect Square</i> . New York: Greenwillow Books, 2011.	A square transforms into a variety of creative pictures including a fountain, a park, a garden, and a mountain.	Give children paper shapes to combine in interesting ways to create designs. Have children glue their favorite designs to paper and make a class book.
Intriago, Patricia. <i>Dot</i> . New York: Margaret Ferguson Books, 2011.	A single dot can convey unique messages by simple manipulation. It can look yummy or yucky, heavy or light, and more.	Children create dot pictures that convey messages (e.g., excited and bored or high and low.)
Light, Steve. <i>Have You Seen My Monster?</i> Cambridge, MA: Candlewick Press, 2015.	Shapes of all sorts (including nonagons and heptagons) appear at the fair. But where is the monster?	Children use stickers to label shapes found in the environment—dot stickers for circles, square sticky notes for squares, rectangular sticky notes for rectangles.
Schoonmaker, Elizabeth. <i>Square Cat</i> . New York: Aladdin, 2011.	Eula, a square cat, feels out of place in a world of donuts and hoop earrings. She learns that being different is not necessarily a bad thing.	Ask “What if there were no circles?” Children can draw a picture or describe what bicycles or cars would look like.
George, Lindsay Barrett. <i>Inside Mouse. Outside Mouse</i> . New York, NY: Greenwillow Books, 2004.	POSITIONAL WORDS Two mice live in different environments (inside and outside) of a house but share similar behaviors.	Children use stuffed animals or felt pieces to act out the movements of the mice in the story. Emphasize the positional words.
Redding, Sue. <i>Up Above & Down Below</i> . San Francisco: Chronicle Books, 2006.	Rhyming text reveals the animal and human inhabitants in varied environments. Dogs go for a stroll above the subway lines and scarecrows keep guard above a rabbit family’s burrow.	Children go on a scavenger hunt to find out what is (a) above the sink, (b) under the teacher’s desk, (c) inside the filing cabinet drawer, (d) outside the school’s front door, and (e) on top of the playground slide. At the last stop there is a surprise such as a treat or book to be read.
Schaefer, Lola M. <i>What’s Up, What’s Down?</i> illus. Barbara Bash. New York: Greenwillow Books, 2002.	Children take the perspective of different animals as they look up (as if they were a mole) and down (as if they were a bird) to view the world.	Have children sit under a table, look up and tell what they see, then sit at the top of the playground slide, look down and tell what they see. Have children discuss how their perspective changes with different views.

Books and Activities that Teach and Practice Measurement

Book	Brief Summary	Mathematics Teaching Idea
	MEASUREMENT TERMS (fast, slow, large, small)	

Kang, Anna. <i>You are Not Small</i> , illus. Christopher Weyant. Seattle, WA: Two Lions, 2014.	Two creatures debate their size in relation to each other and to a larger group of creatures.	Using a paper creature like the one in the book, have children find and share examples of classroom objects that are bigger and smaller: "This ___ is bigger/ smaller than the creature."
Krauss, Ruth. <i>The Growing Story</i> , illus. Helen Oxenbury. New York: Harper Collins, 2007.	A little boy notices how he and his pet animals are growing at different rates. The puppy and chicks are full grown very quickly compared to the boy.	Measure the children at the beginning and end of the year. Have parents send baby and current photos of the children and match them.
Marlow, Layn. <i>Hurry Up and Slow Down</i> . New York: Holiday House, 2008.	In a twist on the familiar tale, this time Hare is the one who slows down—for a bedtime story read by Tortoise.	Ask children what they like to do quickly and slowly. Make a t-chart of their ideas.
Jenkins, Steve. <i>Actual Size</i> . New York: HMH Books for Young Readers, 2011.	LINEAR MEASUREMENT The engaging illustrations and foldouts in this book help children make size comparisons as they learn the actual sizes of some unusual animals and their body parts.	Cut pieces of ribbon, yarn, or paper to the lengths of some of the animals in the book and label them. Put in order from longest to shortest.
MacKay, Elly. <i>If You Hold a Seed</i> . Philadelphia, PA: Running Press Kids, 2013.	Collage artwork illustrates how a tree grows from a seedling to a place generations of children can enjoy.	With creative movement children act out a seed being planted and covered with soil; sun and rain beating down; the tree sprouting roots, growing upward, and dropping fruit to the ground. Discuss sizes of seed, seedling, and tree.
Schafer, Susan. <i>Where's My Tail</i> . Tarrytown, NY: Marshall Cavendish, 2005.	A lizard loses his tail and begins noticing the sizes of his animal friends' tails.	Children cut yarn to the length of tail they would like to have. As a group, order the tails from longest to shortest.
Zane, Alexander. <i>The Wheels on the Race Car</i> , illus. James Warhola. New York: Orchard Street Press, 2005.	Animals zoom around a racetrack at a lyrical pace, mirroring "The Wheels on the Bus."	Have a race with wind-up toys. Use nonstandard units to measure the distance each toy goes with three twists of the mechanism.
Hyatt, Robyn. <i>I Live in Your Shoe</i> . Luxembourg: CreateSpace Independent Publishing, 2016.	CAPACITY Sally the spider lives in shoes of different sizes.	How many spiders might fit in a shoe? Children fill their shoe with cubes and count how many it holds.
Schubert, Ingrid, and Dieter Schubert. <i>There's Always Room for One More</i> . Asheville, NC: Front Street, 2001.	Beaver builds a boat. As his friends join him, the boat sinks deeper with each new passenger.	Children form boats out of heavy-duty tinfoil and place them in a water-filled pan or sensory table. They count and place counters in the boat until it goes down.
	WEIGHT	

Bracken, Beth. <i>Too Shy for Show-and-Tell</i> , illus. Jennifer A. Bell. North Mankato, MN: Picture Window Books, 2012.	Sam is nervous about speaking in front of his class but overcomes his fears in time for show-and-tell.	Children bring an item from home for show-and-tell. Each child finds a classmate with an item that is heavier, lighter, longer, or shorter than hers or his.
Walsh, Ellen Stoll. <i>Balancing Act</i> . New York: Beach Lane Books, 2010.	Two mice have fun balancing on a teeter-totter until their friends arrive. Can they make more room, or will they all fall?	Children use the pan balance to explore weight and equality. Emphasize terms such as <i>heavier</i> , <i>lighter</i> , and <i>equal</i> .
Willems, Mo. <i>A Big Guy Took My Ball</i> . New York: Disney Hyperion, 2013.	A big guy takes Piggie's ball. Gerald the elephant is big, but is he big enough to get Piggie's ball back? The duo decides sharing the ball with their new friend is a better solution.	The words <i>heavier</i> or <i>lighter</i> can help children understand some aspects of <i>big</i> . Have them place an item such as a bottle of glue on one side of a pan balance and use the balance to find objects that are heavier or lighter.
DePaola, Tomie. <i>Pancakes for Breakfast</i> . Orlando, FL: Harcourt Brace, 1978.	PASSAGE OF TIME A series of difficulties challenge a hungry woman who is determined to make a tasty breakfast.	Draw a timeline to show the events in the story. Discuss what happened <i>before</i> the woman churned the butter and <i>after</i> she gathered all the ingredients.
Hutchins, Hazel. <i>A Second is a Hiccup</i> , illus. Kady MacDonald Denton. New York: Arthur A. Levine Books, 2007.	Time is described in child-friendly terms: "A second is a hiccup—"The time it takes to kiss your mom." A minute is long enough to "sing just one small song." In an hour, you could build a sandcastle, run through a sprinkler, climb a tree, and play pretend.	Have children experience activities for one minute. Record how many times they can jump, walk to the classroom door and back, and put together a puzzle.
Katz, Karen. <i>Rosie Goes to Preschool</i> . New York: Schwartz & Wade, 2015.	Rosie follows the preschool routines and schedule with ease and confidence.	Take pictures of children doing various classroom activities. Have them place the photos in order for the daily class schedule.
Lamb, Albert. <i>Tell Me the Day Backwards</i> , illus. David McPhail. Somerville, MA: Candlewick Press, 2011.	Timmy Bear and his mama and papa had a busy first day after waking from winter hibernation. They relate the day's events in reverse order, trying to recall "what happened before that?"	Relate the events of your own day in reverse order. Rearrange the classroom schedule in reverse order. What comes before lunch? What comes after lunch?
Seeger, Laura Vaccaro. <i>First the Egg</i> . New York: Roaring Brook Press, 2007.	Clever die cuts deliver a string of first-then creations including frogs, flowers, butterflies, pictures, and stories.	Make a set of first-then creations similar to those in the book. Have children match the sets and identify how time passing affects living and nonliving things.

Picture Books and Suggestions for Working with Patterns and Classification

Book	Brief Summary	Mathematics Teaching Idea
	CLASSIFYING	
Gabriel, Andrea. <i>My Favorite Bear</i> . Watertown, MA: Charlesbridge, 2003.	A mama bear tucks her baby in bed as she describes the eight species of bears around the world.	Survey the class about favorite animals (or species). Make a bar graph and discuss the data using terms like <i>most</i> , <i>least</i> , and <i>same number</i> .
Gill, Deirdre. <i>Outside</i> . New York: Houghton Mifflin Harcourt, 2014.	For many children, a snowy day means staying inside. But the boy in this book finds much to do outside by using his imagination.	Label half a sheet of paper “inside” and the other half “outside” Children cut and paste pictures to show activities for each side.
Gravett, Emily. <i>Orange Pear Apple Bear</i> . New York: Simon and Schuster, 2005.	This book re-orders only five words to tell a simple and charming story.	Use die-cut shapes (orange, pear, apple, and bear) to recreate the story and look for patterns in the text.
Hines, Anna Grossnickle. <i>Whose Shoes?</i> illus. LeUyen Pham. San Diego, CA: Harcourt Brace Jovanovich, 2001.	The mouse in this book tries on lots of different shoes before she finds the perfect pair for her to wear. The lift-the-flap format allows children to predict who might be the owner of the shoes.	Set up a shoe store in the social-dramatic play center. Children sort socks, shoes, boxes, money, purses, and wallets for customers of all ages and sizes.
Pinto, Sara. <i>Apples & Oranges: Going Bananas with Pairs</i> . New York: Bloomsbury U.S.A. Children’s Books, 2008.	How are a spoon and a fork alike? They do not dance ballet. This book presents classification in new and funny ways.	Children cut pictures from magazines of items that seem to go together, then dictate a funny punchline for each pair.
Seeger, Laura Vaccaro. <i>Green</i> . New York: Roaring Brook Press, 2012.	This engineered book with window cutouts showcases many shades of green.	Provide children with a collection of objects to sort that come in many shades. Fabric scraps, shells, rocks, or buttons work well.
	PATTERNS	
Lottridge, Celia Barker. <i>One Watermelon Seed</i> , illus. Karen Patkau. Markham, Ontario: Fitzhenry & Whiteside, 2012.	Readers count from 1 to 10 as Max and Josephine plant their garden then by 10s as the watermelon, eggplants, beans, tomatoes, and other foods are picked.	Have children identify the skip counting pattern of tens in the book, and color the tens on the hundreds chart. Challenge children to find other patterns on the hundreds chart and color them as well.
Newton, Jill. <i>Crash Bang Donkey!</i> Morton Grove, IL: Albert Whitman & Company, 2010.	Donkey makes a lot of noise playing his instruments. He annoys the entire farm until the farmer and the other animals realize his music scares crows out of the corn field.	Use oatmeal canisters, covered plastic cups filled with rice, and other homemade instruments to make a class band. Put a different color of sticker on each instrument. Create a pattern using the same kinds of stickers. Play the pattern.
O’Connor, Jane. <i>Ready, Set, Skip!</i> illus. Ann James. New York: Viking, 2007.	A girl leaps, creeps, twirls, and skates. But can she learn to skip?	Incorporate movement by having children create pattern dances: for example, “leap, twirl, hop” or “kick, clap, clap.”

Books to Promote Problem Solving and Logical Reasoning Experience

Book	Brief Summary	Mathematics Teaching Idea
	PROBLEM SOLVING AND REASONING	
Bunting, Eve. <i>Whose Shoe?</i> illus. Sergio Ruzzier. New York: Clarion Books, 2015.	Rhymed text follows a determined mouse on his journey to find the owner of a lost shoe.	Help children use the process of elimination to identify an object by its attributes. Display a variety of shoes like those from the book, describe one, and have the children find it.
Géser, Gretchen. <i>One Bright Ring</i> . New York: Henry Holt and Company, 2013.	When a girl sees a man drop a diamond ring, she encounters many numbered obstacles as she attempts to track down the owner before he finishes his proposal.	Rewrite the story with different obstacles or a different lost object.
Judge, Lita. <i>Pennies for Elephants</i> . New York: Hyperion Books, 2009.	Based on actual events that occurred in Boston in 1914, the children in the story work to raise money to help the city pay for three new elephants for the zoo. From shoveling snow to forgoing movies, the children sacrifice and work so elephants can be permanent residents at the zoo.	Ask children to imagine a problem that requires raising money and brainstorm things they could do to earn money or donations.
Rayner, Catherine. <i>Abigail</i> . Wilton, CT: Tiger Tales Books, 2013.	In this engineered book, a giraffe tries to count her friends' spots and stripes, but they just will not stand still. Abigail uses creative problem solving to count everything up.	Ask children to write an alternative ending for the book. They may act out the new ending wearing animal masks.
Rayner, Catherine. <i>Ernest, The Moose Who Doesn't Fit</i> . New York: Farrar, Straus and Giroux, 2010.	A moose is too large to fit in this book, but his friend helps him solve the problem by designing a fold-out page just for Ernest.	Show children a shoebox, crayon box, and cereal box. Brainstorm objects that are too big to fit in one box but would fit in another. Put toys, stuffed animals, or other objects in the boxes where they fit.
Tullet, Hervé. <i>Press Here</i> . San Francisco, CA: Chronicle Books, 2011.	Children learn cause and effect by tapping on the multi-colored dots and tilting the book to make changes to the illustrations (ideal for small groups).	Children can create their own if-then books.

How to Prepare Take-Home Bags

1. Choose a high-quality mathematics picture book. 2. Suggest simple hands-on activities with few materials. 3. Set up a check-out system that works for you. Note: This is one way to get books and mathematics into the homes of low-income families.

Mathical Book Prize - www.mathicalbooks.org --Use as a source of high-quality titles. Awarded by the **Mathematical Sciences Research Institute (MSRI)**, in partnership with the **National Council of Teachers of English (NCTE)** and the **National Council of Teachers of Mathematics (NCTM)**, and in coordination with the **Children's Book Council (CBC)**.