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Message from Rhian

Dear colleagues,

This spring brings another change of seasons filled with progress to celebrate—the engagement with the DAP position statement and book—as well as continued resilience and adaptability due to the COVID-19 pandemic.

It is a season of change for NAEYC too. At the end of April, after nine years, I will be stepping down as CEO. We have accomplished transformative work together: overhauling our affiliate network and membership structure, streamlining early learning program accreditation, and adjusting how we publish, including a set of themed articles in *TYC* (in this issue it's math!). NAEYC has expanded its policy and advocacy footprint—making NAEYC and our affiliates decisive leaders at state houses and in Washington, DC.

The Unifying Framework for the Early Childhood Education Profession has the potential to fundamentally transform the structure of the early childhood education system—centering early childhood educators as the most essential component and finally recognizing you with practice autonomy, professional salaries, health insurance, and retirement benefits. Our focused work on equity, building on decades of work that came before us, is decisive and unequivocal, but approached with humility in confronting our progress and shortcomings. Finally, building on NAEYC's core strengths sit our new or revised position statements: "Advancing Equity in Early Childhood Education," "Developmentally Appropriate Practice," and "Professional Standards and Competencies for Early Childhood Educators." Most importantly, my heart is full of gratitude for the lifetime of friendships I have made and the extraordinary colleagues I have had the privilege to work alongside. Know that the work you do, each and every day, is the backbone to children's healthy development and learning, our country's vitality, and civic and economic well-being. Never doubt that it deserves the professional recognition we each continue to fight for.

Changes can be big and small. As early childhood educators, we're always reflecting on what is working and what we might adjust. In this issue of *Teaching Young Children*, learn about how to make changes big and small to the early math learning in your setting.

Continue to learn more about math and other areas of early childhood education through NAEYC's position statements and books. We hope to see you at an upcoming, in-person conference such as the 2022 Professional Learning Institute, June 7-10. Come to Cleveland, Ohio, to connect with other professionals, explore and expand your practices, and revitalize your passion for the field. Visit NAEYC.org/events/ institute to register. We hope to see you there!

Onward!

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Rhian Evans Allvin *Chief Executive Officer*

Message from the TYC Editorial Team

How can we make math meaningful, engaging, and playful for young children? How can we as early childhood educators develop confidence in our math knowledge?

This issue of *Teaching Young Children* is packed with answers to these questions, with recommended activities and materials adaptable to your setting. You'll read about number composition, spatial orientation, and integrating math and literacy. You'll also learn about growing as a math educator and more.

A calendar of upcoming events and NAEYC highlights can be found online at **NAEYC.org/tyc/spring2022**.

Reflection Questions from This Issue

- As you read about ways to grow as an early math educator, what do you already feel confident in teaching? What steps can you take to develop further as an early math teacher?
- 2. Are you currently using picture books to integrate math and literacy? What is one new way you can use children's books to offer rich math experiences and explore children's identities?
- 3. Consider the ways you are engaging with families around math. What would you like to continue to do, and what might you change so that families are partners in offering playful math experiences in the classroom and at home?

Feature Teacher

Curti Dunmore is a preschool teacher at Egenolf Early Childhood Center in Elizabeth, New Jersey. She has been an early childhood educator for more than 16 years.

What is most important in your classroom?

Kindness is most important in my classroom: kindness to oneself, kindness to others, and kindness to the environment. We role-play and model scenarios to help the children learn different ways to express themselves, even when they may not feel like being kind. For example, I used puppets to act out a scenario in which sharing was an issue. The puppets demonstrated ways to communicate, problem solve, and determine possible solutions. After role-playing, I like to follow up with a book related to the issue. Children need to be shown that there are many ways to solve a problem and that it can be done respectfully and with kindness.

My teaching style is . . .

Inclusive: In my classroom, everybody counts. Everybody is a valuable member of our classroom community, and everyone is included. We celebrate diversity daily and embrace the beauty of other cultures. It is important to me that children know that we are stronger and better when we work together.

Engaging: Learning should be an adventure. I try my best to create learning experiences that engage children in every way possible. I want them to be able to use all their senses and their minds when learning. When children are actively engaged, they are learning.

Empowering: I want children to all walk away from my class feeling and knowing that they are intelligent, capable, and valuable, that I believe in them, and that they can do anything if they try.

How does math connect to your work with young children?

Math is all around us. It is a subject area that you will use for the rest of your life in endless scenarios. As a teacher of young children, I find it is important to make math engaging and relevant. We incorporate math concepts and skills right into our daily classroom activities, from one-to-one correspondence to measuring distance and volume. For example, we encourage children to count themselves for attendance, and together we graph the results. Through songs, books, and application, we expose young children to the wonders of math in hopes that they will embrace it and continue to feed their curiosity.

A future goal is . . .

I would like to expand my professional development portfolio to include more advocacy for young children. I don't yet know what that would look like, but I know that I am passionate about developmentally appropriate practice, inclusivity, and support for early childhood educators. I would love to share some of my experiences and knowledge with future educators. I am also looking into writing children's books.

To learn more about Curti Dunmore, continue reading online at NAEYC.org/tyc/spring2022.

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Playing Around with Number Composition

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Games, Stories, and Everyday Problem Solving in the Preschool Classroom

Alissa Lange, Hagit Mano, Sylwia Lech, and Irena Nayfeld

Five preschool children and their teacher, Sylwia, are galloping around two Hula Hoops placed in the center of the rug. They sing along to a familiar tune playing in the background. When Sylwia pauses the music, the children know to scatter and find a spot in one of the two hoops. This time, they all gather into one hoop.

The music starts again, sending the group galloping around once more. The music stops, and the teacher and children each step into a hoop. "Adrian," Sylwia asks, "what combination did we make this time? How many do we have in each hoop?"

Adrian counts the number of children in his hoop including himself, then counts the other hoop, replying, "Four and two." Sylwia supports her dual language learners by translating key phrases into Spanish, such as "cuatro y dos."

Sylwia then asks the whole group, "And how many are we all together?" The children call out, "Six!"

The teacher continues, "Oh, wow! We made another combination 4 of the number six!" She represents this combination on the board using dots and numerals while the children count the dots with her. "We broke the number six into two parts. One part has . . ." Children complete her sentence: "Four." "And the other part has . . ." "Two." A child exclaims, "Two and four is six!"

6

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Sylwia and the children are not just having fun playing musical hoops. They are engaged in a math experience about composing and decomposing the number 6. Sylwia used a game and real-life problems to make this big math idea meaningful for the children.

What Is Number Composition and Decomposition?

Composing a number is putting together two numbers (two parts) to make a larger number (whole), like joining 2 and 4 to make 6. To *decompose* a number is to break that number (whole) into parts to make smaller numbers. For example, the number 5 can be decomposed as 5 and 0; 4 and 1; 3 and 2.

Activities such as the one in the opening vignette foster an understanding of quantity and of the relationship between numbers, and they lay the foundation for more complex math concepts to come. Number composition is different from addition or subtraction in that we are asking children to grasp the structure of a number. What makes up 5? What are different ways 5 can be split up? As young children think about and model this with concrete objects, they are learning to see the underlying patterns in the number system and to develop number sense.

As children develop their skills to compose and decompose numbers quickly and accurately, they can begin solving number problems in various contexts. For example, a child might be asked to set the snack table for seven children, but only have four cups in their stack. If they can fluidly decompose 7, they can quickly figure out how many cups are missing. Later, children will use what they know about number composition to help them do addition and subtraction.

Foundations of Number Composition and Decomposition

Children have the most success with number composition and decomposition activities when they have the beginnings of some foundational skills. For example, it is helpful when children have begun to

- > know the verbal number sequence (be able to count from 1 to 10 aloud)
- > count objects with one-to-one correspondence (numbers correspond with specific quantities)
- > identify the quantity of objects in a set and know that the last number counted tells how many (*cardinality*)
- > understand that numbers higher in the number sequence are greater than those earlier in the sequence (*magnitudes*)

These skills may not develop in the same sequence or at the same rate for all children, so games like Sylwia's are perfect for utilizing and building upon several of the skills at once.

Introducing Number Composition to Children

Here are tips you can use when introducing number composition and decomposition to the children in your classroom:

- > Start small. Counting and manipulating smaller numbers, like numbers 1 through 5, are easier for early math learners. Check for children's understanding of the fundamental skills noted above. Later, challenge them with larger numbers.
- > Use concrete objects. Use objects such as fingers or toys to represent quantity. You can use both hands to represent numbers under 10, then borrow a child's or coteacher's hand for larger numbers. The use of concrete objects supports dual language learners as well because they are able to make connections to numbers and quantities by manipulating materials without depending so heavily on language.
- > Use identical objects. When possible, use objects that all look the same, like identical, one-inch blue cubes, in number composition activities. This is especially helpful early in the development of number composition, as children may be distracted by objects that have different features.

Teaching Young Children

With the above strategies in mind, the following are activities you can do with children to practice number composition and decomposition:

- > **Practice during daily routines.** Find opportunities to compose and decompose numbers across the day during children's routine activities. During snack time, prompt children to find different ways to group their blueberries, pretzels, or cookies.
- Tell a story. You can mathematize many of the stories you tell children. Having a story behind a problem helps children connect to and make sense of the number operation. For example, after reading *10 Little Rubber Ducks*, by Eric Carle, give children a mat that has been divided into two sections using tape. One half of the mat represents a pond, and the other half represents grass. Encourage children to create stories about the 10 ducks and find as many combinations of 10 as possible. For dual language learners in your classroom, use the Spanish translation of this book alongside the English version. During the activity, translate key phrases for them as you go, such as "*diez patitos de goma*."

In Sum

After the Hula Hoop game, the children in Sylwia's class are so curious about number composition that they explore it on their own during center time. They engage in valuable math practices by creating and solving their own problems, then communicating their findings graphically.

When center time is over, the children count how many classmates are going to clean up. The whole number is 12. Sylwia has the opportunity to teach the children how to split the number 12 into four groups: Three children go to the house area, three to the toy area, three to the block area, and three to the discovery area to clean. Sylwia connects visuals—such as drawing dots on the easel or using dot cards—with activities like this one so children can see the number groups.

Get inspired when children not only understand something new about their mathematical worlds, but also when they choose to use this new knowledge in their play! You can build upon children's capacity for number composition and decomposition through engaging games and stories and authentic and meaningful experiences. With your help, children can come to see math as fun and as a useful tool to use every day.

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A list of free resources for teachers to explore can be found at **NAEYC.org/tyc/spring2022**.

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This article supports the following NAEYC Early Learning Programs standards and topics Standard 1: Relationships 1B: Building Positive Relationships Between Teachers and Children **Standard 2: Curriculum** 2F: Early Mathematics Standard 3: Teaching 3D: Using Time, Grouping, and Routines to Achieve Learning Goals

Teaching Young Children

Spring 2022

Helping Your Preschool Child with Computational Thinking

Heather Lavigne, Jillian Orr, and Marisa Wolsky

Encouraging "computational thinking" may sound intimidating, but it doesn't have to be. It's simpler than you think! Some researchers talk about it as learning to think like a computer scientist. But computational thinking doesn't require using a computer. Children—including preschoolers—can learn how to use computational thinking to solve everyday problems.

Use the following tips to build on your preschooler's math skills—including counting, pattern recognition, and sequencing to solve problems—to support computational thinking.

1. Play fun sequencing activities.

Pointing out the steps needed to complete a task can help children understand order and why it matters. Create cards for everyday tasks, like packing your lunch or feeding your pet. Discuss what happens when you mix up the steps and how to put the steps in the right order.

2. Explore patterns to find and fix mistakes.

Preschoolers enjoy exploring patterns around them. They can also show what they know by "debugging" mistakes they find in patterns. For example, you can create a set of colorful caterpillars out of clay, alternating the colors to form a pattern. Make some silly mistakes in the pattern, and encourage your child to check the pattern and to take pride in explaining to you what the problem is. Work together to come up with ways to fix it!

3. Make big problems more manageable.

Small problems for adults can seem like big ones for young children. Help your child make big jobs more manageable by breaking them into smaller jobs and making a plan. For example, packing a picnic lunch can seem like a big task, but not if you work together. With real or pretend food, determine together how many jobs there are to do. Then give each helper a job. Perhaps one helper counts and packs pretzels, another counts fruit, and another counts the dessert. When you break down the problem, it is much easier to solve!

Using these strategies with young children fosters early math skills that support computational thinking development. You can encourage your child by making time for or incorporating activities like these in everyday routines and by helping them think through the steps for solving problems and trying new things. You can also try GBH's resources, which provide free, at-home learning activities that support computational thinking. Learn more at www.ahaisland.org.

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Promoting Spatial Orientation

A Math Activity for Teachers and Families

Lindsey Perry, Eloise Aniag Kuehnert, and Leanne Ketterlin Geller

Spatial reasoning—the ability to interact with, navigate in, and understand your environment—is a foundational and critical concept for early childhood mathematics. In fact, evidence suggests that spatial reasoning skills support the development of overall mathematics knowledge and specific math concepts such as place value, relationships between numbers, and operations. Spatial reasoning skills are also important to learning in the other STEM (science, technology, engineering, and mathematics) areas during childhood and beyond.

One of the key components of spatial reasoning is *spatial orientation*, or the ability to recognize your position in space while viewing surroundings from different perspectives. In preschool and extending into elementary school, children practice spatial orientation when they draw maps from a "birds-eye" view, use directional language (*behind*, *above*, *beside*, *under*), and imagine locations from different perspectives. Spatial orientation is a particularly important early learning skill because it helps children learn how to navigate within their environments and represent those environments with maps. This also lays the groundwork for the knowledge and skills used in STEM careers in fields such as architecture and aviation, to name a few.

As former teachers and early mathematics researchers, we have seen the benefits of engaging, playful spatial orientation learning experiences that provide opportunities to take different perspectives while simultaneously using spatial language. Sharing spacial orientation activities with families reinforces the concepts learned at school and helps children remember and use what they are learning.

The following classroom activity and its home extension include step-by-step instructions and sample questions to promote conversations about spatial orientation. During these, both educators and families should use spatial language as much as possible to describe situations and to build children's reasoning processes and spatial terminology.

I Spy from This Perspective!

To encourage children to visualize their environments from different perspectives, teachers give children a photo of a location, then challenge them to take the same picture. To do so, children must examine the spatial relationships in the photo, mentally picture what they might see from different places in the environment, and predict where they should take their picture. Teachers guide children through this process by asking questions and offering both assistance and challenges to foster spatial reasoning.

This activity is very flexible and can be used in whole-group, small-group, or one-on-one formats. It can be completed

in about 30 minutes or broken down so that each step is explored on different days and in shorter periods of time.

To prepare, teachers will need the following materials:

- > printed photos of a familiar location, such as a classroom or playground, taken from different perspectives
- digital cameras, classroom tablets, or cellular phones, if available (If these tools are not available, children can pretend to take photos using a handmade prop: teachers can cut a camera shape out of cardboard and cut a small hole or square to look through.)

Steps	Questions to Promote Spatial Reasoning	
Take children to a familiar location, such as a playground or their classroom. Give children a photo taken from somewhere at that location. Using spatial language, ask them to describe the environment in the photo.	 What is on top of the (chair)? What is in front of the (sandbox)? What do you notice in the photo? What is close up (or far away) in this photo? Where is the (slide) in relation to the (swing)? What can you <i>not</i> see in the (classroom)? Does the (desk) look closer to the (door) or the (whiteboard)? 	
Challenge children to predict where they would need to stand to take the same photo.	 Where do you think you should stand to take the same picture? Why do you think that? What clues are you using to help you make your prediction? Does the photo look like it was taken by someone who is very tall or very short? Why do you think that? How would the height of the person change what the photo looks like? Where would you need to stand to take the same picture? Why do you think that? 	
Ask children to stand in the location they predicted, then ask them to evaluate their choice. If digital cameras, tablets, or cell phones are available, the children can now take a digital photo to compare to the printed photo.	 Compare what you see to the picture. What is the same? What is different? How would you need to change your position to make what you see the same as in the photo? How would the photo change if you took five steps forward? Ten steps to the side? 	
Give groups of children a few different photos. Ask them to predict the route they would need to take around the location in order to take the same photos.	 Which photo is taken from somewhere closest to you? If you were going this way, which photo would you be able to take next? How did you decide this photo was taken from this perspective? 	

What Do You See?

When teachers offer home-based learning activities that are connected to the curriculum, they extend children's learning and deepen the connection between the two environments. With math in particular, linking these contexts helps young learners see that math is all around them and gives options for families to inspire and support doing mathematics with their children.

Home-extension activities should be easy for families to do and require little to no specialized materials or equipment. Step-by-step instructions, translated into a family's home language, can be accompanied by photographs or a brief video introducing the activity. Families can choose to do a few steps of the activity, complete all of the steps in about 30 minutes, or space out the activity across multiple days or weeks.

As part of developmentally appropriate practice, teachers continuously look for ways to integrate children's knowledge, interests, and backgrounds from their homes and communities into meaningful classroom experiences. With this activity, teachers can encourage families to document their experiences by writing or drawing in a small journal, printing their photos, or creating a small poster to share with the class. Children and families can share their photos digitally, so teachers can display them on classroom bulletin boards or virtual whiteboards. Children can share their experiences, discuss what part of the activity was most interesting or challenging, and describe the spatial language they used with their families. Doing this showcases children's experiences outside of the early childhood setting and helps to continue the classroom conversation on spatial reasoning.

This activity requires the following materials:

- > paper and pencils for drawing
- > digital cameras or cellular phones, if available (If not, teachers can provide families with a cardboard camera.)

Steps	Questions to Promote Spatial Reasoning	
Invite your child to choose a location that interests them, such as a neighborhood playground or a room in your home. Describe the location using language like <i>in front of</i> , <i>behind</i> , or <i>closer to</i> .	 What is beside you? Imagine standing over there. What would be closest to you? Let's stand in different places. How is what you see different from what I see? 	
Walk around the location and encourage your child to take photos or create drawings from different perspectives.	 What is behind the (slide)? Describe the location of the (television). If both of us are standing in the same place, how different do you think our photos or drawings will look? 	
Challenge each other to find where different photos were taken or drawings were made.	Which photo or drawing was created closest to the (swings)?How did you decide to stand there instead of (in front of the couch)?	
Ask each other to put the photos or drawings in order based on a specified route.	 Let's pretend you walked that way to take photos. Which photo or drawing would you have created first? Next? Last? What did you notice in the photos or drawings that helped you decide to put them in this order? How might you prove that the photos or drawings are in the right order? 	
Give your child the set of photos or drawings in a specific order. Ask them to guess the route taken to create the photos or drawings.	 Describe the route you would take to create these photos or drawings. Where would you need to stand first? What direction would you need to walk next? What clues in the pictures tell you how far to walk? 	

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Grow in Confidence as an Early Math Teacher

Anita Kumar

Young children are natural mathematicians and are capable of engaging with complex math ideas. Yet studies show that young children do not consistently experience intentional math-focused learning experiences, particularly in programs for children from families with low incomes. One reason for this trend is that many early childhood educators do not feel adequately prepared and confident in teaching math.

As a first step in this journey, reflect on your own math learning experiences:

- > How have they shaped your teaching?
- > What are the reasons you may feel nervous or unsure about teaching math to preschoolers?
- > What areas do you think you need to grow in?

Based on your reflections, here are nine ideas you can use to grow in confidence as an intentional math teacher.

Strengthen your knowledge of early math content

Understanding content helps teachers develop appropriate goals and learning experiences for young children. Once you gauge your current early math knowledge, you can work to fill in any gaps or areas of uncertainty. Look for resources and professional development experiences to build your mathematics knowledge base; specifically, the big ideas of early math. These include number sense, counting, operations, patterns, measurement, data analysis, spatial relationships, and shape.

${\mathcal Q}$ Learn more about how children develop or progress in math

There are different *developmental progressions* (the orders in which skills and concepts build on one another as children develop knowledge) for different mathematical skills. Knowing about these can help teachers consider how to introduce certain math concepts and skills to young children. Developmental progressions also help teachers more effectively use observations to identify what children currently know and what they may be ready to learn next.

3 Listen to and observe children's math learning and engagement

Honing and using your observation skills can help you identify where each child is in their development of math skills and concepts. Then you can adjust your teaching and supports to meet their needs and spur new learning. For example, you may observe a child arbitrarily touching and counting objects. Knowing that they are still emerging in one-to-one correspondence skills, you can scaffold their learning by collecting tongs, egg cartons, and ice trays: they can use the tongs to pick up an object (one at a time) and move it to one space in the egg carton or ice trays. This will help the child slow down their counting and match one number word for each object they touch.

Use video recordings to notice and respond to children

You can also take videos of children's math engagements to look and listen closely (at a later time) to children's math behaviors, thinking, and language and to determine scaffolds they may need. You might also share your video or photo documentation with other teachers to receive their feedback, and you can use others' videos to consider new or different practices too.

5 Use your strengths to build your math teaching tool kit

Draw on well-honed skills like using children's books and hands-on materials, asking questions, fostering play, observing children, and extending and connecting activities across the curriculum to support early math instruction. Prepare whole-group experiences that target specific concepts, then spend more time with children in small groups around mathematical ideas so that you can observe closely and support appropriately. Children's books, read alouds, and book discussions offer good entry points to mathematical concepts. Curate a collection of high-quality children's books related to the early math big ideas. As you gain expertise in the big ideas, you can highlight and expand on them with children, even with books that do not explicitly address those ideas. (For more information on using picture books to foster mathematics learning, see "Make Picture Books Count: Effective Ways to Integrate Math and Literacy," by Carrie S. Cutler, on page 16.)

6 Be intentional about having math discussions

Look for opportunities to use math-related vocabulary words and to have extended discussions. Teachers' questions and conversations give children the opportunity to explain their thinking, reflect on their prior experiences, and construct new knowledge. When children get stuck, use wait time, offer hints, and prompt further thinking by asking open-ended questions and prompts, such as

- What do you think?
- How can we find out?
- How did you know what to do?
- Show me how you did that.
- What are other ways to do this?
- What do you think about (name)'s idea?

Displaying math words and question stems in different areas around the classroom can help you use math talk purposefully.

Integrate math into daily events and other learning areas

Look for opportunities to use everyday experiences to "mathematize" children's learning and thinking. Math is a valuable part of daily living, and teachers can make these everyday connections visible for children. For example, ask, "How many of us are here today so we know how many cots to place during nap time?" Teachers can intentionally integrate math into daily routines like taking attendance, lining up, setting the table for meals, and during physical activities and play. These everyday connections offer developmentally appropriate ways of embedding math in real and relevant settings.

Collaborate with other educators

One of the best ways to develop teaching expertise is to learn with fellow educators. You might form a professional learning community or study group focused on early math in your school or program. Learning communities can support teachers' collaborative learning when members are willing to share their classroom practices and assessment data and to try out and sharpen new practices with each other. Activities can include book discussions, video analyses, completing math activities, and playing with hands-on manipulatives, paired with in-depth reflective discussions.

Connect with families

Early childhood teachers and families share an essential and reciprocal relationship in promoting young children's early math development. Like learning in all content areas, math learning is influenced by children's cultural and social contexts. Developmentally appropriate practice calls for educators to incorporate family and community practices into classrooms, with input and insights from families. Teachers can also provide families with tips and ideas to extend math learning at home. In many programs, teachers use newsletters or communication apps, informal meetings, and family events to offer early math tips and resources and to have families share their experiences of using math at home. (See "Promoting Spatial Orientation: A Math Activity for Teachers and Families," by Lindsey Perry and colleagues, on page 8.)

Further Resources

- Access early math videos and other resources at Erikson Institute's Early Math Collaborative, earlymath.erikson.edu
- Learn more about the big ideas of early math at earlymath.erikson.edu/why-early-math-everydaymath/big-ideas-learning-early-mathematics
- See earlymath.erikson.edu/the-best-childrensbooks-for-early-math-learning to check out collections of children's books organized by big ideas of early math.
- For ideas about collecting and using photographic evidence from observations, read the Young Children article "Photographs and Learning Progressions: Supporting Intentional Assessment and Instruction in Mathematics" in the July 2019 issue.
- Discover examples of math talk from the *Young Children* article "More, All Gone, Empty, Full: Math Talk Every Day in Every Way" in the May 2012 issue.
- Learn more about learning trajectories at www.learningtrajectories.org, where you can see an example of developmental progressions for early math skills from birth to grade 3.

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Spring 2022

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Make Picture Books Count

Effective Ways to Integrate Math and Literacy

Carrie S. Cutler

Ms. Stewart's questions and fears about math bubble up as she reviews an upcoming objective: "Young children's comparisons should be number-free initially (e.g., longer, shorter, heavier, lighter, faster, slower) and involve only two objects for comparison before comparing multiple objects." She can assign a worksheet where children circle pictures of shorter or longer objects, or she can bridge math content to an area in which she feels more confident—literacy.

She knows the perfect book. In *Alma and How She Got Her Name*, by Juana Martinez-Neal, Alma Sofia Esperanza José Pura Candela feels she has far too many names: six! Yet as she learns the story of her name, Alma realizes that it is a history of where she came from and whom she may one day be.

A length comparison activity springs to Ms. Stewart's mind. Children can build towers with one cube for each letter of their names, then look for a classmate with a name that is longer, shorter, or the same length. This activity unites math and literacy through meaningful, connected learning. Like many preschool educators, Ms. Stewart loved sharing picture books with her children. She felt less confident and prepared to teach math—a commonality among early childhood educators. However, research has shown that early achievement in math predicts later school success as well as or better than early literacy skills do. This includes success in language and reading competencies.

Early childhood educators can use children's literature to leverage a love of literacy with rich mathematical explorations. They can start by looking for math in the books they share with children and by intentionally planning ways to integrate early math concepts with literacy goals. Following are suggested books from a variety of social and cultural perspectives, paired with activities that meld literacy concepts and math learning experiences related to counting, shapes, measurement, classifying, and patterning. All use materials that are readily available in early childhood classrooms and programs, meaning teachers will not have to spend extra money to implement them.

Counting and Rhyming

Most classroom libraries contain a variety of counting books. Appealing illustrations and engaging storylines make these ideal for connecting math with literacy.

Feast for 10, by Cathryn Falwell, shows the steps to preparing a family meal—shopping, washing and peeling, baking and frying, and finally sharing the meal with 10 hungry folks. This book helps children understand the relationship between numbers and quantities, and it supports cardinality (knowing that the last number said is the total number in a set). It also follows a rhyming pattern. The ability to hear rhymes (*beans* rhymes with *greens* but not with *beets*) is an essential skill for learning to read. It shows that children are beginning to recognize and closely attend to the sounds within words. Becoming familiar with rhyming patterns in speech helps them start to recognize that these sounds are represented in print.

This article is based on "Get the Picture: Connecting Young Children to Mathematics Through Books" from *Deepening Students' Mathematical Understanding with Children's Literature,* copyright 2018, by the National Council of Teachers of Mathematics. All rights reserved.

1-2-3-4 Meals

Objective

This activity helps children learn counting sequence (the order numbers go in) and one-to-one correspondence (saying one number word for each item counted).

Supplies

- Bottles, boxes, and cans of play food in the dramatic play, home, or grocery store center or pictures of foods
- Placemats
- Cards labeled 1, 2, 3, 4

Directions

- Have children count aloud as the teacher points to the pictures in the text. Talk with children about the nutritious foods in the story (beans, greens, tomatoes, and potatoes).
- 2. Place the numbered cards in the corners of the placemat.
- 3. Children use play foods to create a 1-2-3-4 meal. They choose 1 meat or protein, 2 grains, 3 fruits, and 4 vegetables, placing them on the corners that correspond to those numbers.
- 4. If children demonstrate understanding, extend to use larger quantities (up to 8) by having children show servings for two people.

Measurement and Comparative Terms

Concepts like *lighter/heavier*, *longer/shorter*, *bigger/ smaller*, and *faster/slower* are best learned when they can be compared against each other. (How, for instance, will children understand which object is heavier unless they have a lighter object to compare it to?) In the book *You Are (Not) Small*, by Anna Kang and illustrated by Christopher Weyant, two creatures debate their size in relation to one another. While the gray creature seems small in comparison to the brown one, they are both tiny when the blue creature appears. This story demonstrates that *bigger* and *smaller* need a comparison object or unit to make sense.

Comparison experiences need not be limited to length. In Look, Grandma! Ni, Elisi!, by Art Coulson and illustrated by Madelyn Goodnight, Bo needs the perfect container to show off his traditional marbles in his family's booth at the Cherokee National Holiday. He compares the capacity of a too-big mat, crate, box, and vase before finding that a basket Grandmother wove for him is the perfect size to display his wares.

Which Bowl Is Best?

Objective

This activity helps children begin to consider capacity as a form of measurement.

Supplies

- Four containers of varying sizes
- A small pile of cubes or counters (be sure they are all the same size)

Directions

- 1. Ask children to guess which container will be too small for all the cubes. Which will be too large? Which will be just right?
- 2. Have children fill the containers and discuss their findings.

Shapes and Descriptive Language

Books can help children learn about the properties of shapes and explore spatial relationships. In Amitha Jagannath Knight's *Usha and the Big Digger*, Usha, Aarti, and Gloria describe the same constellation differently—as the Big Dipper, the Big Digger, and the Big Kite—depending on how they look up at the sky. The book, featuring Indian American characters, guides children to discover that flipping or turning a shape does not change its attributes. Children experience big ideas in geometry as they visualize shapes in various positions and listen to the book's characters describe the direction, distance, and location of a constellation in relation to other objects, such as a tree or house.

Teachers can use this book to build children's understanding of positional words (*top, bottom, in front of, behind*) and to add these words to their vocabulary.

Shape Hunt

Objective

This activity helps children begin to identify shapes by their attributes and use positional words to describe locations.

Supplies

• Square-, rectangular-, and circle-shaped stickers or sticky notes

Directions

1. Guide children on a walk around your setting.

- 2. When a child recognizes an object's geometric shape (such as a rectangular door, square floor tile, or circular clock), ask them to mark it with the sticker or sticky note that matches its shape.
- 3. Encourage children to describe the attributes (number of sides, number of corners) of the shapes they find.
- 4. Ask children to describe the shapes' positionality (below the sink, beside the door).

Classifying and Story Retelling

Preschoolers enjoy sorting blocks, buttons, toys, and manipulatives by color, texture, size, or shape. Books can prompt children to classify other objects as well. In *Red Shoes,* by Karen English and illustrated by Ebony Glenn, Malika has all sorts of adventures in her beloved red shoes. When the shoes become too small, Malika and her Nana take them to a resale shop. There, Inna Ziya gives them a second life as a Ramadan gift for Amina, her niece in Ghana.

Red Shoes supports preschoolers' development of narrative skills as they retell the main elements of the story (such as characters and settings) and recall the sequence of events (such as time, order, and cause and effect).

Sort It Out

Objective

This activity helps children explore and extend their understanding of classifying objects.

Supplies

· Children's shoes

Directions

- 1. Ask children to remove one shoe.
- 2. Place the shoes in a pile.
- 3. Ask children to sort the shoes according to a variety of attributes. These can include color, style, type of closures (laces, Velcro), and size. Talk about the similarities and differences between the groups.
- 4. Help children line up the shoes to make a graph. Ask children, "Which type of shoes do we have the most of? Which do we have the least of?"
- 5. Guide children to use shoes to create a pattern such as slip-on, Velcro, lace, slip-on, Velcro, lace.

Patterning and Letter-Sound Correspondence

In *Bracelets for Bina's Brothers*, by Rajani LaRocca and illustrated by Chaaya Prabhat, Bina wants to make her brothers beaded bracelets for Raksha Bandhan, a Hindu holiday that celebrates siblings. She finds out which colors her brothers like, then sets to work creating bracelets with an AB pattern plus a unique bead that represents each brother's hobby.

Algebraic reasoning in preschool focuses on identifying patterns and relationships and generalizing them to new situations or objects. For example, an AB pattern like Bina used can be represented with colors (blue-orange-blueorange), movements (clap-jump-clap-jump), or sounds (honk-whistle-honk-whistle).

Bracelets for Bina's Brothers also offers an engaging way to build preschoolers' knowledge of the alphabet and letter-sound correspondence—especially since the letter *B* is used throughout the story. Children can start to link this and other letters to their corresponding sounds as they are read or they read the words in the book (such as *bracelet*, *Bina*, *brothers*, *blue*, *book*, and *basketball*).

Pattern Dance

Objective

This activity helps children create and understand patterns that are made with movements.

Supplies

• None

Directions

- Children take turns creating a dance using three different motions in sequence; for example, clap-stomp-jump. The ABC pattern is repeated over and over.
- 2. Say the movements aloud while the class is doing them.

3. After a while, say "A, B, C" in place of the movement words, telling children that this is a shorter way to represent clap-stomp-jump or any series of three movements.

Tips for Choosing Books to Promote Math and Literacy Integration

Picture books have the potential to promote rich math explorations in early childhood classrooms. Here are some ways to integrate math concepts and skills while engaging with books.

- Choose books that children find funny, clever, and interesting. Point out the math. ("Which character do you think is big? Why or why not?") Describe, explain, and wonder aloud while reading.
- > Connect children to the math in a story. ("Do you have some friends who are taller than you are? How can you tell who is taller?")
- Get preschoolers talking about math by asking open-ended questions. Encourage them to put their ideas into words. ("What do you think this character means by 'bigger'?")
- > Find ways children can use their bodies to model the math in a story. ("I wonder how we could find out who is the tallest in our class?")

Integrating math and literacy aligns with NAEYC's position statement on developmentally appropriate practice. The activities and materials shared in this article illustrate how the concepts, language, and skills children encounter are best learned when they are connected in meaningful, coherent ways. While it takes practice to develop, seeing the math potential of picture books can add more math and more literacy to children's days.

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Exploring Children's Thinking About Data

Angela Chan Turrou, Nicholas C. Johnson, and Megan L. Franke

Children naturally notice and collect information about their world. Tall buildings, tiny ants, heavy backpacks, and loud motorcycles draw their excitement and wonder. Children use what they notice to make decisions, reason, and ask questions ("It's cold, so I'm going to wear my jacket," "If I go down that hill on my bike, I will go really fast!"). They attend to similarities and differences between people, places, and objects and begin to communicate about the attributes and relations that draw their attention ("That slide is really, really, big," "Your banana is littler than mine," "My dad is bigger than your grandpa").

The observations and comparisons children inherently make on a daily basis provide entry points to make sense of important ideas about *measurement* (quantifying particular kinds of attributes, such as length, weight, and volume—or even time, temperature, and sound) and data (gathering, organizing, examining, and summarizing information). Supporting the development of children's understandings of these ideas requires listening to what children notice; supporting them in communicating their experiences and observations; and helping them begin to systematically compare, reason, and ask questions about their collective noticings. Our book *The Young Child and Mathematics*, Third Edition, features Instructional Activities that are purposely designed to be intentional yet open, supporting children to participate in varied ways as they share and build upon their mathematical thinking. In this excerpt, we showcase children's thinking about data as Ms. Recinos engages her preschoolers in an Instructional Activity called What Do You Notice?

A Fruit Survey by Ms. Recinos's Class

To gather data, Ms. Recinos asks the children in her preschool class to select their favorite fruit from a list with pictures. Each child makes a mark on the paper using a black marker. She also makes some marks using a blue marker, one in the strawberries category for herself and two in the grapes category for her teaching partner and the preschool director.

Ms. Recinos decides to use the What Do You Notice? activity as a way of presenting the results of the survey to the class and engaging them in a conversation about analyzing data.

Clarise notices that three people (including her) chose bananas, and several children want to share which fruit they chose. Kevin says that "Actually my favorite fruit is mango," but since that wasn't an option, he chose strawberries instead. Marcus notices the blue marks and asks about them. When Ms. Recinos says that those marks represent the grown-ups' choices, the class insists on her telling them which grown-up chose what fruit.

Camila is disappointed that oranges "lost" since they are her favorite, but she is excited to find out that the other person who chose oranges is her friend Bethany. Jeremiah comments that there are "a lot" of strawberries and grapes but only one apple, one banana, and one orange in the pictures on the survey results. Vanessa says that strawberries were chosen by the most people; Alyssa disagrees.

Ms. Recinos asks the class which fruit is the favorite of the most people. Some children say strawberries, a few say apples, and a few others say both. Daniel says, "I don't know." Ms. Recinos asks him what he's thinking about, and he says that the marks are kind of bunched together, so it's hard to tell. Ms. Recinos invites him to come up and count the marks, and they determine that both apples and strawberries were chosen by six people. César says, "Yeah but if it was only kids, then apples would win."

Victoria decides that she wants to switch her choice from grapes to oranges so that oranges can have the same number of marks as bananas. Sebastián reminds Ms. Recinos that Leo has been absent the past two days, so he didn't get a chance to vote. Ms. Recinos asks the class to share their predictions about what fruit they think Leo might choose and why. ••• Here Ms. Recinos uses a data representation that the class has created together. This data representation is the focus for the What Do You Notice? activity, this one centered on data.

Instructional Activity: What Do You Notice?

What Do You Notice? is an Instructional Activity that invites children to consider and communicate about a range of content. For this activity, the teacher typically displays an image, asks children to think silently about what they notice, then invites them to engage in conversation about what they've noticed. By listening to and picking up on what children notice, teachers can draw out, extend, and connect children's ideas and support them in making sense of and building on one another's ideas. The example of this Instructional Activity in Ms. Recinos's preschool classroom illustrates ways you might elicit and explore children's ideas about data. Depending on the image, what captures children's interest, and the teacher's goal, this activity can also be used to seed conversations about spatial relations, numbers, patterns, and more.

•••••• Since the children have made their own tick marks on the fruit survey, you might notice that they are a bit "messy" and the spacing between the marks varies. This can complicate the work of making relative comparisons, but it also provides an opportunity to consider differences between space and quantity. And perhaps more importantly, children get to see that there is a specific mark that is just for them.

That said, many children need to be able to make sense of data in relation to themselves before they can step back and reason about the entire representation. During the fruit survey in Ms. Recinos's class, for example, Clarise, Kevin, and Camila make meaning of the data in relation to their articular choices. By collecting,

own particular choices. By collecting, organizing, and representing particular information, children can begin to consider different kinds of questions and the corresponding data that might be used to answer such questions.

After data has been gathered, children can create or examine data displays to notice frequencies, see relationships, and even make predictions. For example, when Camila says that the oranges "lost," she is noticing the relative frequency of oranges to other fruit. Similarly, when the class has some difficulty determining which fruit was chosen by the most people, some may be grappling with the idea that what matters in the representation is the number of marks in the right column, not the size of the marks or the amount of space they take up on the chart. Jeremiah, in noticing the amount

Children love to ask questions. They also love to notice things that are similar and group them together. Wondering about who is absent today, reporting their favorite TV shows, and putting toy vehicles into a line of cars and a line of trucks are all things that come naturally to children. They are also early ways of engaging in processes related to gathering and organizing data. Supporting children in making sense of data can begin by leveraging their curiosity and inclination to sort and group objects and information.

It can be quite powerful for children to see themselves in data. Collecting survey data about children's lives, interests, and preferences can help them to see data as related to themselves and the people in their world. For example, you might survey children about their pets, number of siblings, or favorite food (as Ms. Recinos did). Children might even design their own survey and collect information from their peers. It is also powerful for children to formulate questions that might be answered through observing their world; for example, "Do more children walk to school, drive, or take the bus?," "What do my classmates choose to do during choice time?," or "Who does the most laps on the bike path during outside time?" The observational data that results from gathering answers to these questions mines children's natural curiosity and allows them to see themselves as data producers, rather than just consumers.

An eventual goal in learning about data is to see how it can be used to answer questions that are not immediately obvious. For example, the question "How can we make our school drop-off area safer?" opens opportunities to collect data about cars stopping at the stop sign in front of the school (e.g., who stops and who doesn't, what the busiest times of the day are, if there are any adults watching to

Questions from Teachers About What Do You Notice?

What Do You Notice? seems like such an open-ended activity. How can I make sure I am working toward my mathematical goals?

This activity is designed with a focus on participation first; every child should feel invited to the conversation in a way that works for them. You may wonder how to encourage many different children to share their noticings while also making sure to surface and follow up on important math that emerges. Digging too much into every idea might cause the conversation to stall. However, selectively asking children to elaborate on an idea or respond to a peer's noticings can nudge the conversation toward particular mathematical goals. Here are some tips for how to navigate the balance of making this activity open yet intentional:

- Use different kinds of images. Some images might provide richer opportunities for particular math ideas over others. Some entice you to count a lot of pumpkins, while others might draw your eyes to curved roadways and long shadows. You might even want to revisit an image you discussed previously to elicit and build on different ideas.
- Anticipate what children might notice and talk about. Take a moment to consider in advance ideas that are likely to surface during the conversation with children. Use what you know about your group of children and their experiences as you anticipate. (This is also a great way to collaborate and plan with a colleague.) Doing so will allow you to think about the variety of follow-up responses you might provide.
- Consider more than one possible mathematical goal. Have a few questions ready that might build on particular math ideas. Sometimes you may think an image will lend itself to specific math content (e.g., comparing heights, conceptualizing large quantities), but children may take the conversation in other, equally worthy directions (e.g., making shapes from other shapes, describing movement). Having a plan is helpful, but you may revise your plan when children surprise you with their curiosity and creativity!

of each fruit shown in the pictures on the chart, may also be working out what aspects of the data representation provide what kinds of information.

An important goal is not just learning to read and represent data displays but also developing a critical lens through which to consider what is represented and what might be left out. Embedded within César's idea that "if it was only kids, then apples would win" are important issues related to sampling and parsing data. Relatedly, Kevin's comment about mangos hints at how methods of collecting and reporting data may influence the results. Opening space for children to share and grapple with observations like these is important in building understandings of the power of data to answer questions, as well as its limitations and potential sources of error or bias.

Collectively and over time, opportunities to gather, represent, and interpret different kinds of data will help children build a foundation of understanding. These early experiences eventually allow them to make sense of abstract ideas like expectation and variation—that is, anticipating what is likely and grappling with how much things differ and why this might occur. Even young children can begin to reason about these complex ideas. For example, Ms. Recinos takes up Sebastián's comment about Leo's absence as an opportunity to engage the children in making a prediction. While many children might predict that Leo would choose whatever fruit they themselves chose or make a guess based on what they know about Leo, eventually they may see that the existing data can also be used as a way to make predictions.

This article is excerpted from NAEYC's recently published book *The Young Child and Mathematics*, Third Edition, by Angela Chan Turrou, Nicholas C. Johnson, and Megan L. Franke. For more information about the book, visit **NAEYC.org/books/youngchildren-math**

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NOW READ THIS

Supporting Positive Racial Identity with Literacy-Based Math

Toni Sturdivant

It's center time in Ms. Alma's and Ms. Christine's prekindergarten class. Stacey, a 4-year-old Black girl, and Elisa, a 4-year-old Latina girl, are playing with dolls. Elisa sits down with her doll and opens a hairstyle book.

Elisa: Which one should I make? (She flips to the page with an illustration of a girl wearing her hair in an afro.)

Elisa: I don't want to make that hair.

Stacey: Why not?

Elisa: Because I'm going to make a hair that is beautiful.

Stacey looks over at the picture Elisa is referring to and sees that the character is wearing a style very similar to hers. She pauses her play for a bit, frowning as she looks to the floor.

Ms. Alma and Ms. Christine know that young children talk about human differences like hair, skin color, and eye color. Without proper adult support, the children may make hurtful or stereotypical comments about other people that make it difficult for some children to feel good about who they are. These teachers know how critical it is to address such comments. And they also know that they can integrate learning across the curriculum while advancing equity.

There are many ways early childhood educators can help ensure that children are confident in themselves and their families and see the value in one another's differences. As noted by the 2020 NAEYC position statement on developmentally appropriate practice, educators make every effort to ensure "each child hears and sees their home language, culture, and family experience reflected in the daily interactions, activities, and materials in the early learning setting." When messages that celebrate humanity's differences are woven together with and across academic content, we can

- > show just how important these ideas and attitudes about diversity are
- > increase engagement as children see themselves reflected in the activities
- save some planning time by creating learning experiences that integrate across content areas and developmental domains
- > ensure that math instruction is relevant to children's lives

Below are a few math activities based on children's literature for preschool settings. These books and activities send positive messages to children about diversity in hair textures and styles as well as in skin color—and they foster early math learning. Rich with text and visual details, each and every child can benefit from engaging with these books and with the associated math activities.

Visual representation is important in the classroom. While only a few examples of hands-on math activities for preschoolers are included, early childhood educators can create their own activities inspired by these ideas to deepen children's acceptance, understanding, and joy surrounding diversity. Two of the following activities use dolls with tightly coiled hair, which is a common texture for Black hair. If dolls that look like this aren't readily available, it is a good idea to get some by purchasing them from the store (if budgets allow), looking for dolls at garage sales, or asking friends or family if they have well-cared-for dolls to donate.

As children play, it is important to pay attention to the topics that interest them and any emerging or explicit negative feelings regarding race. Educators can use this information to create learning experiences that not only teach academic skills but further children's accurate and positive understandings about race.

I Love My Hair

by Natasha Anastasia Tarpley. Illus. by E.B. Lewis. 2001. New York: Little, Brown Books for Young Readers.

I Love My Hair tells an authentic story of a young Black girl getting her hair styled by her mother. The mother takes readers on an imaginative journey of comparing hair styling to yarn being spun in a spinning wheel and crops being planted in rows in a garden as she explains the versatility and beauty of afro-textured hair to her daughter. The daughter expresses the joy she experiences from her hair and celebrates it with a beautiful metaphor of her afro style being free and round as the Earth in our solar system.

Try this! Bead Patterns. A common hairstyle within people of African descent is to wear braided hair adorned with beads. In *I Love My Hair*, Keyana delights in hearing her beads clink as she walks about. Early childhood educators can use this iconic hair accessory as a math manipulative for patterning. Teachers can provide children with a doll and hair beads (such as pony beads) of different colors or sizes and encourage children to practice stringing on the beads to make patterns. This bead pattern activity also supports the development of fine motor skills.

Don't Touch My Hair

by Sharee Miller. 2019. New York: Little, Brown Books for Young Readers.

Aria, a Black child, loves her hair but does not like it when people touch it without her permission. After finally setting a personal boundary by yelling "Don't touch my hair!" to all who can hear as she is walking through town, she gets to enjoy her free-flowing afro-textured hair without having to worry about unwanted touches. Friends and community members begin asking to touch her hair and accepting her response, rather than reaching in to touch it without her permission as they did before.

Try this! Roll the Dice/Find the Matching Hands. In *Don't Touch My Hair*, Aria describes the many hands trying to touch her hair. In this math activity, provide children with dice and pictures of hands holding up fingers to show quantities ranging from one finger to five fingers. Children roll their number die, then look for the number of fingers that match. For example, if a child rolls four, they will search for the hand holding up four fingers. If they roll a six, children might find ways to match different finger values that add up to six, such as four and two fingers or five and one fingers. This matching activity can also celebrate dark skin tones if the pictures of the fingers include dark skin tones and the hands are turned where the children can see the hue of the skin, rather than simply the palm.

For added engagement, early childhood educators can use pictures of the hands of children in the classroom. Children will enjoy trying to guess whose hands they are matching with their dice. Educators can also remind children of the importance of getting permission before touching people's bodies as the activity comes to an end.

Princess Hair

by Sharee Miller. 2018. New York: Little, Brown Books for Young Readers.

This rhyming book celebrates different natural hairstyles for children with afro-textured hair. The narrator describes the diverse hairstyles appropriate for a princess to wear under their crown as they do things they love and as they love their hair. From kinks to Bantu Knots to blowouts, each style is suitable for a princess.

Try this! Matching Numerals and Afro Puffs.

One of the featured hairstyles in Princess Hair is afro puffs (afro-textured hair sectioned into ponvtails). After reading the book together, teachers can prompt children to replicate this hair style using classroom dolls with tightly coiled hair. Hand out numeral cards to each child based on their counting skill level (if you don't have any on hand, you can make your own using index cards), and ask them to match the quantity of afro puffs on the dolls with the number on their cards. If there are limited dolls with tightly coiled hair available, educators can take and print pictures of each style and present them to children with the numeral cards. These photos can be used later to discuss human differences in a social studies unit, to diversify the physical space of the classroom through displays, or to use for other math activities such as patterning or sorting.

All the Colors We Are The Story of How We

Get Our Skin Color

by Katie Kissinger. 2014. St. Paul, Minnesota: Redleaf Press.

This informational text features photographs of real people. Using child-friendly language, Kissinger explains the scientific and historical reasoning for differences in skin color. The author explains that skin color comes from three sources: our ancestors, the sun, and melanin (the pigment that makes skin a certain color).

Try this! Color Match Recipe Cards. A

commonly used diversity activity in the early childhood field is to have children mix paint to find their exact skin color. Teachers can extend this art activity into a math activity focused on quantity, counting, and writing numerals by having children create recipe cards as they make their own unique shades. Provide children with spoons, a bowl, and paints in various skin-tone colors. Help children count and document the number of spoonfuls of each color they use to make their unique color. Educators can then laminate these recipe cards, and children can use them throughout the school year to make the paint that matches their own skin color and that of their classmates.

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Standard 3: Teaching 3B: Creating Caring Communities for Learning **Standard 9: Physical Environment** 9A: Indoor and Outdoor Equipment, Materials, and Furnishings

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Beyond Classroom Pets

Innovative Ways to Connect Young Children with Animals

Annemarie Hindman

It's circle time, and Mr. Gonzalez is introducing his preschool class to a unit on bees. As he shows a photo of a big, fuzzy bumblebee, a river of facts and opinions spills out of the children. Everyone has seen a bee before, and everyone is curious to learn more about these small, important animals.

Over the next four weeks, Mr. Gonzalez's preschoolers explore bee anatomy, types of bees and their homes, bees' role in pollination, and the way they communicate through dancing. Indoor and outdoor reading, writing, math, and science activities fuel long conversations about vocabulary words like *wing*, *antennae*, *hive*, and *waggle*. As a final part of their investigation, the children make a video sharing their new knowledge with friends and family. Most profoundly, they are beginning to understand why humans need to share the world with animals like bees and respect their needs so that everything on the earth can thrive.

Most early childhood classrooms heavily feature animals, from topics or themes of study to storybooks to decorations on the walls. One popular way of bringing animals into a preschool setting is through a classroom pet that children observe and help care for. Classroom pets are generally small animals that can survive in a small cage and eat easy, inexpensive diets. They tend to be fairly quiet, nondisruptive, and nondistracting. Popular pets include rodents, lizards, fish, amphibians, turtles, and tortoises.

In theory, classroom pets help children learn about animal care, bond to that creature or species, and become aware of broader environmental issues. They also can serve as a springboard for meaningful learning activities, such as journaling about the pet's adventures, engaging with informational texts, and measuring and recording the pet's food and water. Yet in reality, having a classroom pet often does not work out this way. During decades of work in early childhood settings, I often have witnessed sad situations in which classroom pets did not survive or thrive, despite the teachers' and children's best efforts. Additionally, they did not drive exciting instruction in the ways that teachers had hoped.

As seen in the opening vignette, early childhood educators can introduce animals into their settings in more effective, engaging ways. In this article, I explain some of the challenges with classroom pets, then offer alternative, unit-focused approaches that are better for animals, early childhood educators, and children.

The Challenges of Classroom Pets

While the idea of a classroom pet sparks excitement, keeping these animals in early learning programs and schools can pose several challenges for teachers and the animals themselves.

Longevity

Most classroom pets can live far longer than one school year. For example, small rodents such as mice, gerbils, and hamsters can live at least two years, while rabbits can live at least eight years. Common goldfish can live 10 years, and tortoises can live an astounding 40 years or more. This longevity means that teachers need to plan healthy places for the pet to spend many holiday and summer breaks. Families who volunteer to host the pet may not know how to take care of it appropriately or have the right environment set up. Teachers may not be prepared to accommodate the animal in their own homes.

Expense

Costs for food, housing and bedding, and toys mount over time. Most of these animals need an annual trip to the veterinarian to make sure they stay healthy, and as they age, they may need treatment for chronic issues (arthritis, vision loss). Costs can easily exceed \$500 per year, and teachers are generally responsible for covering these expenses.

Loss of Interest

As time passes, children often become less interested in the classroom pet. Unlike household pets like cats and dogs, most classroom pets cannot be easily, safely handled by preschool-aged children. Consequently, children mostly observe the pets through their cages, and the pet's behavior is likely to be the same from day to day. As children lose interest, the opportunity for inspiring curricular activities fades as well.

Decreased Quality of Life for the Animal

Perhaps most important to consider is animal well-being. Scientists cannot tell us exactly what makes a good quality of life for most of the animals commonly found as classroom pets. However, in nature, none of these animals lives in one very small area, enclosed for their entire lives. Instead, they move freely throughout their habitat, and some (frogs, turtles) spend time on land and in open water. Many classroom pets, particularly smaller animals, are also highly sensitive to light and sound and may find bright, loud preschool classrooms stressful. Moreover, teachers cannot use classroom pets to teach children about how these animals live in nature. For example, it is difficult to explain how far tortoises can roam (up to half a mile per day) when your classroom tortoise is confined to a small terrarium, perhaps for four decades or more.

Innovative Ways to Bring Animals into Preschool Settings

Rather than relying on classroom pets, teachers can plan animal-themed projects and studies with brief animal interactions. Not only is this more humane, it can also be a more educational and engaging approach. (See "Questions to Ask Before Connecting Children with Animals" at naeyc.org/ tyc/spring2022 for additional considerations.) The following four suggestions can be used independently or in combination throughout the preschool year.

Zoo and/or Rescue Visit

Many American Zoo Association-accredited zoos welcome visitors or will come to your classroom to share child-friendly "ambassador" animals—a term the organization uses for animals that like being around people. These include owls, rats, hedgehogs, armadillos, bearded dragon lizards, and tortoises. Local refuges for specific species (guinea pigs, reptiles, or wild birds) are also good candidates for classroom visits. Experts from either of these venues will be able to share animals that are comfortable with children, give helpful information about them, then take them back to their appropriate housing. In my experience, a 30- to 60-minute session with the animal works well.

Cost: Varies

Considerations: Zoos and rescue organizations may not have experience with preschoolers, so a brief planning conversation with the presenter or handler can help ensure that the presentation will engage children. (For more information on planning and preparing for experiential learning, see "Embracing Partnerships with Informal Settings to Enhance Teaching and Learning," by Sara L. Hartman and Jennifer Hines-Bergmeier, in the Summer 2021 issue of *Young Children*.)

Extension activities: A zoo or refuge visit invites classroom discussion of key concepts like animal care and safety, eating habits, and environmental adaptations. Useful books to pair with animal visits might include *A Visit to the Zoo*, by Blake A. Hoena, or *The View at the Zoo*, by Kathleen Long Bostrom and illustrated by Guy Francis. Dramatic play activities could include transforming areas of the classroom into different parts of the zoo or refuge and pretending to care for the animals that reside there.

Hatching Chicks

In the span of a few weeks, teachers can introduce children to a baby chick's lifecycle. Teachers can purchase six to 12 chicken eggs and rent or purchase an incubator (for eggs) and a brooder (for chicks). Local farms, farm stores, and online companies (e.g., RentACoop.com) offer these supplies. After about three weeks in the incubator, the eggs will hatch. Children can then watch as the chicks move to the brooder and start to grow.

Cost: \$10 to \$50 for eggs and shipping; \$50 to \$100 for the incubator; \$50 to \$100 for the brooder, which can be reused.

Considerations: Eggs and chicks can carry salmonella and/or E. coli, which means teachers must wear gloves during any interactions and wash their hands thoroughly afterward.

The Centers for Disease Control and Prevention recommends children not handle the chicks (see cdc.gov/healthypets/pets/ farm-animals/backyard-poultry.html). Also, teachers need to identify safe, chicken-friendly homes to adopt each chick. In many cases, classroom chicks cannot go back to live on their original farms because of the risk of infecting other animals. Teachers should ask chick providers what will happen to the chicks if they are returned.

Extension activities: A chick study introduces children to concepts such as eggs, embryonic development, and hatching. *From Egg to Chicken*, by Gerald Legg, and *Chick (See How They Grow Series)*, by Jane Burton, can help support this learning. Corresponding math and language activities could include describing, counting, and charting the number of eggs, the length of time each takes to hatch, and the appearance and behavior of the chicks once they emerge.

Nurturing Butterflies

In the spring, classrooms can host caterpillars as they transform into butterflies. Several companies offer caterpillars, food, and housing to curious classrooms (e.g., www.insectlore.com). After ordering, caterpillars arrive in a small cup full of food. Teachers and children keep the caterpillars in their food container until they create chrysalises, then transfer the chrysalises into a netted butterfly house. After the transformation from chrysalis to butterfly is complete, children can set the butterflies free. This activity takes approximately two weeks.

Cost: Initial outlay of \$35. This includes \$20 for the butterfly house, which can be used year after year, and \$15 for the caterpillars.

Considerations: Different kinds of butterflies thrive in different locations. Ask the company you purchase from about selecting a breed that will thrive in your area.

Extension activities: Key concepts include metamorphosis, insect anatomy, and pollination. Helpful books to extend learning might include *From Caterpillar to Butterfly*, by

Deborah Heiligman and illustrated by Bari Weissman, or the classic *The Very Hungry Caterpillar*, by Eric Carle. (Carle uses the word *cocoon*, which teachers might want to substitute with *chrysalis*). Science- and literacy-based activities could include asking children to journal (write and draw) their observations at each stage of the butterfly life cycle.

Studying Bees

From early spring through early fall (when bees are most active), teachers like Mr. Gonzalez from the opening vignette can guide children in spotting bees outdoors and observing their behavior from a distance. Bee safety is a key part of this conversation: it's important to teach children to respect bees and their fierce self-defense capabilities. Teachers can also take children to visit a local honeybee-keeper's hive. An excellent source for locating beekeepers is the American Beekeeping Federation (abfnet.org). Finally, in early fall, teachers can introduce children to the nonstinging mason bees, which build nests instead of hives.

Cost: \$20 if teachers wish to buy a Mason Bee House, which attracts mason bees and gives them a place to lay eggs.

Considerations: Observing bees in the environment is unwise if children have bee allergies.

Extension activities: Key concepts of a bee study include bee anatomy, eusocial behavior, and honey production. *National Geographic Readers: Bees*, by Laura Marsh, is a comprehensive informational text about these insects, while *The Honeybee*, by Kirsten Hall and illustrated by Isabelle Arsenault, includes simpler text in a more narrative form. Science and movement activities could include drawing or sculpting bees and diving into the waggle dance that bees use to share information.

Conclusion

A classroom pet may not be an ideal way to bring nature into the classroom because it often involves taking an animal *out* of nature. Instead, implementing a series of animal-focused themes or projects throughout the year can provide safe, cost-effective, nature-friendly ways for preschoolers to learn how animals truly live and thrive.

Annemarie Hindman is professor of early childhood education and educational psychology at Temple University in Philadelphia, Pennsylvania.

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Transitions Within the Day

I have a 4-year-old who struggles with transitions, including coming to and leaving the classroom and circle time. He does not want to change activities throughout the day. He is a great, happy kid once he tries the activity. We give notice before a transition. We use a timer. We follow a routine each day. We sing the same goodbye song each day, and he stresses out if his parent comes before his name is sung. They will wait until we sing his name, and then it is a bit easier for him to leave. He prefers adults to kids.

Mom and I plan to meet next week. Any suggestions about how to help this child with transitions are appreciated.

ELIZABETH, FLORIDA

Something I use is a picture schedule. All the activities are laid out on the wall with Velcro, and when it's time for an activity, the children get to move the picture to that specified activity. If it's circle time, they take the picture to circle time. When the activity is over, they place the card in a basket to signify the end of the activity. This has seemed to work for me along with all the other strategies you have been using.

PAOLA, FLORIDA

Perhaps the child who is struggling with transitions can be in charge of initiating the transitions. In other words, he can be the one to hold the timer, start the song, etc. It sounds as if you are doing everything right, so maybe this will help him.

GINA, NEW YORK

Transitions bring up big emotions for some children. This might be related to not being able to anticipate what the steps of the transition will be, the child might be worried that the next thing will not be as satisfying as the current thing, or they may feel angry/frustrated/ disappointed that they have to stop doing the thing they're focused on, and they aren't sure how to navigate those emotions.

If it's a pattern behavior, it's important to be aware of and utilize your own coping strategies. The way to find out if this is an emotion-processing development opportunity is to offer Collaborative Emotion Processing consistently during transitions for two weeks (while also providing pictorial cues). If it starts to get better, then that's what it was! If it stays the same, there might be something else going on with development, and it's a good time to explore additional resources.

LAUREN, MASSACHUSETTS

Note: Collaborative Emotion Processing is an approach to empathy development by which people can integrate their emotions in a mindful way. This process involves the following steps: allowing one's emotions to exist; recognizing perceived emotions; developing security in feeling a range of emotions over time; utilizing coping strategies; and moving on from emotions once they have been processed or a problem has been solved.

NAEYC's **HELLO** online forum is a great place to have conversations and create connections with peers around important early learning issues. Excerpts from HELLO have been edited for style and length.

Do you have questions or suggestions to share with your peers? Are you simply interested in reading different takes from early childhood educators around the country? Tap into the vibrant discussions on HELLO at **hello.NAEYC.org/welcomehello**

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