

EARLY CHILDHOOD  
**MATH** ROUTINES  
EMPOWERING  
YOUNG MINDS TO THINK



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WITH PATRICIA GALLAHUE AND DANIELLE IACOVIELLO

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# Foreword

Karen Economopoulos

This is a book that celebrates childhood and the power of young children's thinking. It is a book about children's ideas, the ones that make sense and the ones that don't quite make sense yet. This book focuses on the joyful learning that occurs when young children have opportunities to play with important ideas.

This is a book about purposeful teaching, because environments where children's thinking is at the center of the work don't just happen by accident. It is a book about teachers stepping back and children stepping forward.

This is a book about giving agency to children because when young students are engaged in interesting and meaningful work, they own the problem, they own the thinking, and they own the solution. This is a book about early childhood math routines that empower young students to think.

For those of us who have spent time studying the social, emotional, and cognitive development of young children and have been immersed in classrooms that foster this growth, the vignettes and images that Toni Cameron and her colleagues present will be familiar and affirming. For those of us who have spent time studying the complexities of early childhood mathematics and thinking about how to engage young students in making sense of the big ideas in early number, Cameron's notion of using routines to connect children to mathematics will be exciting and powerful. For others of us who might not have ever experienced how young children become counters and comparers and problem-posers and problem-solvers, this book will convince us that young children can and do think like mathematicians.

This is a book that teachers, coaches, and administrators can use tomorrow because it is about routines that are familiar and accessible. Many of these routines build on existing practices that are part of early childhood classrooms, such as taking attendance or counting the number of days in school. Toni, however, reshapes what is familiar and uncovers the potential mathematical opportunities often hiding in plain sight. She suggests variations that engage students and invite them into the routine. She opens up possibilities for engagement that shift the responsibility of the task from teacher to student. She offers questions that can reveal what students understand or do not yet understand. She comments on the math ideas and skills in accessible ways and in doing so, supports teachers to learn more about the math they are teaching.

This is also a book that teachers, coaches, and administrators can use over time to expand their practice, to improve their understanding of the big ideas in early childhood mathematics, and to hone their pedagogy as they observe students at work and listen to their thinking. Educators will connect







# Transforming Early Childhood Math Routines

“ We don’t stop playing because we grow old; we grow old because we stop playing.”

George Bernard Shaw, author and playwright, *Pygmalion*, 1912

## Wonder and the Early Childhood Classroom

If we believe that young children need time and space to wonder, create, and set goals for their own learning, we must structure our early childhood classrooms to reflect these beliefs (Duckworth 2006). The current reality is that many early childhood classrooms do not have *play* at the center, but rather are more focused on academic learning. This shift has happened in part because the current expectations for learning, which are set by state and local standards, have diminished the importance of play and have instead placed great emphasis on the development of specific skills (usually reading and math skills) in early childhood. Although some of the goals underlying these standards are admirable (e.g., to level the playing field so all children—no matter their socioeconomic background—learn to read), the real question might be “At what cost to children?”



The conundrum faced by educators of young children is this: How do we, given the current educational structures and expectations that are focused on meeting standards, find ways to create rich, vibrant learning communities where exploration and play are central? This is a question we (Toni, Dani, and Patricia) have grappled with in our own teaching and coaching. Although there is no easy answer to this question, one solution we have found is to use thinking routines in our teaching that are multilayered; they can be used to develop specific content ideas (and meet different standards) and they also can be seen as tools to develop playful mindsets, problem-solving habits of mind, and a wide range of communication skills.

## Play and Learning: Ways of Seeing Are Ways of Being

Picture this: a birthday party; a child, after unwrapping presents, leaves all of them in a pile and goes off to play with the box they came in. All the bells and whistles, the bright colors, the expensive gizmos meant little to the child—they didn't entice her in the least. Instead she takes the plain brown cardboard box and it becomes the object of fascination; hours are spent engaging and reengaging with it. Why is this?

For most adults, to paraphrase Gertrude Stein's famous quip, a box is a box is a box (Stein 1922). A box is utilitarian; it is a container; you put things in it; you mail things in it—its potential is fixed. For children, on the other hand, a box is a gateway to another world where purpose and usefulness are directly connected to the imagination. A child wonders, "Could this object be a dollhouse?" She asks, "What if I put my boat in the stream? Will it float?" She builds a castle with the box, hides in it, or uses it as a car. The box's usage is limited only by the boundaries of what can be envisioned (see **Figure 1.1**).

Did You Know

### **The United States has a National Toy Hall of Fame.**

The ordinary cardboard box has been inducted into the Hall of Fame and lives alongside other beloved toys like Lego and Mr. Potato Head!

## Routines in the Early Childhood Classroom: How We Define Routines

If you look up *routine* in a dictionary, some of the nouns that come up are *procedure*, *pattern*, *drill*, *system*, and *method*. Some of the adjectives connected with routine are *commonplace*, *conventional*, and *ordinary*. Although these definitions hint at what might make routines boring, classroom routines do not have to be uninspired.

We define routines as a kind of *system* that contains a predictable *pattern* that makes them easy for students to learn and remember. Repetition is an important feature of routines; it helps students internalize the routine's structures (Ritchhart et al. 2006). As students become more familiar with the routine, the structure becomes automatic. For example, the structure of the *You Say, I Say* routine will stay the same over time (although at some point, children may not need the sentence frame of "You say . . . , I say . . . "). However, because the words children say change every time they do this routine, the thinking never becomes rote. Although the structure (writing the words generated on the board and looking for connections) stays the same, the actual connections children make are highly variable.

Even though different routines may have similar structures, the purpose of one routine may be radically different from another. For this reason, it is important for teachers to be able to distinguish between types of routines and also to be clear about their purpose as they plan routines.

### ROUTINE TYPES

Educational researchers Leinhardt, Weidman, and Hammond (1987) have organized routines into four broad categories:

- **housekeeping routines** (e.g., how to put away materials in a classroom);
- **behavior management routines** (e.g., how children walk to the rug and gather in the morning meeting circle);
- **discourse routines** (e.g., norms for how members of the classroom community listen to each other and ask questions of one another when they don't understand something that has been said);
- **learning routines** (e.g., a math routine in which students figure out how many children are present and how many milks they need for snack).

Although it's helpful to be familiar with these types of routines, it is also important to recognize that these are not rigid classifications; a single routine may fit into more than one category. All of the math routines in this book are structured to develop multiple social and learning behaviors. For example, here are a few things children learn as they participate in counting routines: (1) physical behavior: how to sit together and interact socially in the meeting area; (2) discourse: how to listen to each other—attend to the numbers other children are saying in the sequence—and let others know if they agree or disagree with what's been said; (3) math learning: the rote counting sequence and patterns of counting numbers in base ten.

## Routines as Mirrors of Our Values

It is no secret that carefully thought-out and well-managed routines are essential for the smooth running of classroom life. Moreover, the routines a teacher selects communicate what is valued in the classroom. If students are given many opportunities to talk to one another during turn and talks and collaborative tasks, they learn that their ideas are worthy of consideration and that they can figure things out by talking to each other. If, on the other hand, student talk is focused primarily on answering only the teacher's questions, students may think that their job is to figure out what the teacher is thinking or what she wants to hear.

Although classroom routines are essential for creating a structured environment where students can thrive, not all routines have positive long-term effects. It is important for us, as teachers, to think carefully about the explicit and implicit messages that underlie our routines. Here's an example of the dual nature of routines: one common classroom routine is for students to raise their hands and wait to be called on by the teacher before speaking. This routine may, at the outset, seem positive—it creates order by structuring the learning environment in ways that help students manage their impulsivity. But there can also be negative consequences to hand-raising routines. Always relying on hand-raising can encourage compliance above all else. Even though compliance may not be the intended outcome, children may internalize a classroom hierarchy that places the ultimate source of power in the teacher. For example, in whole-group discussions when children have internalized the "I-can't-speak-until-I've-gotten-permission-from-my-teacher" mentality, there is often a stilted kind of conversation. Whether they agree, disagree, or have a question, children are not able to speak directly to the person expressing an idea. A child's personal power can also be diminished when he realizes that he needs permission to speak; that act of control on the teacher's part—even when well intentioned—can have negative consequences on the minds of learners (Toshalis and Nakkula 2012). One way to avoid developing this kind of negative behavior is if we, as teachers, are careful to balance hand-raising structures with ones that encourage more natural conversational structures. The latter provide opportunities for student choice and are essential in developing children's autonomy.



## ENVISIONING YOUR ROUTINES

As you think about which routines you use and why you use them, try to picture your ideal classroom: What does it look like? Sound like? Where are you in the classroom and how do students relate to you and each other? Once you have a clear vision of what you want, you can think about your choice of routine by posing the questions: How will this routine help you create a classroom culture that is a true reflection of what you value as a teacher? What evidence are you looking for in children's learning and behavior that will help you assess its effectiveness?

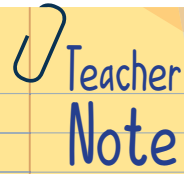
## CAREFULLY CHOOSING YOUR ROUTINES

As we saw in the comparison of *I Say, You Say* and *The Calendar*, not all routines are created equal. Some routines create rich talk and deep thinking; others do not (Ladson-Billings 2014). Some engage students in playful thinking; others make them disinterested. How do we then, as teachers, choose routines or decide what constitutes an effective routine? Here are a few questions that might help with analysis and selection. These questions focus on the *what*, *why*, *who*, and *how* and are essential in lesson design (West and Cameron 2013).

1. Why are you using this particular routine—what is its purpose?
2. If the routine is designed to develop mathematical thinking, what are the big ideas or strategies underlying or embedded in it?
3. Who are your students? What are their developmental needs? Is this routine appropriate for all students? For some students? Which ones?
4. What are the possible learning pathways (Clements and Sarama 2014) for students in this routine? Is it differentiated in ways so that all learners will have access?
5. How will this routine meet or challenge your students' developmental needs?
6. How do you assess and document student learning?

## ROUTINES SHOULD EVOLVE OVER TIME

It is helpful to keep in mind that all routines can (and perhaps should!) evolve over time. As children engage in a routine multiple times, they internalize its structure (Ritchhart et al. 2006). Over time, some of the teacher scaffolding becomes unnecessary. It is important to be aware of opportune moments when you can shift your routines—this prevents them from becoming mechanized and boring. For example, with *You Say, I Say*, teachers have noticed that over time, their students do not need to use this sentence frame, because they have internalized the routine's structure and can easily share their words without it and still maintain the flow of language.



## Learning Pathways

Learning pathways can be thought of as the possible directions that students can take in their mathematical journeys within a given routine. It is important for teachers to consider these different learning paths and to be prepared to slow down or extend a routine based on student needs. This type of planning is possible only when we deeply understand the content embedded in a task. To help us think about children's learning journeys in this book, we will refer to a developmental framework called a *landscape of learning*, which is made up of big ideas, strategies, and models. This model was developed by Maarten Dolk and Cathy Fosnot. To read more about this tool and how it might be used, see, *Young Mathematicians at Work: Constructing Number Sense, Addition and Subtraction* (Fosnot and Dolk 2001).

## THE ROLE OF THE TEACHER IN SETTING UP ROUTINES

Teacher intent and clarity about purpose (Why am I using this routine?) and ability to notice (Pam and Amari distract each other and may have to be moved to different spots in the meeting area) are foundational for routines to run smoothly. Equally critical to the successful implementation of routines are the choices the classroom teacher makes about when to slow down and what to highlight (e.g., In a counting routine, why it's helpful to sit a certain way; how to listen carefully so that you know what number to share when it's your turn; how to disagree with a mistake in the count without being mean). The more clearly the teacher envisions *how* the routine works, the more easily she can tweak specific aspects of the routine when they are not working and find ways to help students develop as individual learners and as members of a community (Barell 1991; Hiebert et al. 2000).

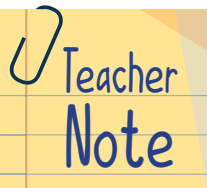
## What Kind of Routines Can You Expect in This Book?

This book, in focusing on routines, emphasizes an important subset of discourse and learning routines called thinking routines. "Thinking routines are easy-to-learn structures, mostly taking the form of simple sets of questions or metaphors that naturally involve children in *thinking processes*. These routines may expand the children's repertoire of cognitive strategies because they constitute a major form of organizing memory and thinking" (Salmon 2011, 366).

The work in this book builds on the spirit of thinking routines first described by Harvard's Project Zero. According to the work of this project, thinking routines "focus on the establishment of structures that weave thinking into the fabric of the classroom and help to make the thinking of everyone in the classroom more visible and apparent. These kinds of routines provide models of thinking and are often a vehicle for incorporating thinking language into classrooms as well" (Ritchhart et al. 2006).

## Thinking Routines in the Early Childhood Classroom: *Notice and Wonder*

The beauty of the thinking routines is twofold. First, they are quick and enjoyable for children to learn and do. Second, they hold great potential for developing students' mathematical reasoning and communication skills. Here's an example of a thinking routine created by the educators and researchers at Project Zero that we have adapted and used in our classrooms. They call it *See, Think, Wonder*. We call it *Notice and Wonder* (Ray-Riek 2013).



### A Look at Research

Vygotsky is the preeminent proponent of the position that pretend play increases intelligence and develops abstract reasoning. Vygotsky uses his famous example of the stick that, in play, becomes the horse, to explain how play allows children to develop a separation between perception and meaning. The stick is the "pivot," which allows thought, word meaning, to be separated from objects and action to arise from ideas as opposed to arising from things. Although the stick is still needed to separate thought and object, the child's relation to reality is now changed because the structure of his perceptions has changed. For the first time, meaning predominates over object (Vygotsky 1978). Vygotsky writes that "this characterizes the transitional nature of play; it's a stage between the purely situational constraints of early childhood and adult thought, which can be totally free from real situations" (1978, 98).