How to Use This Resource

Watch the video clip "Introduction." Talk with a friend or colleague; what do you see in the introduction that makes you the most excited about *Teaching Preschool and Kindergarten Math*?

Why This Resource?

We designed this resource to support the efforts of teachers, supervisors, program coordinators, and private/in-home caregivers in creating a more focused, successful mathematics program across and within early childhood classrooms while simultaneously deepening their understanding of the mathematical ideas that need to be developed at an early age.

As teachers of young children for more than fifty years combined, we have studied the needs and interests of three-, four-, and five-year-olds. This resource reflects the best of our studies, featuring lessons, math talk ideas, investigations, formative assessment opportunities, routines, insights concerning student misconceptions, research-based strategies, and more. We use video clips, classroom stories, photos, student work samples, and teacher reflections to share student learning. The accompanying DVD contains

26 video clips filmed in an actual early childhood classroom, giving you the unique opportunity to see these practices in action with young learners.

We know that high-quality preschool education is crucial for all students. Unfortunately, there exists a well-documented gap in mathematical knowledge within the group of children first coming to school. This gap in mathematical knowledge not only applies to preschool children; in our many conversations with our preschool and early childhood colleagues we hear teachers lament their lack of mathematical content knowledge and the lack of mathematical professional development available to early childhood teachers. We intend for this resource to facilitate change for all involved.

We believe that a rich and focused early childhood program is fundamental to children's success in their future studies. We hope to deepen teachers' understanding of the mathematical ideas that they are teaching. We want teachers to engage their students in mathematical talk that demonstrates what children are learning. We want young children to use their voice to share their thinking, their mathematical ideas, and their growth over time. We believe that all children bring to their learning awareness, competence, capability, and a potential for learning. They have their own theories about why and how things happen, and they are curious about their world. We also know that children learn in many different ways. Children are visual, tactile, kinesthetic, and/or auditory learners. Some children see things geometrically; others see things numerically. This resource shares ways we have found to help all kinds of learners make sense of the mathematics in their world.

Teaching Insight

Instead of Cut-Outs

We want early childhood teachers to understand that young children are willing and excited about interacting with math. We know that young children do not learn mathematics through pencil/paper tasks or worksheets. Neither do teachers have to buy cute counting objects or spend tons of time cutting out charming figures. Instead of cut-out monkeys, we suggest teachers use connecting cubes to represent monkeys—children will then be engaged in symbolic play much like they will be when they learn that numerals represent quantities. Remember: Young children are very competent! They also have wonderful imaginations.

Connections to Curricula

There are numerous preschool curricula on the market. Most have curricular themes that are interesting to young children: school, family, community, animals, and nature. Most have a strong emphasis on literacy, oral language development, and learning about school skills and behaviors. What we believe is largely missing from these programs is an in-depth focus on the essential mathematics that needs to be experienced in the early grades. The Common Core Standards, while not specifically addressing preschool, describe *Standards for Mathematical Practice* that have guided us in writing this resource. It is our hope that teachers with one of the popular preschool curricula already in place at their schools will turn to this resource and these practices, to enhance and make more focused the work they are doing in developing mathematical thinking and math conversations with their students.

Why Young Children Inspire Us

People who work with children in the early years are familiar with the poignant and amusing things that young children say and do. Children during these years find all sorts of ways to play with most any object, from a box to a stick. As teachers of young children, we are inspired by their notions and behaviors.

We are charmed by the young children who cover their eyes while playing peek-a-boo and honestly think that we cannot see them because they cannot see us. They have a strong sense of themselves.

We admire the child who comes to school wearing a superhero cape and stays in character throughout the entire school day. This child has an imagination that can serve her well as she negotiates challenges throughout the day.

We respect the imagination of the child who climbs inside a washing machine box and transforms it into a bear cave. He makes connections between his world and the world of the animals he is learning about.

We understand the significance of counting when we hear how a child who loves to count will show you five fingers for how old she is. She proudly associates her age with counting, as Gabi does in Video Clip 4.1.

We have also seen how young children cannot make sense of numbers without a meaningful context. Consider this dialogue between the teacher, Brenda, and four-year-old Maybaleve:

Brenda: *How many is four and one more?*

Maybaleve: *Six.*

Brenda: *How many is four balloons and one more?*

Maybaleve: *Five.*

Brenda: *How many is four dogs and one more?*

Maybaleve: *Five.*

Brenda: *How many is four candies and one more?*

Maybaleve: *Five.*

Brenda: *So how many is four and one more?*

Maybaleve: *Ten.*

The young child can make sense of *one more* with a context, yet makes no sense at all of the same numbers when there is no context.

Because of these special perspectives about young children, and because of the importance of the role of mathematics in their future lives, we were inspired to create this resource.

"Everything around us can be better understood with mathematics. Preschool is a good time for children to become interested in counting, sorting, building shapes, measuring, and estimating." —Clements (1999)

Five Steps to Getting the Most from This Resource

1. Read "Why This Resource?" It only takes fifteen minutes to do this. Congratulations! You're partway there.
2. Observe mathematics in an early childhood classroom. Use the questions outlined in Reproducible A, Observation Questions: Mathematics in an Early Childhood Classroom. If you are a teacher, think about these questions as they apply to your own classroom.

   Become familiar with how this resource is organized (see pages xxiii–xxvi). We recommend you start with Section I and proceed next to Section II and then to Section III. We have tried to build ideas about how children typically develop mathematical thinking beginning with looking at real objects, then seeing the need to count them, and eventually looking for relationships in their world.
3. Pay special attention to the series of *Learning Progressions* reproducibles (Reproducibles C1–C7). Take a moment to look them over before exploring the ideas within the chapters. These reproducibles will help you observe and assess children's thinking and learning.

See Reproducible A.

See Reproducibles C1–C7.

4. Read, watch, and reflect. Read the chapters. Watch the video clips as they come up in each chapter. Continually reflect on the observations you made in Step 2.
5. Put the practices in this resource into use. Give yourself and your colleagues time. Determine a date to check back in with your observations. Revisit your responses to the observations questions—are you seeing change? Let us know. Email us at info@mathsolutions.com.

How This Resource Is Organized

This resource is divided into three sections: Young Children's Mathematical Ideas: Getting Started; Understanding How Young Children Count; and Developing Young Children's Number Sense. For maximum benefit, we suggest reading the sections in order because they build on one another. Each section is divided into topic-specific chapters. The chapters offer an abundance of lessons, math talk ideas, investigations, formative assessment opportunities, routines, insights concerning student misconceptions, research-based strategies, classroom stories, and more. Each chapter adheres to similar friendly elements as follows.

Connections to the DVD

The accompanying video clips are a look at early childhood math experiences. Brenda Mercado, author and preschool teacher, takes educators into her classroom in PACE (Parent And Child Education) Preschool in Amelia Maldonado Elementary School for a *seeing is believing* look at young children experiencing math. The clips have been chosen to help readers think about what the actions and words of children might mean in their development as young mathematicians. Throughout the book, a video icon appears when there is a corresponding video clip. The video clips are organized on the DVD by chapter and by topic (Circle Time, Small Group Time, Choice Time, and Assessment Opportunities).

Reproducibles

The Reproducibles

Whenever possible, we include reproducibles to facilitate the implementation of the suggested ideas and activities. When a corresponding reproducible is included, it is noted with an icon. Pay special attention to the series of *Learning Progressions* reproducibles (Reproducibles C1–C7). Take a moment to look them over before exploring the ideas within the chapters.

Math Talk

At the heart of this resource is an emphasis on promoting and supporting student *math talk* in various settings. Chapter 1 is devoted to math talk, *Math Talk* sections in every chapter highlight definitions, suggestions, learning scenarios, and math content for supporting math talk in early childhood classrooms.

A Child's Mind

This resource informs teachers about common student errors and/or misconceptions so they can teach more purposefully. Teachers need to think about what goes on in a child's mind and then find ways to address how the child reasons. These reflections are highlighted throughout so that you can easily refer to them time and time again.

Teaching Insights

Throughout the chapters we share insights that we feel will be especially helpful to teachers in managing their classrooms and/or successfully implementing the activities and lessons. We include explanations of key math manipulatives from pattern blocks to connecting cubes, and share our best practices in managing classroom space, from the studio to the light table.

Literature Connections

Children's literature brings another voice, or part of the outside world, into classrooms. Because children are naturally drawn to books and stories, we provide numerous ideas for using these resources. Reproducible D is a bibliography of children's books that support mathematical thinking.

Home/School Connections

Since the child's world is broader than the classroom, we want to help teachers, supervisors, and program developers extend the classroom learning to the child's home and neighborhood. We are careful to include how teachers can do this, and support family efforts in helping children become mathematical problem solvers. Although there is mathematics in everyday life, parents and caregivers may not know how they are supporting it every day. We hope to encourage family efforts by sharing with them things they are already doing that help develop mathematical thinking. We also share documentation of what the child can do with families so they can celebrate the child's progress.

Key to Additional Icons

The National Academy Press report stresses "children need a great deal of practice doing a task, even after they can do it correctly." This kind of meaningful practice will lead to fluency and confidence. For this reason, we offer an abundance of learning opportunities throughout this resource. The learning opportunities are identified by the following icons (key features of an early childhood curriculum). These learning opportunities are also in Quick-Reference Lists at the end of this resource. Each list features the opportunities by type as another user-friendly way to access them.

Circle Time Circle Time, an activity for large groups of children, has been around for about a century. Every individual in a circle is equal and belongs to the whole group. Each member of the circle can see and hear every other member of the circle. Children express feelings and ideas to the whole group, take turns listening and speaking, and listen to stories or participate in songs and games.

Teachers use Circle Time when they want to share something with the entire group. It is difficult for young children to listen and focus for long periods of time, so these Circle Time activities are kept short and lively. Often during Circle Time we ask children to share their ideas about interesting mathematical ideas and problems. We ask them to share their strategies so other children can hear. These conversations act as sources of knowledge for the children who are listening.

Small Group Time In Small Group Time, groups of four to six children move through rotations until eventually all children have the opportunity to complete a task or receive specific instruction. The activities are planned and either teacher-directed or teacher-supported. Teachers may slightly alter the instruction to meet the needs of each small group, knowing that some children may complete an activity and move on to another activity, while other children may need teacher support. This is not a rigid use of time. Sometimes students in one group "finish" the activity and move on to their choice activity. In the same time, some students may need more time within the supportive environment with the teacher to complete the task.

Choice Time Choice Time is an opportunity for children to choose where they want to work. There are usually areas of the classroom designated for specific choice time purposes: the writing area, block area, housekeeping

area, studio, light table, reading nook, take-apart area, and science area, for example. (The Classroom Map on page 333 shows how Brenda's classroom is designed to accommodate Choice Time areas and more.) During Choice Time children are self-directed and often have particular preferences. Choice Time is one of the most important times of the day as we watch children negotiate, investigate, and experiment with their peers and materials. Their personal choices really matter to them. It is important for them to find a part of the day where they can truly make a personal choice about how they want to spend their time.

Teaching Insight

Using a Choice Board

Use a "choice board" to help children plan their choice time. Take photos of the areas in the classroom open for choice time. Place the photos in a column on the viewer's left side of a pocket chart. Ask each child to decide where he or she is going to go during choice time; the child then places his or her photo in the pocket chart, next to the corresponding classroom photo. A choice board helps deter children from wandering around, not knowing what to do during choice time—most importantly, when children make the choice they become invested in the activity. Children are welcome to make different choices during the time allotted.

Angelica places her photo on the choice board, next to the classroom area she has decided to go to during choice time.

Teaching Insight

Cleaning Up During Choice Time

It is important that children learn that they need to clean up their choice time area before they move on! This is a challenge that teachers need to anticipate when they introduce choice time procedures. Practicing moving from one choice activity to another needs to be part of the process for introducing this classroom procedure. Once children have practiced this, it becomes easier to manage.

A Note About the Research

There is clear documentation that high quality preschool education is important for all students (Espinosa 2002). Further, the emphasis and improvement of the mathematics education for our youngest and most needy children who first come to school is crucial (Bowman, Donovan, and Burns 2000).

Research supports the recommendations and practices in this resource. We draw particular inspiration from the NCTM and NAEYC Joint Publication *Curriculum Focal Points* and the National Research Council's Early Childhood Math Report that emphasize coordinated learning paths for children to move within and across the grades. These documents clarify for pre-K teachers how foundational and necessary it is for them to work more deeply on pre-K mathematics goals.