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Chapter 1

Guided Math: A Framework for Mathematics Instruction

Think back to your elementary school days. Picture your math classes. What do you remember? Many of us recall instructions to get out our math books and open to a specified page. The teacher explains the lesson using the chalkboard or overhead projector. One or two students may be called on to solve problems at the board as the rest of the students practice at their desks. Some of us may remember using manipulatives in our early grades, but probably not beyond second grade. Finally, problems from the book are assigned for classwork or homework. These assignments are later turned in to be checked and graded. Periodically, quizzes are given to check on understanding. At the end of the chapter, a test is given. The teacher then moves to the next chapter.

Was this method successful? For many of us, the answer is yes. The teacher-centered approach provided the instruction we needed. We applied this instruction to problems to be completed, and our understanding increased. If it didn't, we comforted ourselves with the knowledge that some people just don't have mathematical minds. We often decided to make the most of our other skills. Many of us simply opted out of math classes as soon as we could. All too often in the past, this was considered good enough. Students either "got it" or they didn't. Their grades indicated how well they "got it."

Unfortunately, too many of us "didn't get it." Mathematical literacy is a serious problem in the United States (U.S. Department of Education 2008). Seventy-eight percent of adults cannot explain how to compute the interest paid on a loan, 71% cannot calculate miles per gallon on a trip, and 58% cannot calculate a 10% tip for a lunch bill (Phillips 2007). According to the U.S. Department of Education's National Mathematics Advisory Panel, "there are persistent disparities in mathematics achievement related to race and income—disparities that are not only devastating for the individuals and families but also project poorly for the nation's future, given the youthfulness and high growth rates of the largest minority populations" (2008).

In spite of the evidence that too many of our students are struggling with mathematics, the traditional, whole-class instructional method continues to be what most students encounter in today's schools. Whereas instruction in reading has changed dramatically over the last twenty years, the teacher-centered, large-group instruction model of teaching is still prominent in mathematics classes across the nation.

Because of the limitations of this method of instruction, students are often presented with the message that there is a particular way in which mathematics must be done—that there is only one right answer and only one right way to find that answer. The emphasis is on learning a set procedure rather than on conceptual understanding. Devlin in his book *The Math Instinct* (2005) states, "The problem many people have with school arithmetic is that they never get to the meaning stage; it remains forever an abstract game of formal symbols." As Hyde (2006) points out, by fourth or fifth grade, children seem to have lost the problem solving skills they had when they began kindergarten. Lack of conceptual understanding handicaps many students as they face more difficult math challenges in the upper grades.

Many students who don't "get it" fall further and further behind in mathematics as teachers struggle to find the time to help them. Teachers are frustrated trying to meet the needs of those students while continuing to challenge students who master the concepts

quickly. Some students complain of being bored while others fail miserably in understanding the concepts being taught. It is easy to feel caught in the middle of a tug-of-war game when trying to balance the needs of diverse students.

The frustrations felt by educators are only increased by the demands of accountability enacted by state and federal governments. School systems are struggling to eliminate the gaps in achievement between minority and majority students, special education and regular education students, and students receiving free and reduced lunches and the rest of the student population. It is no longer acceptable to have a portion of our students underachieve in mathematics. Although the National Assessment in Educational Progress (NAEP) indicates that some of these gaps are slowly narrowing (National Center for Education Statistics 2004), teachers are searching for effective means to reach *all* of their students and ways to adapt instructional methods to accommodate all levels of learners. Making this task even more complicated is the fact that students who are slower learners for one concept in mathematics may very well be accelerated learners with other concepts.

States are upping the ante by developing new and more demanding math standards based on the standards developed by the National Council of Teachers of Mathematics (2000). Teachers are discovering that methods they have used successfully in the past are no longer working. The demands of the new curriculum standards require new ways of teaching.

As I grappled with these frustrations in my own classroom, I gradually developed a model that offers all students opportunities to develop their mathematical skills at increasingly challenging levels of difficulty with the ultimate goal of helping them gain the ability to function independently in the world of mathematics. I learned the importance of establishing and maintaining classroom frameworks that are organized to support numeracy, just as teachers have done for literacy for many years. As teachers establish a culture of numeracy in their classrooms, they extend the mathematical experiences of students in classrooms by making connections to real-world experiences.

The instructional components of this model include:

1. A Classroom Environment of Numeracy
2. Morning Math Warm-ups and Calendar Board Activities
3. Whole-Class Instruction
4. Guided Math Instruction with Small Groups of Students
5. Math Workshop
6. Individual Conferences
7. An Ongoing System of Assessment

Together, these components allow teachers to support each student's efforts at varying levels according to their needs.

A Classroom Environment of Numeracy

Environments rich in mathematical opportunities for children are essential if we want our children to develop a thorough understanding of mathematics. When students begin to recognize how numbers and problem solving affect their everyday lives, mathematics becomes more meaningful to them. Because learning is both a social and constructive process, children learn best through active engagement in authentic opportunities to use and extend their number senses.

The creation of a classroom environment supporting numeracy enables students to build on their previously acquired knowledge of numbers. An organized mathematical support system for students requires that we encourage children to use manipulatives, compute, compare, categorize, question, estimate, solve problems, converse, and write about their thinking processes. Ideally, a math-rich classroom environment and engaging activities will help students become increasingly aware of mathematical and problem-solving opportunities throughout their everyday lives, thus putting a "math curse" on students as authors Jon Scieszka and Lane Smith describe facetiously in their children's book of that title (1995).