

Helping Children Be Successful in Math





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Introduction

In this new century, expectations for math literacy (numeracy) are high. They have to be—numeracy is the gateway to critical jobs in science, engineering, and technology. Changes in the workplace have created changes in education. The National Mathematics Advisory Panel recognized that math education in the United States is “broken,” and outlined steps for ensuring that children have the math proficiency necessary for success in school and, ultimately, in the jobs of the future. Made up of mathematicians, education experts, and psychologists, the panel described the need to prepare students for algebra through a curriculum that simultaneously develops conceptual understanding, computational fluency, and problem-solving ability.

Just as important is family encouragement and support for children’s math education. Teachers can help by encouraging a positive environment for math learning at home. Through many easy, everyday activities, parents can help their children become math literate and well prepared for success in a changing world.

Although mathematics is a specific area of knowledge, the skills developed in mathematics can be applied in all facets of life.

How is the world changing and what does this mean for children?

As teachers and parents, we often dream of our children's futures and hope they will have wonderfully rich and productive lives. We do everything in our power to ensure that they will have developed all the tools they need to be successful adults. But have we thought about what their future world will be like and how different it will be from today's world? How can we feel confident that we're giving children the educational experiences that will prepare them—can we predict what kinds of tools they will need to be successful in this future world?

Let's think back. Could our parents—let's say in the 1960s—have envisioned the tools we would need to be successful in today's workplace? If the world has changed so dramatically in the last twenty years, what will happen in the next twenty years? What will this mean for today's children? It's very likely that in 2028 some kinds of employment and some of the tools needed for these jobs have yet to be invented. Interestingly enough, hints about these tools can be found in a survey of Fortune 500 companies taken ten years ago. This survey found that the job skills most valued by these companies were (in order of importance): teamwork, problem solving, interpersonal skills, and listening skills. These applied abilities were more valued than basic knowledge skills such as reading and computation! Think about a global market and workplace that are both complex and rapidly changing, where people from different backgrounds and cultures will be communicating and collaborating. It goes without saying that these applied skills will continue to be critical in the future.

Why is numeracy so vital to children's futures? Although mathematics is a specific area of knowledge, the skills developed in mathematics can be applied in all facets of life. The National Mathematics Advisory Panel suggested that students need a deeper understanding of the basic math facts, including fluency with whole numbers and fractions, as well as elements of exploration and discovery. Developing automaticity (automatic recall) and fluency with mental arithmetic leads to better reasoning and problem solving.

This kind of balanced math learning diet gives students the tools and the skills to solve problems logically, developing mental flexibility, independence of thought, self-esteem, and ability to persevere. For example, when struggling to solve a problem, a child might say, "This strategy doesn't work; let me try a different way." Or "This is hard work, but I'm not going to give up!"

How early should children begin learning math?

Current research shows that math learning should begin well before children start school. According to Greg Duncan of Northwestern University, based on findings from six large longitudinal studies (covering school entrance to grade 5 in England, the U.S., and Canada), the single most important factor in predicting later academic success is that children begin school with a mastery of early math and literacy concepts. And math proficiency is of paramount importance. Mastery of early math predicts not only future math achievement, it also predicts future reading achievement.¹



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The fact that a head start in learning helps children achieve greater academic success is not surprising. What is striking is that, according to this research, mastery of early math concepts supersedes every other factor in predicting children's future academic achievement. Math readiness was found to be more important than reading skills, and even various social and behavioral factors were found to be less relevant in predicting later success in school. This suggests that a marked shift in how parents support their children's early math education is in order.

How has the teaching of mathematics changed? Why has it changed?

Think about your own mathematics learning. What comes to mind? Lots of problems for practice? Paper-and-pencil tasks you completed in silence? When there was conversation, what was the focus? Were there opportunities for different points of view to be shared? Did you hear questions like, "Did someone solve it a different way?" And what was your feeling as a learner in these classrooms?

As you ponder the past, your student's future, and the role of mathematics in it, these questions are important to consider. Why?

First, to be prepared for the future, children must have opportunities to develop the full range of skills and logical thinking, from learning the basic facts and the standard algorithms for computation to developing problem solving, reasoning, and proof (developing and evaluating mathematical arguments and proofs), which depend on the ability to communicate one's ideas orally and in writing.²

Second, another significant predictor of success in mathematics is related to the emotions of the learner. How children view themselves as mathematicians—their feelings about learning mathematics—will be critical to their success. If one of the gateways to the jobs and skills of the future is a high level of numeracy, then children have to be prepared to take higher-level mathematics courses. Surprisingly, recent brain-mapping research has shown that a big part of students' willingness to take higher-level math in college is connected to their emotional view of themselves as learners.

The national math panel suggested that it's not just lessons that need to change, but also the nation's attitudes about math. When parents say they "weren't good at math either," children assume they don't have the talent for numbers.³ It's important for parents, then, to help children develop the confidence in their own abilities to think so that doors to jobs are open to them in any industry that is experiencing innovation and change.⁴

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The school-home connection. What can families do to foster math learning?

For families that want to support math learning at home, it may be helpful to understand your state's guidelines and standards for math instruction and the standards outlined in the math curriculum used at your child's school. Some of these your child's teacher might tell you about in parent conferences or in newsletters that teachers send home. Many state standards and standards-based curricula are aligned with either the Common Core State Standards or the Focal Points from the National Council of Teachers of Mathematics.

Teachers and parents can support math learning by staying in touch about what's being taught in school and sharing regular progress reports. With respect to homework, be clear about the nature of an assignment (Is it for reinforcement? For practice?) and a parent's role (Am I to correct the work? Help my child finish it? Explain things to him? Let her work on her own?).

What can parents do to encourage a positive attitude towards math?

Children go through different stages of physical and verbal development at rates particular to that child. One child may walk at ten months; another at twelve months. Likewise, growth in mathematical understanding is relative: children learn to count with meaning, but not all do so at the same age. Understanding that guidelines for stages of development are broad can help parents form realistic expectations about a student's progress.

Some constructive questions for teachers and parents to think about: What is my attitude toward mathematics? Do I find it interesting? Do I encourage early math learning in the same way that I support early reading? A parent would never say, "I'm not good at reading" because it sends such a negative message. Your feelings—positive or negative—can influence your child's.

You can ask: can I model how a learner behaves? A learner asks questions; is able to revise his thinking; recognizes that some problems may have more than one answer and may be solved in more than one way.

Look for mathematics opportunities from everyday life that can make math interesting and challenging. For example, "How tall is that tree?" presents an interesting problem because it is too tall to measure. But there are ways of reasoning about the height of the tree that can be explored. In this situation, helping your child think about what he already knows and how he might use this, develops resourcefulness. Don't hesitate to share your own ways of thinking about the problem: "You know, I'm six feet tall. How does that information help us think about the height of the tree?" You may not get an answer immediately, but you've found a way to provoke reasoning! You can turn this kind of conversation into a game, combining recall of basic facts (What's 3x6 feet?) with the reasoning ability to consider different ways to solve the problem. As your child explores problem solving with you, knowing that you're listening to her, that her ideas are important, and that you're willing to explore her ideas, you will help her gain confidence.⁵

There are endless possibilities for fun ways to help your child see the math in everyday activities.



Tips for parents to bring math learning into everyday life

There are endless possibilities for fun ways to help your child see the math in everyday activities. Open-ended questions are good questions—they can help you understand what your child knows and build on it. They can develop his reasoning skills, support his enjoyment of math challenges, and develop his confidence.

Two good questions for your questioning repertoire are “How many?” and “How can you find out?” “How many” is a good way to begin, because it is not a leading question and it holds many possibilities for how your student can find the answer. It also helps a teacher or parent assess a child’s knowledge of, for example, the counting sequence, and depending on the situation, to learn how she strategizes. Using basic skills can lead to higher-level problem solving. If your student doesn’t respond to “How many?” the question, “How can you find out?” might stimulate a response.

In a counting interaction with your child you can use challenging amounts. For example, a bowl of grapes and the question, “How many,” poses a real problem for many young children. Observe how your child organizes and counts the grapes. Does he count by ones? What happens when she loses count? Does she start all over again? Does he solve the problem by grouping the grapes in 2s, 3s, 4s, 5s, or 10s? Does this make counting easier or has he created a new problem: how to count using the groupings? What does she do when she gets stuck? What does he do when he gets frustrated?

Remember, children learn best when they’re having fun! You know best when your student has reached his limit, so by all means end the exploration. Being patient and periodically doing similar counting activities will give a child the pleasure and confidence of building knowledge for herself.



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For more information about DreamBox Learning Math, go to www.dreambox.com.
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Endnotes

- 1 You can read about the study at <http://www.northwestern.edu/newscenter/stories/2007/11/duncan.html>. And you can learn about its primary author at <http://www.northwestern.edu/ipr/people/duncan.html>.
- 2 National Council of Teacher of Mathematics. 2000. Principles and Standards for School Mathematics. Reston, VA: National Council of Teachers of Mathematics.
- 3 National Mathematics Advisory Panel. Foundations for Success: The Final Report of the National Mathematics Advisory Panel, U.S. Department of Education: Washington, DC, 2008. You can download a PDF at <http://www.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf>
- 4 Hopko, D., Ashcraft, J., Ruggiero, K., & Lewis, C., Journal of Anxiety Disorders, Vol. 12, Issue 4, "Mathematics Anxiety and Working Memory: Support for the Existence of a Deficient Inhibition Mechanism." 1998, pp. 343-355.
- 5 Duckworth, E., "The Having of Wonderful Ideas" and Other Essays on Teaching and Learning. (New York: Teacher's College Press, 1987).