

FUN MATH: LOVING MATH WITH YOUR YOUNGER CHILD

A MENTOR MOM © CLASS

by Jennifer Georgia

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Three Stages of Math Development

Concrete: relying on tangible objects to understand numbers.

Mental Image: imagining tangible objects to understand numbers.

Abstract: the ability to manipulate numbers in their pure sense. Jumping over the first two stages leads to a shaky “number sense.”

The same stages are followed to build “operation sense”-- the intuitive understanding of what happens to the numbers or other symbols when you add (or subtract, multiply, divide, square, cube, etc.) them.

“A major purpose of using manipulatives is to help children build images in their heads. With images in our heads, we can solve problems without resorting to exterior models. We have interior models to think with. Thus we should never push children to drop the use of manipulatives, because they will drop them themselves as soon as their mental images are good enough.” Ruth Beechick, *You CAN Teach Your Child Successfully*

“Children need what we rarely give them in school – time for ‘Messing About’ with reading – before they start trying to learn to read, to make the connections between letters and sounds. They need time to build up in their minds, without hurry, without pressure, a sense of what words look like, before they start trying to memorize particular words. In the same way, they need time for ‘Messing About’ with numbers and numerals....They need to build up a mental model of the territory before they start trying

to talk about it. We teachers like to think that we can transplant our own mental models into the minds of children by means of explanations. It can’t be done.” John Holt, *How Children Learn*

“A good way to support the shift towards understanding is with a tool-based pedagogy: the use of manipulative, pictorial, and electronic thinking tools. The use of such tools does not guarantee understanding, but it does provide a good environment for discussion, communication, and reflection, and can play an important role in rethinking early mathematics.” Henri Piccioto, *Employing Children's Natural Powers to Build Algebraic Reasoning in the Context of Elementary Mathematics*

“A mathematician, like a painter or poet, is a maker of patterns. If his patterns are more permanent than theirs, it is because they are made with *ideas*.” G. H. Hardy, as quoted by Paul Lockhart in *A Mathematician's Lament* (article online)

“Hands-On” Resources

Manipulatives have a fun factor, and are an open door to self-directed learning. There are lots of great manipulatives: counters, tangrams, attribute blocks, pattern blocks, abaci, Base-Ten number sets, “Weigh To Learn” math set, fraction “rods,” and Cuisenaire rods and rod tracks (my favorite). Some household items that are also great for building math skills are measuring tapes, rulers, measuring cups and spoons, calculators, and a clock to play with. Thread some beads, ten of each color all in a row, on a piece of yarn or wire strung between two chairs or desks, and let your children make different numbers with the beads, and add sets together. All of these help a child model reality, engaging his senses and his creativity.

Teaching Tips

*Allow lots of time for a child to become familiar with a new manipulative and to start to discover its properties on his own. Let your child see you playing with them too, and as you search for patterns, he will also.

*Don't say "What is THE answer?" Say "How can you make this number sentence true?"

*When your child is confused about HOW to do an operation, have him substitute simple numbers for the complex ones: "If you had to divide two apples between six people..." This takes him back from Abstract mode into Mental Image mode, where he is more comfortable. When he has refreshed his memory of the principle of the operation, he can apply this to the more complicated problem.

*Try "frame addition"– writing the solution in squares, circles and triangles: $3 + \square = 7 - \square$ (the same number goes in each identical frame - different frames within a problem can contain different numbers). This is pre-algebra. Do some which are open-ended (can have many answers). Have him make up a problem for you while you make up one for him.

*Read fun math books to your kids (a list of math literature is available on Melissa Orton's handout for her *Math for Smarty Pants* class).

Math games and activities

Have your child **look for patterns** in numbers: number charts, addition charts, multiplication charts, square numbers, cube numbers, number roots of different sets of numbers (adding together the digits of a number until it is a one-digit number – all the multiples of 9 add up to 9).

Family Math, and *Family Math for Young Children* – full of games, puzzles and projects to do together.

Picture Puzzles with Cuisenaire Rods – solve "cross-number" arithmetic puzzles with rods.

Games for learning the addends of ten – all the other addition facts can be related to those ($2 + 7$ is one less than $3+7$):

The "Hidden Bean" game. "I have ten beans here. Now I'm dividing them between my two hands." Keep one hand closed and open one to show some of the beans. "How many are here? Three? So how many do you think

are in the other hand?" Let them guess, then open your hand and let them count. Then let them quiz you.

The "Ten Pair" game. Cut twelve squares of paper in two different colors, and write 0 through 10 on them plus one that says "Wild." Each player starts with one set of colored cards upside-down in front of him. The players take turns flipping over one card and placing it in the middle. If the card makes a "ten pair" with another card (e.g. a "3" card and a "7" card) he may collect them for his point pile, or if there is a "ten pair" that the other player hasn't seen, he can collect that one. He may use the "wild" as he chooses, but must say which number it represents. Whoever has the most pairs at the end of the game wins.

The "Lucky Clover" game – cut several three-leaf clovers out of paper. On each write three numbers that add up to ten. Divide between two players, and give each player a penny. The first player turns over a leaf and quickly places the penny over one of the numbers. The other player tries to figure out what number is under the penny, and if he does so he can keep the leaf, otherwise the first player can keep it. If your kids are motivated by money, give them a whole pile of pennies, and they can keep all the pennies from the facts they do correctly.

Jennifer Georgia and her husband Paul have been homeschooling their children since birth, and their oldest is now a junior in college.

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