

## Scaffolding Your Child's Math Education

Jennifer Georgia [georgiatimes.blogspot.com](http://georgiatimes.blogspot.com)

A scaffold is essential for building a structure, keeping it from collapsing until it is strong enough to stand on its own. We cannot build the “understanding” of math in our child’s brain – he must do it himself. But the scaffold that we provide will help support his growing understanding until it is strong enough to stand on its own. Scaffolding consists of:

Real-life opportunities to use the math principles

PLUS

A vision of the big picture of math that keeps them moving forward with interest

“Knowledge acquisition is ‘situated,’ i.e., it reflects how it was originally acquired and has been used -- it consists not only of abstract rules, laws, and formulas, but also of personal experiences.

Becoming an expert, say in mathematics or physics, may be a process of ‘desituating’ one’s knowledge to make it less context-bound, less tied to surface features.” ~ Giyoo Hatano, Japanese cognitive psychologist

Things to focus on:

1 - Build number sense (flexibility with numbers)

Use your hands and eyes at ALL levels

“Manipulatives provide a geometric context where students can broaden and deepen their understanding, which is often only mechanical mastery of algorithms.” Henry Piccioto

Avoid symbols (at first) and focus on quantity

Tell stories with numbers, think about parts and wholes, do some pressure-free mental math

Practice estimating with large and small quantities

Discover the characteristics of numbers (prime, even, odd, square, cube, those which form various 2D and 3D shapes, how they fit into nature, etc.). Numbers have personalities!

2 - Build logic skills

Simplify complex math scenarios (learning to ask the right questions), then help them to generalize truths from the simple that still work for the complex.

Word puzzles are good for math logic too

Ask “Why do you think you are correct?” The CHILD must come to the understanding on his own. If he cannot, he is too young – try again later.

“Practical experience ... shows that direct teaching of concepts is impossible and fruitless. (!!!) A teacher who tries to do this usually accomplishes nothing but empty verbalism, a parrot-like repetition of words by the child, simulating a knowledge of the corresponding concepts but actually covering up a vacuum.” Lev Vygotsky, Russian psychologist

3 - Build operation sense (a feel for how numbers change when different things are done to them)

Look for repeating patterns in charts

Practice making up rules to explain the patterns.

Use the question “So, if this happens when you do this to this, what do you think will happen when you do this to that?” Then create a rule, and give it a silly name. “So if we ‘twinkle’ this number, what will happen?”

4 - Build interest

“All play is associated with intense thought activity and rapid intellectual growth. The highest form of research is essentially play. Einstein is quoted as saying, ‘The desire to arrive finally at logically connected concepts is the emotional basis of a vague play with basic ideas. This combinatory or associative play seems to be the essential feature in productive thought.’” *Play is Education*, by NV Scarfe

Believe in the value of fun - even saying something in a playful voice helped preschoolers in one study use logic correctly

Read real math books—so many fun new ones out there

Read the stories of mathematicians who contributed throughout history, and tell your child the answer to “Who made math?” is YOU can make it!

5 - Build stamina

Children typically avoid doing the hard work of thinking if possible: “Just tell me the answer!” Build up to this slowly, so they eventually can feel the joy of “I solved it on my own!”

Make playing games and doing puzzles part of your family culture.

“Games are to math as books are to reading.”

“What then am I? A thing which thinks.

What is a thing which thinks? It is a thing which doubts, understands, conceives, affirms, denies, wills, refuses, which also imagines and feels.”

- Rene Descartes

Resources for you:

*The Grapes of Math: How Life Reflects Numbers and Numbers Reflect Life*, by Alex Bellos

*Flatterland* by Ian Stewart

*Free to Learn : Why unleashing the instinct to play will make our children happier, more self-reliant, and better students for life*, by Dr. Peter Gray

Coursera.com “Learning How to Learn”

LivingMathForum yahoo group - parents writing about their challenges and insights

Mathworld.wolfram.com

NaturalMath.com Dr. Maria Droujkova

plus see her “5 Year-Olds Can Learn Calculus” article in *The Atlantic*

TED talk by Conrad Wolfram “Teaching Kids Real Math with Computers”

Resources for you and your older children:

*Mathematics: A Human Endeavor*, by Harold Jacobs

*A Beginners’ Guide to Constructing the Universe: The*

*Mathematical Archetypes of Nature, Art, and*

*Science*, by Michael S. Schneider

*What is Calculus About?* by W.W. Sawyer

Puzzles: Brain teasers, ThinkFun games, Stella’s stunners (Google it), online puzzles on sites (Google Jo Edkins Maths Index)

Cool things to play around with:

Demonstrations.wolfram.com

Nrich.maths.org (online puzzles: tangrams, stick puzzles, paper-folding, etc.)

Numberphile.com

MathIsFun.com

Khan Academy-Math for Fun and Glory section

iPad app game “Forty-Nine” by Andrew Fenner

DragonBox Algebra app

DragonBox Elements app

wild.maths.org/7-things-you-need-to-know-about-prime-numbers Watch this to get a feel for the types of questions that mathematicians ask. Don’t worry, she was lecturing to 16 and 17 year-olds.

Resources for younger children:

see “Playing with Math” class handouts on the LDSHE Audio Library for an extensive list of resources and home-made games. Here are a few new favorites since then:

*The Greedy Triangle*, by Marilyn Burns

The Warlord’s Series, by Virginia Pilegard

*Math Curse*, by John Scieszka

*Moebius Noodles: Adventurous Math for the Playground Crowd*, by Yelena McManaman

Games - Fish Sticks, Sum Swamp, all the ThinkFun games, DragonBox Numbers App - NEW! Like digital Cuisenaire rods with lots of fun twists and many puzzles

### Factor Dominoes (home-made by me, inspired by several sources)

Make large cards, divide in half, print/cut out or draw a factor number picture on each half. I made 44 cards, so 88 numbers, 1 to 20, with a large-ish one and a small-ish numbers on most of the cards.

Deal all cards to the players, placing one face up in the center. Players look at their top card. On their turn they match one of the factors on their card to a card on the table, placing it alongside in any direction. So a 15 could match with a 5 or a 10, OR it could match with any card showing a factor of 3. Primes can match only with themselves or 1. The numbers on the card must share a factor with each number they touch. If they cannot play, they pass, discarding the card back into their draw pile and choosing a new one. The object is to be the first to place all your cards on the table.

After playing this way a few times, add the rule that the cards may be matched by addition, i.e. you can play a 17 in T-shape off of the center of a card with a 14 and a 3.

<http://www.datapointed.net/visualizations/math/factorization/animated-diagrams/>

