

# Math Matters

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## Understanding Productive Struggle through Shoe Tying

In a recent article by Jo Boaler, a Stanford Professor, author, and co-founder of [youcubed.org](http://youcubed.org), titled *Why Struggle is Essential for the Brain - and Our Lives* she describes how research has shown that the most learning happens through times of struggle. If we can learn to accept the feeling of struggle and approach it as an opportunity to learn, then we will find more success in school and in life. What does this mean for us as teachers, parents, and caregivers? Let's consider what productive struggle looks like for something we can all relate to: shoe tying.



### What's That Word?

**INVERSE OPERATIONS** are operations that undo each other. Ex., addition and subtraction are inverse operations.

The answer to a division problem is called the **QUOTIENT**.

To **SUBITIZE** is to be able to recognize a small group of objects without counting. It is an important number sense

**NUMBER SENSE** is the understanding of numbers, their magnitude, relationships, and how they are affected by operations.

As an elementary school teacher, I know the critical importance of shoe tying as a life skill. Not only is it unsafe to walk around with your shoes untied, but do you really want to touch your child's shoelaces after they've been dragged around the floor of the school, the playground, and even the restrooms for an entire day? Of course there are slip on shoes, velcro shoes, and the ever popular tie-a-really-good-knot-and-slip-them-on-and-off method, but eventually all kids learn to tie their shoes.

Shoe tying is a skill that has to be developed. It is rare that a child would be shown how to do it, told the steps to follow, and instantly find success. Even if they know the steps, it still requires specific fine motor skills as well as the understanding of how knots and bows are made. When you teach this to your child you tell them the steps and show them how to do it, but then they have to figure it out for themselves. It can be frustrating for many to not be able to do it instantly. As a parent in those moments you have two choices: rely on one of the tried and true no-tying options to avoid the frustration or allow and encourage your child to struggle through it. If you choose no-tying you are rescuing your child, but also eliminating their opportunity to productively struggle. This struggle is called productive because it is a space for them to learn, develop, and grow. Do we really want to rescue them from that?

As a parent or caregiver, it is difficult to watch our children struggle. However, when struggle is an important part of learning we do all we can to support them. We might watch their attempt and provide specific feedback as they go. We might look on youtube to find different ways to tie shoes and allow them to try all the strategies. With my kids, I learned that if I had them double the crossover in the first step the laces stayed more secure and made it easier for them to learn the tie. I also learned that flat laces stayed tied better than round ones. These were scaffolds that I was able to put in place to help my support my children in their attempts. They enabled better opportunities to struggle with the tying piece and not extraneous factors. But in the end, if I wanted them to be able to tie, I had to support them in learning through struggling with the skill.

In math we need students to engage in productive struggle. We present challenging problems because we know that struggle will be the vehicle for their learning. We can provide them with multiple strategies, specific feedback as they work, and scaffolding along the way, but we have to resist the urge to rescue them by jumping in and telling them exactly what to do. If we rescue children from shoe tying, they will need velcro for life. If we rescue students from math, they will need someone to show them the steps for every problem they are ever given. This is not realistic. To be successful in life skills such as shoe tying or math, we need to allow our students to productively struggle!

**Questions to support your child's productive struggle are on the next page!**

### Click It!

#### Check out these websites:

- ◆ i-Ready Student dashboards can be accessed through [Clever.com](http://Clever.com) for students in grades K-5.
- ◆ [Freckle.com](http://Freckle.com)  
Students at TCS can log in using their teacher's classroom code.



## Recommended Reading

Counting (grades pre-K-1):

### Ten Jolly Pirates

by Ian Cunliffe & Emily Ford

Number Sense (grades pre-K-1):

### Exercises for Improved Number Sense - Number Sense Books Children's Math Books

by Baby Professor

Multiplication grades 2-5):

### The Best of Times

by Greg Tang

Place Value (grades 2-6):

### Zero: Is it Something? Is it Nothing?

by Claudia Zaslavsky

## Math Jokes, Riddles and Tips!

Why was the fraction apprehensive about marrying the decimal?

Answer: Because he would have to convert!

We all know that 6 was afraid of 7 because 7, 8, 9, but why did 7 eat 9?

Answer: Because he learned you are supposed to eat 3 squared meals per day!

## Supporting Productive Struggle:

Instead of rescuing your child when they are stuck on a math problem, try asking these questions to scaffold their Productive Struggle:

- ♦ What do you already know that could help?
- ♦ Can you explain the task in your own words?
- ♦ Can you draw something that would help?
- ♦ What have you done that makes sense? What are you unsure about?
- ♦ Can you picture the numbers (on ten frames or with base ten blocks)?
- ♦ What do the numbers mean in the problem? (word problems)

## Figure It Out Together!

### Play It:

#### (K-3) Make Ten Go Fish

**Materials:** Deck of cards with only Ace-9

**Directions:** This game is played just like Go Fish but instead of matching cards, you want to make pairs that add up to ten. Deal 5 cards to each player. On each player's turn, they can lay down any "Ten Pairs" they have in their hand. Then they ask any player for a number they need (example: I have an Ace so I ask another player if they have a nine). If that player has the nine they give it to the player who asked and the play continues to the next player. If not, the other player says "Go Fish" and the player draws one from the leftover deck of cards. Play ends when one player has gotten rid of all the cards in their hand.

#### (3-6) Multiplication War

**Materials:** Standard deck of playing cards with kings removed. Paper and pencil as needed to use strategies for solving

**Directions:** Deal out the cards. Jacks have a value of 11 and queens are worth 12. Each player flips the top 2 cards in his/her pile and multiplies the numbers on the cards together. They then state the multiplication sentence. (For example 8 X12 equals 96 or the product of 8 and 12 is 96). The player with the higher product collects all 4 cards. In the event of a tie, flip over 2 more cards to determine the winner of the "war". When no more cards remain, each player counts the cards they've won to determine the winner.

To modify this game for practice with different ranges of facts change the range of the cards you include in the deck. Consider using Kings as zeros too!

### Try These Apps for Math on the Go!

**K-1:** Subitize Tree HD by Doodlesmith (\$0.99)

**1-4:** Thinking Blocks Addition  
by Math playground (free)

**3-6:** Thinking Blocks Multiplication  
by Math playground (free)

**K-6:** Tangram Unlimited by Virtuesoft (free)

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Have a great math riddle, tip, trick, website or book to share? Have questions, comments, or concerns? Contact us by email at:



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