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Reading Rockets (http://www.readingrockets.org/)

Transcript from an interview with Greg Tang

Below is an edited transcript from Reading Rockets' interview with Greg Tang. The transcript is divided into the following clips:

Meet Greg Tang

My name is Greg Tang and I've written eight math picture books and also contributed to a lot of textbooks. I started with *The Grapes of Math*, which is obviously based on *The Grapes of Wrath*. What I try to do is kind of steal famous titles and kind of use them for myself so the next book was *Math for All Seasons*. The third book was *The Best of Times*; it was on multiplication. Then I wrote a book called *Math Appeal*, *Math-terpieces*, *Math Fables* and *Math Potatoes*, my favorite.

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A jack of all trades

What did I do for a living? I did a little bit of a lot of things. I went to grad school because I thought I was going to be a professor in economics; that didn't work out. I wasn't that interested in economics. So I went and worked for Pfizer for a couple of years and was in strategic planning and did the speechwriting for the CEO.

I learned a lot about graphics in doing these big presentations so I started Technovations, which was a graphic design company in New York City. I did that for

about ten years and we did a lot of big, multimedia presentations and we also developed a lot of custom software applications. That was about ten years. Then I moved to Boston to open a Tae-Kwon Do school. I got involved with a health club, renovated the health club, started teaching Tae-Kwon Do and decided I didn't like teaching kids Tae-Kwon Do; I liked teaching adults. That didn't last too long.

I started writing books just as a hobby, just for fun and that's turned into a career. Originally, schools would ask me to do author visits to talk about the books and I would go in and instead of talking about the books, I would just start teaching math. The teachers would ask me to do professional development for the teachers instead of working with the kids. I started doing a lot of teaching of teachers. Now I do about 200 district workshops a year where I just teach teachers how to teach math.

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Numbskill? Who, me?

Well, there's a couple components to the teaching materials. One, I'm trying to do kind of Cliff Notes for teachers. If you look at any teaching manual for math, the teaching guide is probably this thick for second grade math. My feeling is if it's this thick, they didn't do it right because second grade math should be easy. What I try to do is I'm trying to write a very small, condensed abridged primer on teaching math so that any parent or any teacher could read it in sixty minutes and actually know how to teach their child math.

To go along with that, I've created a whole bunch of math games. *Numbskill* is one of the games I've created. I've done a bunch of flash cards for multiplication, subtraction, addition, division. There's a series being put out by Houghton Mifflin called *Math Street Smarts* that will be on YouTube.

What we do there is I go on the streets of Boston and we interview really supposedly smart math people — MIT grad students. We interviewed an engineer from Apple. We got a Harvard senior who got like 1600 on his SATs. What I do is ask them math questions. A lot of times, they can't solve them quickly. I show them good strategies to solve them and then we have the whole thing on video. It just turns out to be a very fun way to teach math. That's really the components of the program I'm putting together.

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The easy way to do math

It's not that math is important to me; it's just math is one of those things where you have to be good with numbers. There's so many fields that require you to use numbers,

from business to math to science to social sciences. If you're good with numbers, all of that stuff is easy. When you're bad with numbers, especially big numbers, all of those fields are very difficult. It's not really math. I just want kids to be comfortable with numbers, to actually understand how to work with numbers to make them easy and to become good problem solvers, not just in math but really in anything.

Most kids don't like math and the reason is most kids are bad at math. The reason most kids are bad at math is most adults are bad at math. We're not teaching kids how to become good at math. It turns out there's two ways to do math. There's an easy way and there's a hard way. Most people do math the hard way. They do a lot of counting. They do a lot of memorizing. They do a lot of skip counting. They do a lot of things that are actually making math harder.

Now kids that are good in math all use the same strategy. They're very good at taking big numbers and breaking them into smaller numbers. When they have to solve a big problem, they break it into smaller problems. It turns out there's one strategy that I try to tie everything to: if something is too big, you make it manageable by breaking it into smaller pieces. Now the question is, what are the right pieces?

Most kids take big numbers and break them into ones. They're breaking them into the wrong pieces. Now if a kid learns to break the numbers down in groups bigger than one, they learn to stop counting. All of a sudden, they have a chance to be good in math. That's really what my program and my strategies are all about — teaching kids how to be great with numbers.

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Reconciling the two approaches

Part of the reason kids are not good in math is I don't think the field of math — the teachers — have decided what's the best approach to teach math. You have a whole bunch of traditionalists who care about facts and they care about instant recall. That kind of has translated into memorization and kind of a brute force approach. Then you have kind of more the new wave teachers, the new wave programs that are all really geared toward understanding. Now a lot of the problems with those is the kids do have a better understanding of math, but they're not so good computationally.

There's kind of this debate going on about which is right. To me, it turns out you've got to have both. Now if somebody understands what they're doing and you teach them how to break down the numbers, it's not a question of memorizing tricks or formulas. Just like kids learn to break down words and spell by understanding sounds and syllables, you teach a kid how to break numbers down so that they can work with them in an easier way.

Really what I'm trying to do is reconcile the traditionalists with kind of the modern

approach to math and really show that it's really the same thing. When somebody really understands both approaches, then they're in a position to see it's really the same thing. But I think that a lot of people that are just in favor of one or the other don't understand math as well as they might. That's kind of a risky thing to say because that describes a lot of teachers of math and leaders in math.

But that's kind of the conclusion I'm getting to. People that are inherently good in math are very abstract thinkers. But does that make them a good teacher? Generally not. A very abstract teacher is generally not a good teacher because they can't make things concrete enough for somebody to understand them. Then you have the flip side. You have teachers of teachers who are very good teachers. Why are they such good teachers? They're very concrete thinkers. They can make things very concrete. But does that mean they're good in math? I'm going to say no.

The more I'm in this field, what I see is the very good math people are not good teachers and the very good teachers are not inherently good math people. They've learned math, but they're naturally not great in math. I think it's rare to find somebody that's great in math as an abstract thinker, but is also concrete enough that they can make abstract concepts understandable. Now I'm hoping I might be one of the people that can help put this together.

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Beginning with the concepts

I combine math with picture books for a couple of reasons. One is to communicate the math concepts more clearly. I think a lot of people started out writing math picture books as a way to make math more palatable to teachers especially that don't like math and then kids that don't like math. If a person is more comfortable with reading, if you give them a book that's got words and pictures, but it's really math, that's better for them. The problem with that is a lot of the original books in math were really the old math concepts based on memorization and not a lot of understanding.

If a person is more comfortable with reading, if you give them a book that's got words and pictures but it's really math, that's better for them. The problem with that is a lot of the original books in math were really the old math concepts based on memorization and not a lot of understanding and then we put words and pictures around them. You have a better version of these kinds of strategies that kind of didn't work.

What I tried to do is say, "No, the key is to come up with better math concepts first and then use pictures and words to communicate better concepts in a more effective way." What I've really tried to do with my books is come up with better strategies and then also communicate them to kids in a better way through words and pictures. That's really why I write math picture books.

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Tips for teachers

If I could get teachers to see a couple of things in math, it would be a few. One of them would be basically that math really can be easy. Most people, again, are not thinking about numbers the right way. Teach a kid to break them down early and you've got a kid that's got a chance to be good in math. Now one of the most important things is to fix kinds of is counting. I say in my workshops, "Counting is the root of all evil." Most kids and most people are doing some form of counting in their head. They're either counting in their head or they're counting on their fingers.

When a person counts, they're taking numbers and they're breaking them into ones. They're thinking about numbers as all ones. Turns out, when the numbers get big, it's the worst way to think about a number. We've got to get kids to, first of all, break numbers down in better ways than ones. For instance, if I say the number ten, do I want a kid to be thinking, one, two, three, four, five, six, seven, eight, nine, ten? No. I want him to think five and five, six and four, seven and three, eight and two, nine and one. I want a kid to be able to break down numbers.

Second thing, to be a good math teacher, you have to be good at content knowledge so it's not about having tons of different activities for your kids to do in the classroom. If you yourself aren't comfortable deep down with math content, I don't think you can ever be a good math teacher because what you end up doing is taking a very concrete approach to teaching.

You end up teaching very specific tricks, facts and formulas and it turns out that's the exact opposite of what math is. Math is about abstract algebraic thinking, which means you're not focusing on specifics; you're focusing on generalizeable concepts. Teachers really have to improve their own content knowledge before they can ever hope to be really good math teachers.

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Partnering with parents

I think the most important thing for schools to do if they want parents on their side, they need to do parent workshops. What's really important is for a school to run a parent workshop in math a couple times a year, explain to the parents the whole idea of the math program and they will see — if the school does a good job — that what the parent wants which is fluency with numbers, computational fluency, instant recall of facts, is exactly what the teachers want.

It's just two different ways to get there. Parents tend to favor the traditional approach

based on rote memorization and brute force and teachers nowadays have been trained to teach more through understanding. The teachers will get there eventually if they're good math teachers and the parents just have to see that they share the same goal. It's just a different way of getting there.

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Many ways to peel a potato

Math Potatoes is one of those where I'm starting to think about how to write a poem about potatoes so that the math problem was to figure out how many potatoes. I had these potatoes in groupings. I'm thinking to myself, "Boy, there are so many ways you eat a potato. You've got hash browns. You've got baked potatoes. You've got mashed potatoes." I'm thinking of all these ideas and I came up with this idea that I thought was good.

"Potatoes au gratin, the kind that are best forgotten." I thought that was funny. Turns out, it's not. But it did give me an idea for how to structure the poem so the poem ended up something like this… "Boiled and baked and often mashed; peeled and fried and sometimes hashed. No wonder they hide underground; life is painful when they're found. Can you add up these poor souls; for whom the bell already tolls? In groups of ten, you'll hear their cries. Please don't turn us into fries!"

The clue in that poem was don't think in doubles, which is what everybody does. If you see a four next to a four, most people will think eight. But if you see a four, should you put it with the four? No. What goes better with a four? How about a six? So the whole key is to think in groups of ten, not to think in doubles.

So again, I use all my poems to teach important math strategies. I try to make them funny by using poems and using word play and bad puns and that kind of gives me a kick out of it. It makes me enjoy writing. So I have a new poem that I just wrote on bats and echolocation. That's in the new book, *Math Fables, Too*. The name of that poem is *The Sound and the Furry*.

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"There is no frigate like a book, to take us lands away" — Emily Dickinson