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Effective Teaching to Ensure Mathematical Success for All

Beyond Literature Connections: Storytelling in Math

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The Math Teacher Continuum

What is your relationship with math? How did you become a math teacher?

I've loved math since I was a kid.	I learned to love math as an adult.	Math is just a subject I have to teach.	I don't like math that much.	I've never liked math.

It is a well-documented fact that math aversion is pervasive in the adult population. That, of course, includes teachers and parents who tell their children, "I was never good at math."

The non-profit Change the Equation found in a 2009 survey that 36% of Americans admit to often saying they can't do math. Among Americans aged 18 to 35, the number goes up to 53%. Also, almost one third of Americans would rather clean their bathrooms than do a math problem!
(http://changetheequation.org/stemtistics/math?page=2)

In a 2013 study from Texas Tech University, pre-service teachers were asked about their fears about teaching math. 41% identified their greatest fears as related to mathematical teaching and 25% as related to mathematical content. Respondents said things like, "It's not my strong subject and I don't enjoy it," and "I'm afraid of teaching a concept I'm not familiar with."
(http://www.k-12prep.math.ttu.edu/journal/5.attributes/bates01/article.pdf)

Where are you on the continuum? How did you become a math teacher? What are your fears as a math teacher?

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The Impact of Emotions

In the past decade, neuroscientific research has exploded, revealing how the interrelation of brain functions affect learning. Best practices based on this research are geared toward creating optimal conditions for the brain to access higher order thinking, learn, and remember. Paramount among these best practices are reducing anxiety, fostering enthusiasm, and creating a sense of community support.

http://www.edutopia.org/blog/neuroscience-behind-stress-and-learning-judy-willis

What do you know about the brain and learning? What techniques do you use to promote optimal brain conditions in your students?

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Storytelling in Math

Children grow up hearing and telling stories. It is a natural part of their development. Once they enter school, story time is a constant in most students' lives. This familiarity can be used as a bridge to math. By weaving storytelling –which is different from literature connections- into their lessons, teachers can build confidence, spark curiosity, develop algebraic thinking, strengthen communication skills, and foster metacognition. Additionally, storytelling is an effective way to differentiate instruction.

How have you used storytelling in your teaching? How have you used story telling in teaching math?

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The Math Student Continuum

Children start establishing their identity at a very young age. They also establish their identity as students in the early grades. Part of this identity is the student's relationship with math. This is particularly important for girls. A 2011 study at University of Washington found that, as early as second grade, boys and girls had different attitudes toward math and associated boys with math and girls with reading.
http://faculty.washington.edu/agg/pdf/Cvencek&al.ChDevel.2011.pdf

Independent of their gender and whether they fall in this stereotype or not, students tend to gravitate toward one subject more than the other.

*Loves story lines, gets attached to characters *Process-oriented *Numbers are just words	*Likes nonfiction. *Enjoys the process, wants the results *Has number sense.	*Loves patterns, logical premises, and quantities. *Results-oriented *Has difficulty explaining in words.

Using storytelling in math fosters growth at both ends of the spectrum. For those who are more verbal oriented, storytelling plays to their strengths and preferences, replacing fear of math with a positive bond while strengthening their understanding of math concepts. For those who are more analytical oriented, storytelling facilitates a focus on process that will enhance their understanding and their ability to communicate their thinking.

Think of a few of your students. Where would you place them on the continuum? How have you addressed their needs?

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The Literacy-Numeracy Parallel

There are many initiatives to promote literacy development at home. Programs and recommendations come from all levels: local libraries, churches, school districts, social services providers, pediatricians, county governments, national task forces, etc.

Three important components are common to these recommendations:

*Make reading an integral part of a child's life: read every day, read everywhere, read with your child, make it fun and special.

*Incorporate elements *around* reading: talk, sing, ask questions, make predictions and connections.

*Model: let your child see you reading and talking about what you read.

http://www.reachoutandread.org/FileRepository/ReadingTips_RT_FLY001_EN_WEB.pdf
https://www.ed.psu.edu/goodling-institute/family-literacy-resources/annotated-ila-websites-updated-march-2012
http://www.edutopia.org/blog/parent-involvement-in-early-literacy-erika-burton

What is the numeracy equivalent to this? What's the equivalent of going to the library? Or the bookstore? What's the equivalent of bedtime stories? Or book clubs?

What recommendations do you give your parents regarding numeracy? Where do you see a parallel between literacy and numeracy?

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The Literacy-Numeracy Parallel (cont.)

A 2009 study in Canada found that parents engage their children in numeracy activities less frequently than literacy. It also found that parents believed that literacy was more important than numeracy.
http://www.psy.cmu.edu/~siegler/121-lefevre-bisz09.pdf

Respected institutions in the US, such as PBS, reflect the same bias when one compares its websites for math and reading.
http://www.pbs.org/parents/education/math/ vs. http://www.pbs.org/parents/education/reading-language/reading-tips/learning-to-read/

Similar to the well-known study correlating the number of words a child hears before starting school with her or his academic success, researchers at University of Chicago were the first to, in 2009, record parent–child interactions in the home and to connect parents' number talk to later performance.
http://news.uchicago.edu/article/2010/11/09/parents-should-talk-about-math-early-and-often-their-children-report-finds

Educators and parents are increasingly aware of the importance of fostering mathematical thinking at home. Even though there is a limited amount of researched-based practices to advocate, recommendations can be grouped in two categories:

*Explicit instruction: teach numbers or addition and subtraction facts, name shapes.

*Math in context: engage in projects and activities, such as shopping, cooking, building or planning a schedule.
http://www2.ed.gov/parents/academic/help/math/index.html
http://www.zerotothree.org/child-development/early-development/supporting-early-math-skills.html#link

*Numeracy-Literacy parallel: do for math what you do for reading,
http://www.getreadytoread.org/ (*Math Matters: A Guide for Parents of Preschoolers* and *Math Skills for Young Children*)
http://bedtimemath.org/

What do you do for literacy that you could do for numeracy?

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What Literary Genre are Number Stories?

Mysteries, of course! Like all stories, number stories have a beginning, middle, and end. They have characters, setting, and a plot. They are interesting and engaging. They are ALWAYS chapter books.

Number story summary in words

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_____
_____
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What are some number story genres?

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How can you summarize number stories?

Think about how you teach your students to read and summarize a regular story.

Activity: Slow reading (see attachment at the end)

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Activity: Felt

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Number story summary in numbers and symbols

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The Writing Process and Number Stories

Students can create number stories using the familiar sequence of prewriting and drafting followed by the cycle of feedback, revising and rewriting, before the final steps of editing and publishing.

Activity: Writing from an outline

Prewriting: What kind of characters will you include? What will they be doing?

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Prewriting: Look at the outline in numbers and symbols. What will be the mystery?

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Drafting: Write a paragraph for each chapter

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Revising: Check that your story makes sense; solve the mystery and explain it in a complete sentence; add detail, action, dialogue, precise language, etc.

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Editing and Publishing: Check spelling and punctuation. Draw a picture.

Activity: Creating an outline

Prewriting: What kind of story will you write? Where will you include the mystery?

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Prewriting: Outline your story in numbers and symbols

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Drafting: Write a paragraph for each chapter

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Revising: Check that your story makes sense; solve the mystery and explain it in a complete sentence; add detail, action, dialogue, precise language, etc.

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Editing and Publishing: Check spelling and punctuation. Draw a picture.

Activity: Treasure boxes

Prewriting: Set up your treasure box. What kind of characters will you include? What will they be doing?

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Prewriting: What kind of story will you write? Where will you include the mystery?

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Outline your story in numbers and symbols

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Drafting: Write a paragraph for each chapter

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Revising: Check that your story makes sense; solve the mystery and explain it in a complete sentence; add detail, action, dialogue, precise language, etc.

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Editing and Publishing: Check spelling and punctuation. Draw a picture.

Standards, practices, strands, focal points, common core…

With story telling, students can engage in the process of doing and undoing that characterizes learning. Stories frequently come from the students themselves and their wonderful creativity and imagination!

How can storytelling enhance your math curriculum?

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How can you weave storytelling in your math curriculum?

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More ideas to create stories….

Fact family houses
Place value art
Numbers in costumes
Crazy number names
Math curses
Angel angles
Place value buildings
Ten-agers
Choose your own story books
Fruit Ninja (or Sum Samurai)
Right and wrong angles
The polygon club

Online survey, online handout, and Twitter

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Download presentation handout from the online conference planner: nctm.org/planner
Tweet using #NCTMBOSTON

Slow Read Activity

Procedure

1. Tell students you are going to practice a slow way of looking at number stories, the same way you take time to explore books.
2. Model reading the number story one idea at a time:
    a. One partner reads out loud while the other follows along.
    b. The listener tells the reader when to stop.
    c. The reader marks that point as one idea (no comments at this time).
    d. The reader re-reads the story one idea at a time. The listener rephrases each idea segmenting it into its components. Either the reader or the listener might suggest changes regarding where each idea ends.
    e. The listener summarizes what s/he thinks is happening in the story. The reader critiques the summary.
    f. Switch roles and read the same story.
    g. Together, the partners discuss what the question is and make logical predictions about the solution.
    h. Partners discuss strategies and approaches, including how they would check their solution (no finding the answer yet!)
3. Students work in pairs following this procedure orally.
4. Model how to take notes. Following the same procedure as above, the listener writes each idea after rephrasing it, using the attached form.
5. Model how to sketch, diagram, or find a number model.
6. Students work individually to sketch, diagram, or find number model for the stories they have read with a partner. They also find the solution and write the answer in a complete sentence.
7. Partners come back together to share and critique each other's work.

In order to help students focus on the procedure, we used alternatively really small and really large numbers.

Name _____ Date _____ Time _____

Number Stories: Slow Read

For each number story:

1. Write the story number.
2. Summarize the story by writing each idea split into its parts.
3. Summarize the question.
4. Write a number model.
5. Solve the mystery. Show your work.
6. Write your answer in a complete sentence.

Story number _____

a. _____ _____ _____
b. _____ _____ _____
c. _____ _____ _____

How many _____ _____

Number model _____

Answer _____

Story number _____

a. _____ _____ _____
b. _____ _____ _____
c. _____ _____ _____

How many _____ _____

Number model _____

Answer _____