Trauma-Sensitive Math Instruction

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Melinda McConnaughey
Purpose and Goals for the Workshop

Purpose: To provide insights into how to create psychologically safe and effective trauma-sensitive math instruction for all children.

Goals: Participants will be able to:

1. Name specific effects of trauma on sensory processing and the development of executive functioning skills necessary for mathematics.
2. Identify possible instructional sources and repair strategies for shame and negative internalized messages about mathematical ability.
3. Develop strategies to build missing sensory and conceptual foundations while providing structures to promote the development of executive functioning in mathematical problem solving.

Strategies will be embedded throughout!
The Epic Mother-Daughter Idea

Colorado

Washington State
Education and Professional Backgrounds

Janyne McConnaughey
- BA - Child Development and Christian Education
- MS - Elementary education
- Ph.D. - Educational Leadership
  Early Education and Math Education dual emphasis
- Preschool teacher, director, and kindergarten teacher
- Teacher Educator (33 years)

Melinda McConnaughey
- BS in Elementary and Early Childhood Education
- MA in Curriculum and Instruction
- Administrative Certification
- National Board Certification in Early Adolescence Math
- 13 years of Teaching and Administrative Experience at the Elementary Level
Mathematics Teaching Experiences

Janyne McConnaughey

- Kindergarten Teacher
- College Level:
  - Developmental Math Concepts
  - General Mathematics
  - Math Methods
- Consultant: Early Education Math Curriculum Development
- Teacher Inservices: Early Education Mathematics

Melinda McConnaughey

- Instructor Highly Capable Mathematics
- 5th Grade Teacher at IB World School in Mexico City
- Math Coach and TAP Mentor Teacher
- National Board Certification
- 3rd Grade Teacher
- Assistant Principal
A Personal Story of Healing Childhood Trauma

Like Janyne McConnaughey Facebook Page for giveaway!
A Framework for how the Brain Learns Mathematics (1:20)
The emphasis is on instruction involving whole body active experiences because the body learns mathematical concepts through sensory processing.

“It is essential that children be allowed to move freely in their environment since motion and movement are necessary for the development of mathematics understanding in general and spatial sense specifically.” (McConnaughey, 2016, p. 14)

Trauma prevents these foundations from being built.
Best Practices According to NCTM—Elementary

- **Implement tasks that promote reasoning and problem solving.**
  - Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

- **Facilitate meaningful mathematical discourse.**
  - Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

- **Pose purposeful questions.**
  - Effective teaching of mathematics uses purposeful questions to assess and advance students’ reasoning and sense making about important mathematical ideas and relationships.

- **Support productive struggle in learning mathematics.**
  - Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
The building blocks of mathematical competence and how interruption in the trajectory of learning creates gaps that affect learning

- Concept of the trajectory. When we interrupt learning, or learning stops, things don’t fall in place the rest of the way.
- New learning not connected can continue. Gaps need to be identified and filled in.
- If traumatic memories get fragmented, so does the learning so we are trying to hook the pieces back together.
The Effects of Trauma on Mathematical Reasoning

(1:40)
Children who have experienced trauma are trying to do math with missing foundations, the result is shame, and shame will send them to dysregulation every single time!
Here is a problem: (Why do we call them problems?)

\[
\frac{(2a-1)/(2a+1)+1}{1+1/(2a+1)}
\]

How would you use the following executive functions in solving this?

<table>
<thead>
<tr>
<th>Emotional Control</th>
<th>Impulse Control</th>
<th>Task Initiation</th>
<th>Self Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning and Prioritizing</td>
<td>Working Memory</td>
<td>Flexible Thinking</td>
<td>Organization</td>
</tr>
</tbody>
</table>

Regulating emotions is the only way to remain in the thinking part of the brain!
The Effects of Trauma on the Mathematical Brain

The brains scans of children who have experienced significant trauma are different than those of children who have not!

The effects are far reaching!

- Metacognition
- Memorization
- Information Retrieval
- Automaticity
- Focus
- Engagement

Full descriptions available at: https://www.janyne.org/educators
“Not only do they steal your innocence they steal your brain. I always felt something was deeply wrong with me. That I had some sort of defect that made me unwanted, stupid, incapable of learning or thinking critically . . . The thought of higher education of any kind never crossed my mind, because I knew I wasn’t capable of reading a book and understanding it. I knew I could never write, or speak intelligently about anything. I knew I couldn’t think for myself.” *

~ Childhood Abuse and Trafficking Survivor (now in college)

*Quoted with permission
Implementing Trauma-Sensitive Strategies
(1:50)
Frustration and Shame in the Classroom

How Trauma Can Affect Your Window of Tolerance

**HYPERAROUSAL**
This is when you feel extremely upset, angry, or even out of control. You may feel like you can’t stop feeling and thinking about something that makes you feel uncomfortable, and you might want to fight or run away.

**DYSREGULATION**
This is when you start to feel trapped. You may feel like you can’t control your emotions or actions, and you might feel overwhelmed by what’s happening around you.

**WINDOW OF TOLERANCE**
This is where things feel just right, where you can start to cope with the panic you feel, but not too much. You’re neither calm nor anxiety.

**DYSREGULATION**
This is when you begin to feel like your thoughts change, and you don’t know how to deal with them. You might feel stuck, frozen, and unable to take action.

**HYPERAROUSAL**
This is when you feel extremely worried and anxious, both emotionally and physically. You might have trouble sleeping, eating, or even thinking normally.

*We call this failure to initiate!

Fight
Flight
Freeze
One Solution: Return Movement to the Classroom!

Modulating and repairing shame, triggers, and dysregulation through sensory based strategies

“When I am upset or frustrated, I go outside and take a walk.”
~ The Adult “Me” who can make choices
Many common math instructional practices are often triggering to children who have experienced trauma, because it triggers the Amygdala. Some practices are necessary or useful, but be sensitive! Feeling safe is everything! It is a mindset of safety.

- **Being asked to work a problem on the board**
  - “You can ask a partner to go with you or I will come stand beside you.”
  - “Would you write how you solved that problem on the board?”
- **Being timed on a test (Math Minutes)**
  - Use continuous improvement strategies (discussed later)
- **Being called on to answer a question**
  - Let them practice being called on to answer questions that you have given them ahead of time--baby steps.
  - Build a culture of “It is Ok to make a mistake.”
The Power of Conjectures and Mistakes

Changing the Shame Narrative

When the light turns green, you go. When the light turns red, you stop. But what do you do when the light turns blue with orange and lavender spots?

Shel Silverstein
American
"Thank you for helping my husband understand math and pass your class!"

The math-phobic college student:

"If I can't pass this class, I will not be able to graduate. My goal is to be a therapist, but I have never been good at math."

My question:

"When did you begin to think that you weren't good at math?"

The telling answer:

"Well, I couldn't memorize the multiplication facts in elementary school."
Multiplication Fact Mastery?

- Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers. (CCSS.MATH.CONTENT.3.OA.C.7)
- Traditional methods to ensure multiplication fact mastery are
  - Flash cards
  - Time Fact quizzes
  - Repetition, repetition, repetition
- Even after all of this, most students have still not mastered their multiplication facts.
Another Way
The use of Continuous Improvement Strategies

To minimize shame triggers . . .

- Shame = “I am not smart enough to do math”
- “I only need to do better than I did before.”
- What continuous improvement looks like:

(Photo Credit: LtoJ Consulting, Dr. Lee Jenkins)

To increase Learning . . .

- Fact Fluency
- 5 minute timings for Multiplication Tables
- Songs for Transitions.
An Example of a Structural Tool to Support the Development of Executive Functions
Frustration and Shame

(Out of the Window of Tolerance!)
## Here is the Structure

### Create the grid

- **Restate**
  - What am I solving for?
  - How can I organize my thinking?

- **Illustrate**
  - How can I demonstrate my thinking?
  - Do I use a picture? An Algorithm?

<table>
<thead>
<tr>
<th>Solution</th>
<th>Explain</th>
</tr>
</thead>
</table>
|  - Ultimately what equation did I solve?  
  - What is my answer? |  - Answer written in a complete sentence with unit and language from the prompt.  
  - Sentence(s) describing the work done in the “I” box. |
Let’s Practice

- In your booklet turn to the page that says draw the grid.
- Draw the lines in the center of the grid.
- Use the organizational method to solve the following problem.

Mary is making bracelets to sell for a school project. She buys a package of 36 charms for the bracelets. She puts 4 charms on each of the bracelets. If she plans to use all the charms, how many bracelets can she make.
Implementation of the Method

5. Start: 3:23
   End: 3:59
   10 + 10 + 6 + 10 = 36
   ? = 36 minutes

6. Start: 7:20
   End: 7:36
   10 + 6 = 16
   ? = 16 minutes

It takes them 36 minutes to get to the mall.

Cassie's practice starts at 3:22.
Let Me Tell You Why

- The grid provides tasks that prompt a self-talk narrative that helps the child overcome the negative internal narratives.
- The grid provides a holding space for memory--the last thought in the sequence of problem solving is not lost as they move on.
- The “illustrate” portion allows the child to use various sensory modalities (manipulatives, drawings, memory tools, etc.) to locate a “place” in their brain where they can make sense of the problem (not just one way to solve a problem).
- No matter how different the problem is, the approach to solving it is always familiar--draw the grid. (Reduces chance of triggering Amygdala)
- Every problem-solving experience follows a pattern which helps the brain to encode new information into previous understanding.
- The teacher has a window to the child’s thinking processes and can determine the sticking point.
Indicators of Success

3rd Grade SBA Scores

2014-2015

2015-2016
Conclusion
(2:20)
Reflection on Goals

Goals: Participants will be able to:

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3. Develop strategies to build missing sensory and conceptual foundations while providing structures to promote the development of executive functioning in mathematical problem solving.
Questions
(2:25)
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