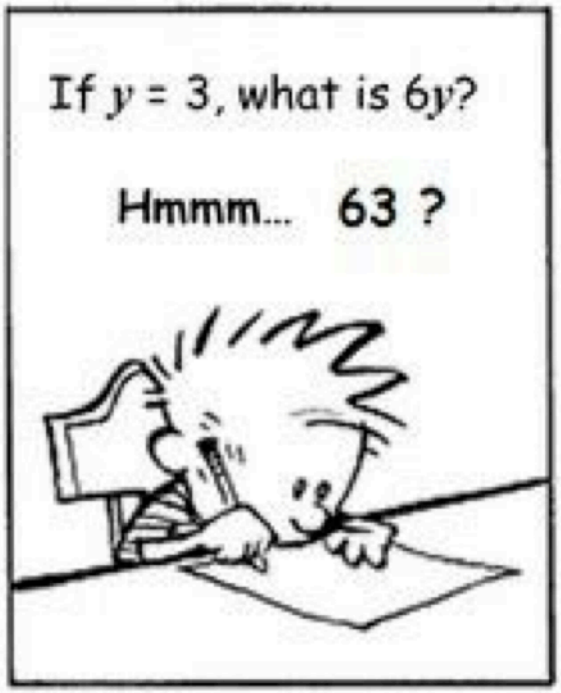


It's Not Right, But It's Okay

Errors as Opportunities

Monica Tienda ~ Detroit, MI ~ @matienda

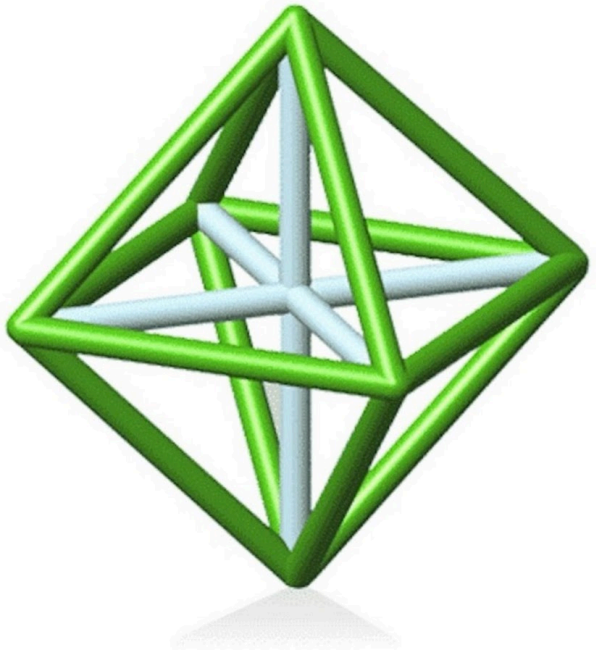
Who I Am…

- Key Elementary ~ Oak Park, MI
  - 4th & 5th grade teacher
  - Borders Detroit; School of Choice
  - At-Risk, Title I population
  - 95% African-American; 5 % Arabic/Chaldean

UNIVERSITY OF MICHIGAN

Who I Am…

- Park City Math Institute ~ Park City, UT
  - 3-week summer math institute for K-12 educators
  - AWESOME!
  - Participant 2012-2015
  - Staff 2016+



Mathematical TEACHING Practices

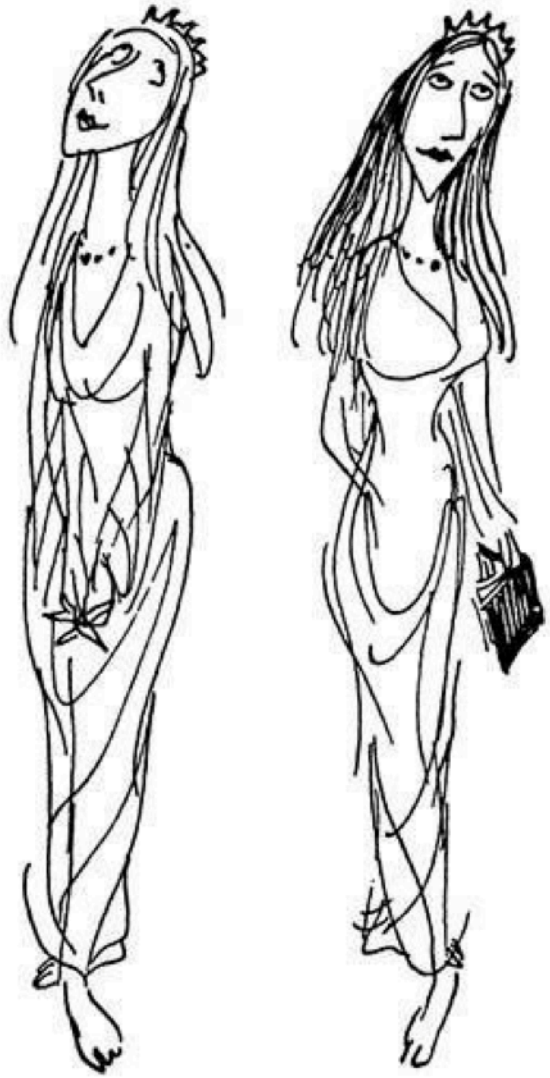
Effective Mathematics Teaching Practices

1. Establish mathematics **goals** to focus learning.
2. Implement **tasks** that promote reasoning and problem solving.
3. Use and connect mathematical **representations.**
4. Facilitate meaningful mathematical **discourse**.
5. Pose purposeful **questions**.
6. Build **procedural fluency** from conceptual understanding.
7. Support **productive struggle** in learning mathematics.
8. **Elicit and use evidence** of student thinking.

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

The Phantom Tollbooth, by Norman Juster

"You must never feel badly about making mistakes…as long as you take the trouble to learn from them. For you often learn more by being wrong for the right reasons than you do by being right for the wrong reasons."



FUN=Productive Struggle

- What does "FUN" look like?

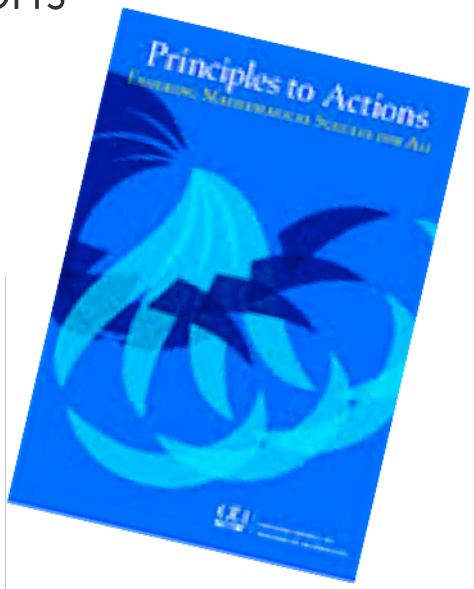
Tax Man

- Start with a collection of paychecks, from $1 to $12. You can choose any paycheck to keep. Once you choose, the tax collector gets all remaining paychecks that are **factors** of the number you choose. The tax collector must receive payment after every move. If you have no moves that give the tax collector a paycheck, then the game is over and the tax collector gets all remaining paychecks. The goal is to beat the tax collector.


FAIL
[F] FIRST
[A] ATTEMPT
[I] IN
[L] LEARNING

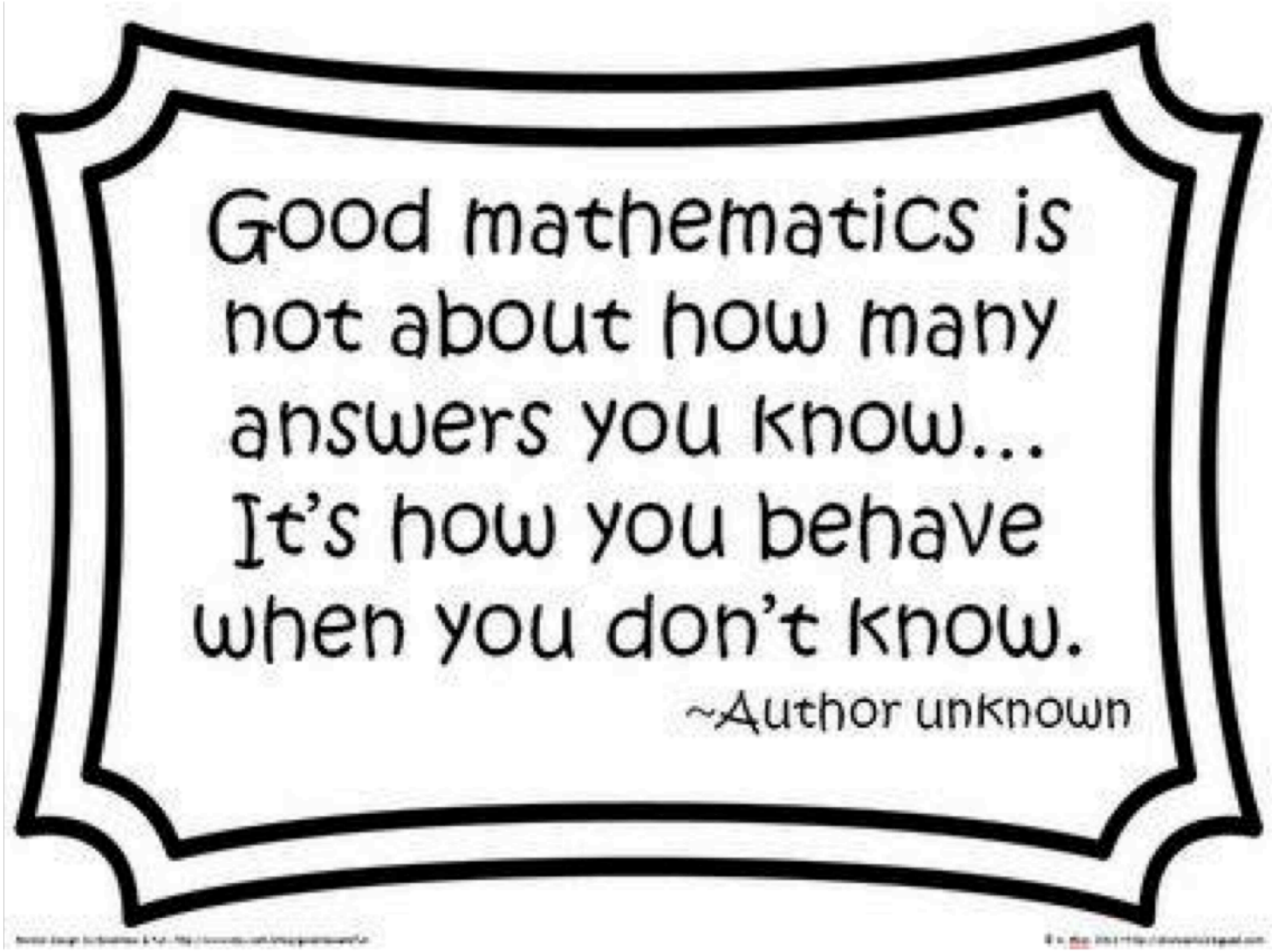
NCTM: Principles to Actions

- "an effective teacher provides students with appropriate challenges, encourages perseverance in solving problems, and supports **productive struggle** in learning mathematics" (NCTM, 2014, p.11).



Productive Struggle

- When students **labor** and struggle **but continue** to try to make sense of a problem, they are engaging in **productive struggle.**

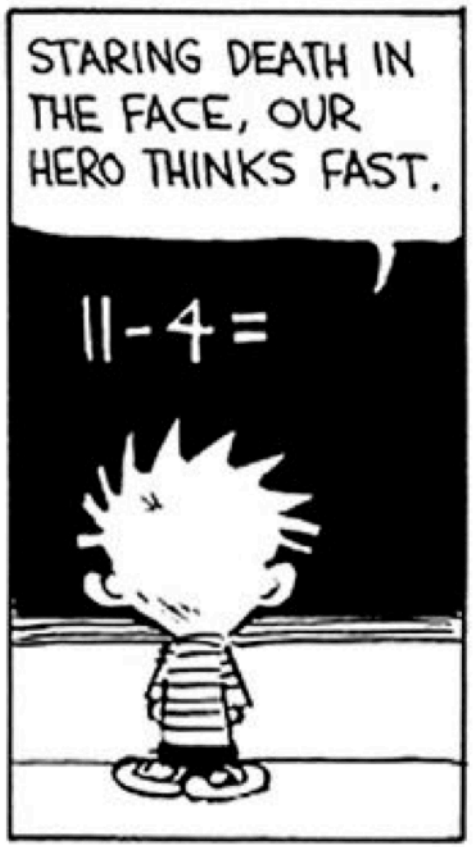

Good mathematics is not about how many answers you know... It's how you behave when you don't know.
~Author unknown

David Wees

- Fundamentally, Wees wants to increase the amount of **thinking "at the edge of their knowledge"** that students do. "There's lots of evidence that what we think about is what we know later," he said. "I want to increase the amount of thinking going on in math class."

Marilyn Burns

- I'm interested in how students solve problems. I think it's very, very important to encourage students to **reason mentally**, without paper and pencil, and at all times to **explain their thinking**.

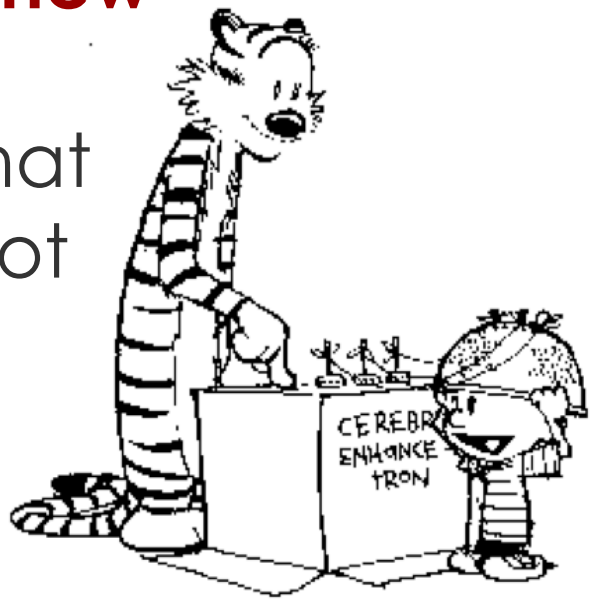


Jo Boaler

- Mistakes and challenging work are critically important for students and part of teaching, for a **growth mindset** involves giving students complex work and **valuing mistakes** that are made…

Jo Boaler

- …every time a student makes a mistake in math they form a **new synapse** - paths that result in concrete learning gains or that can wash away if they are not followed and made deeper.



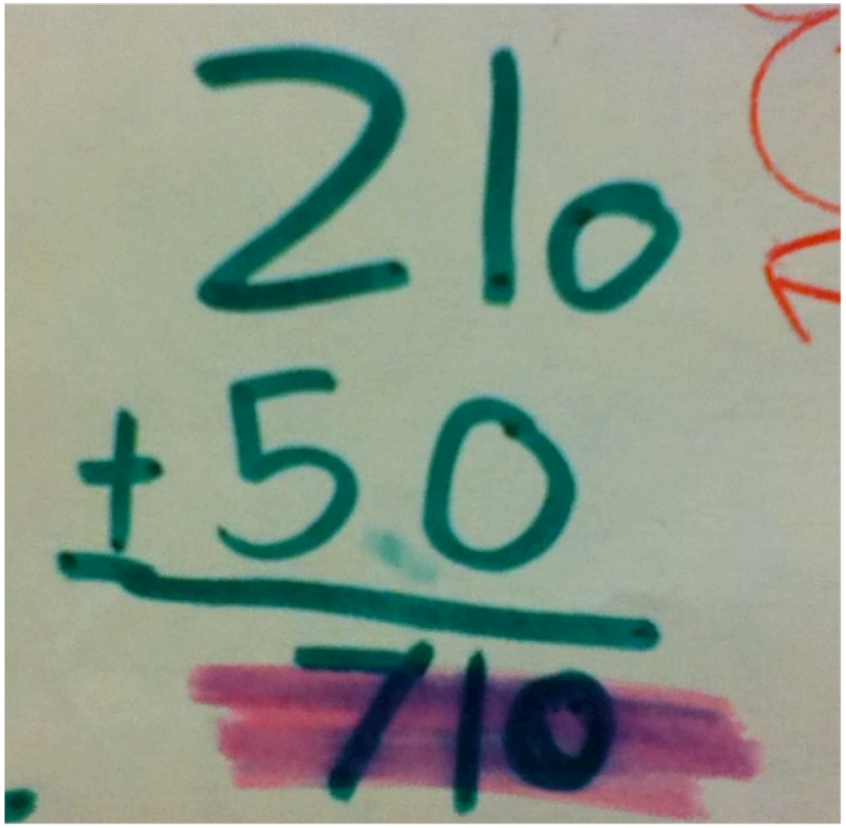
Linda Gojak

- Helping students to learn from their mathematical mistakes can give us **insight into their misconceptions** and, depending on our instructional reactions, can enable them to **develop deeper understanding** of the mathematics they are learning.

TYPES OF ERRORS

- Clueless
- Careless
- Conceptual

Errors as Opportunities:
Be Specific



Errors as Opportunities:
Be Specific