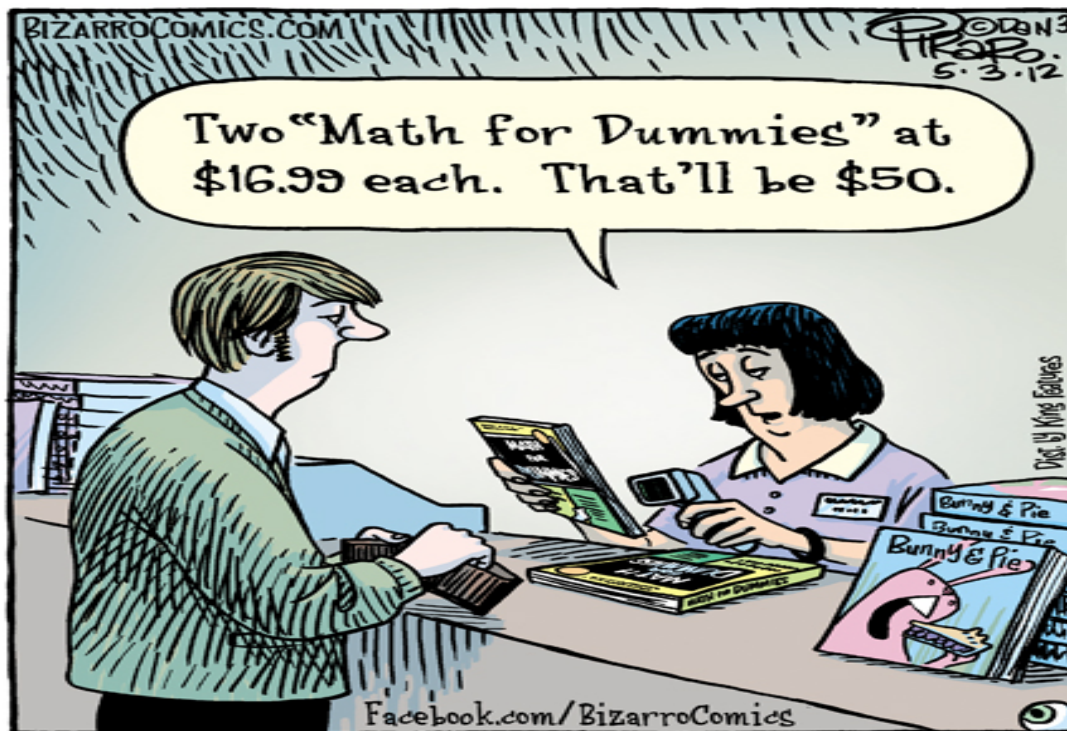
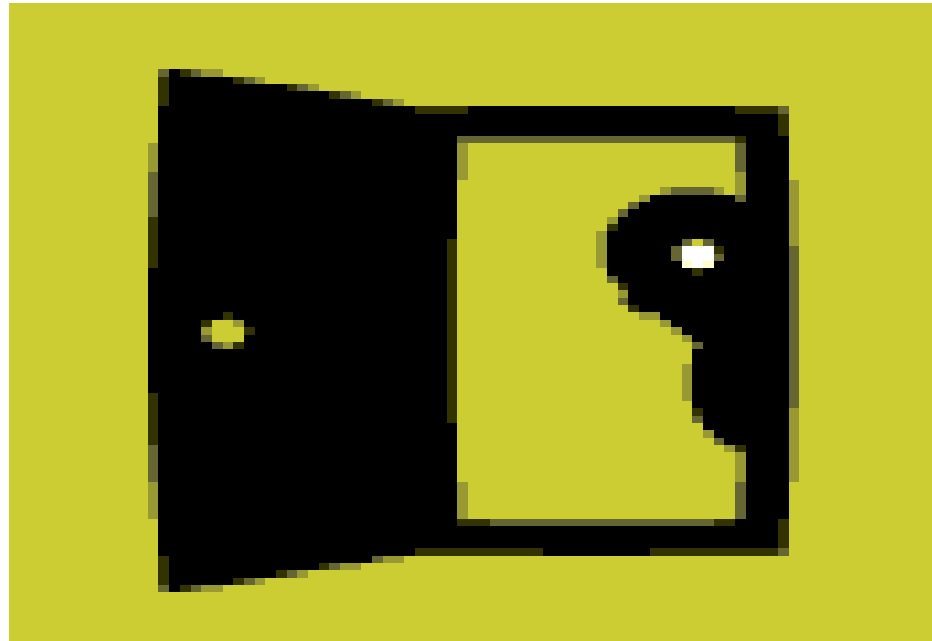


# “Confessions of a Math Phobe: Math Practices That Work”



**Earl Martin, Director**  
**Emporia State University**  
**Professional Development School Partnership with JCCC**

# Exit The Closet...



# Session Objectives:

- Share personal experience from math “phobe” to math “phan”
- Understand what contributes to math anxiety
- Examine math practices that improve math achievement

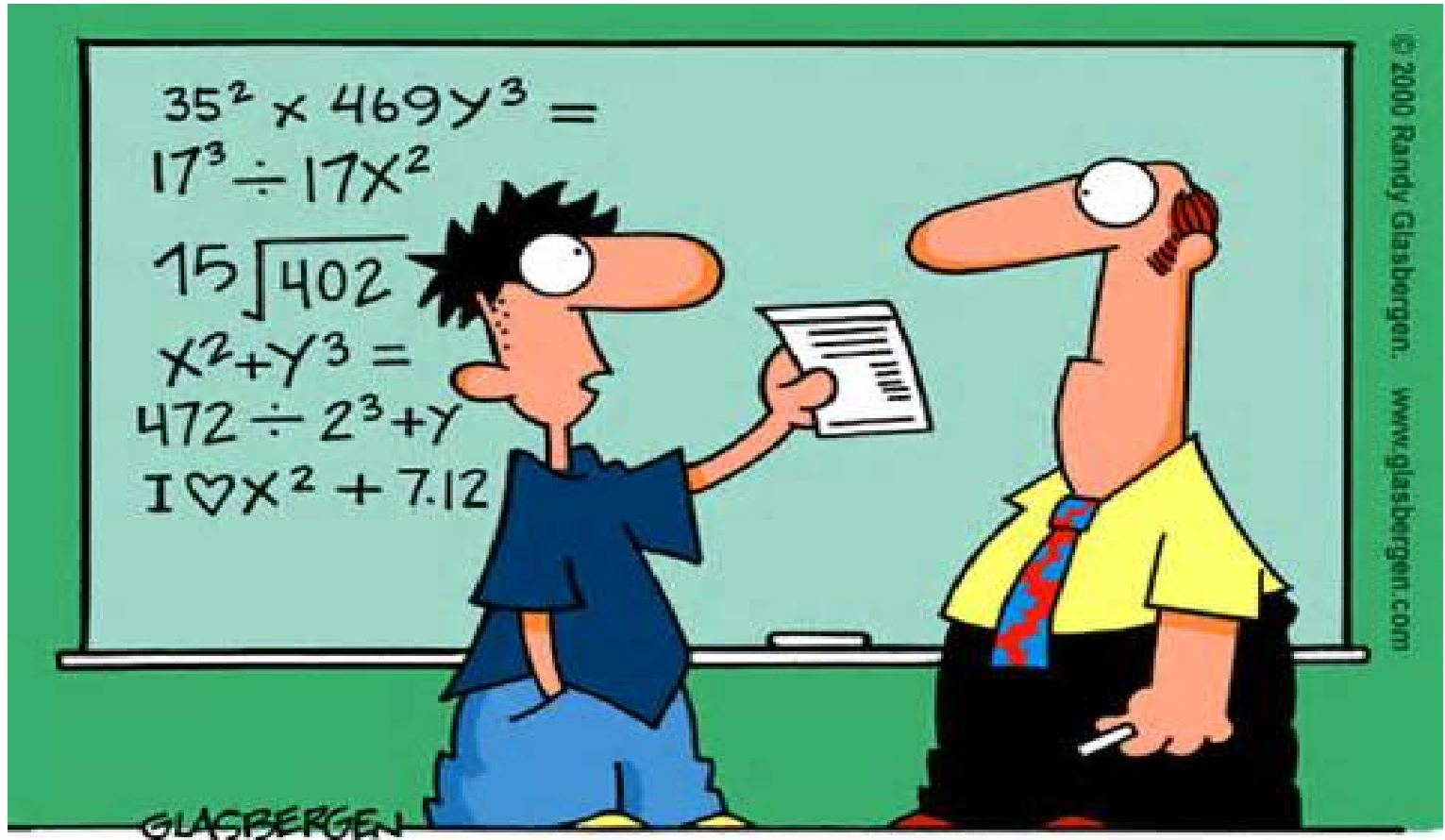
# Why we should look at math instruction in US:

- International Comparisons
  - 2011 TIMSS
    - US 4<sup>th</sup> grade math - 11<sup>th</sup> / 52
    - US 8<sup>th</sup> grade math – 9<sup>th</sup> / 52
  - Apples to apples?
  - *Catching Up or Leading the Way* by Yong Zhao
- STEM job shortages
- Teacher Math Anxiety is real

# Math Anxiety:

- Greg Tang –
  - 75% kindergartners “good at math”
  - 10% - eleventh graders
- Marilyn Burns –
  - 80% teachers “uncomfortable with math”
  - ESU student teaching interns
- Parents –
  - “I wasn’t good at math”
- *“Math: The subject Americans love to hate”*

# What contributes to math anxiety?



"I HAD MY DOCTOR DO A D.N.A. BLOOD ANALYSIS. AS I SUSPECTED, I'M MISSING THE MATH GENE."

# What Contributes to Math Anxiety?

- View of “intelligence”
  - Composite intelligence v. Multiple Intelligences
- Student experiences
  - Family: lack of support
  - History: individualistic, competitive, public
- Teacher attitude
  - What are elementary teachers passionate about?
- Teacher Competence
  - Teaching by history and textbook
  - Ineffective teacher can = 4 years of deficits

# From “Phobe” to “Phan”:Math Heroes:

- *My experiences....*
- USD 233 Math Coordinator – Encouragement
- Marilyn Burns - Communication
- Kim Sutton – Patterns
- Greg Tang – Number Sense



# Math Practices That Work:

1. Create math rich environment
2. Maximize time for math
3. Teach conceptually
4. Guarantee math facts
5. Communicate mathematically
6. Use cooperative learning
7. Teach PS strategies

# A Word about Common Core

<b>Positive Factors:</b>	<b>Cautions:</b>
<ul style="list-style-type: none"><li>•Instructional Focus</li><li>•Fewer / deeper standards</li><li>•National agreement</li><li>•Buy-in from educators</li></ul>	<ul style="list-style-type: none"><li>•Is this the “Golden Key”?</li><li>•Change Fatigue</li><li>•Knowing-Doing Gap</li><li>•Assessment Logistics</li></ul>

# I. Create Math Rich Environment.

- **Teacher Attitude**

- Teacher attitude affects student attitude and achievement
- District/school responsibility – PD!

- **Classroom/School Environment**

- Math Cadre
- Math vocabulary
- Math fun – centers, puzzles, technology
- Math special events—
  - e.g. “Pi Day” – March 14
  - Math Olympics



## 2. Maximize Time for Math

- How much time is allocated to math?

“There is a positive relationship between total time allocated to math and achievement.”

- CCSS Math Practices: perseverance

- “Here it is, now do it and hurry.”

- Jim Stigler research (1979): US student view of math (right answer) v. Asian view of math (effort).
- First grade math study with difficult math problem: US students (30 sec) v. Japanese students (60 min).
- *We give time to our priorities!*

### 3. Teach conceptually.

- What happens when primary students are given these problems:

$$399$$

$$\underline{+57}$$

$$14$$

$$\underline{-7}$$

$$100$$

$$\underline{-99}$$

# Number Sense (Greg Tang)

- Learn math like learning to read new words = breaking into meaningful chunks (not letters).

- *Kids counting on their fingers = no number sense*

- Learn to think in 10's and 100's

- $8 + 6 = 8 + (2 + 4)$
  - $78 + 6 = 80 + 4$

- Add horizontally instead of vertically

21	21	(20 + 1)	+ 34	(30 + 4)
<u>+34</u>		Add tens	then	ones

- Teach place value, not procedures

- Goal: Solve in your head. (Ex:  $18 \times 3$ )

- 90% of real-world math is mental.*

- Use "sponge activities"*

# Getting Conceptual:

- **Lots of PD** – Getting teachers comfortable with math
- Going **beyond textbooks**
- Learning to **think in math**
- Give students lots of **mental practice** in math – sponge activities.

# 4. Guarantee Math Facts

- Teacher frustration: “Don’t know math facts”
- Power of basics – sports examples
- CCSS Math Practices: fluency
- STOP timed math tests!
  - Tests do not “teach” facts
  - They increase anxiety
- Implement a **PLAN**:
  - Assess facts – Target facts they do not know (6-7-8)
  - Teach fact strategies: doubles, 5’s, brain-hooks...
  - Peer Tutor – 10 minutes / 3 x per week
  - Chart progress and celebrate!





# 5. Communicate Mathematically.

## 3 aspects of math communication:

### (1) Math vocabulary

- Explicit instruction
- Math Word Walls (k-12)
- Using correct math vocabulary consistently

### (2) Journaling

- Processing learning
- CCSS – importance of writing

### (3) Metacognition

- Understanding student thinking – explain your answer
  - Student interviews (Marilyn Burns article)
- 
- *Read Marilyn Burns' books/articles...*

## 6. Use Cooperative Learning

- Does math have to be private and competitive? (Is it in the work place?)
- Benefits of cooperative learning:
  - Marzano – 27 % achievement gain
  - Safety in numbers – at risk learners
  - Social learning is fun
  - Processing learning
  - Some students can teach others well

# 7. Teach Problem Solving Strategies

- Problem solving = way we use math everyday
- Strategies = way to organize thinking
- Problem Solving Strategies:

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- Problem solving = way we use math everyday
- Strategies = way to organize thinking
- Problem Solving Strategies:
  - **Find a Pattern**
  - **Make a Table**
  - **Work Backwards**
  - **Guess and Check**
  - **Draw a Picture**
  - **Make a List**
  - **Write a Number Sentence**
  - **Use Logical Reasoning**

# Math Practices That Work:

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# Power of Focus --

“If we choose to take just a few well-known, straightforward actions... we can make swift, dramatic improvements in schools.” (Mike Schmoker, *Focus*, 2011)

