PAM HARRIS

equipping math teachers with content & pedagogy for student success

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MATH IS FIGUREOUTABLE!
FAKE MATH: the myth that math is a disconnected set of facts to memorize and rules and procedures to mimic.

Pam Harris
REAL MATH: using relationships and connections you own to solve problems. By so doing, learn more real math.

Pam Harris
REAL MATH
MATH
MATHEMATIZE
MENTOR MATHEMATICIANS
POWERFUL VISUAL MODELS
MODEL

STRATEGY
NOT THE SAME

MODEL ≠ STRATEGY
Strategy
how you deal with the numbers or structure to solve a problem

Model
representation of a strategy, of relationships; some models can be tools
MODEL
Model
MODEL

Verb  Noun
VERBS
Model - Demonstrate
Model - Demonstrate
Model - Demonstrate
Model - Represent Student Thinking
What is 5 times 23?
What is 5 times 23?
Well, I know 10 x 23 is 230. And 5 is half of 10, so 5 x 23 is 115.
What is 5 times 23?

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Model - Represent Student Thinking

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5 x 23 = ?
10 x 23 = 230
so 5 x 23 = 115
NOUNS
Model-Manipulative
Model—Manipulative
Model - Equation, Function, Predictor
Model - Equation, Function, Predictor

\[ f(x) = 10 \cdot 1.06^x \]
Model–Process
Model-Process

- Problem
- Formulate
- Validate
- Compute
- Interpret
- Report
Model - Representation of the Situation
Sam sold his old skateboard for $24 and some other toys for $12. He is going to use the money to pay for guitar lessons. The cost each lesson is the same every week. Draw a strip diagram to show Sam’s cost for 1 month of guitar lessons?
Pam has 2 pencils in her zipper pouch. Bob has 5 times as many pencils as Pam. How many pencils does Bob have?
Model - Representation of the Situation

Strip Diagram

On Monday, the 3rd grade students at SLE collected 185 boxes for a math project. On Friday, they collected 223 more boxes. How many boxes did they collect?
Model - Representation of Thinking
Model - Representation of Thinking

related to . . .
What is 5 times 23?

Well, I know 10 x 23 is 230. And 5 is half of 10, so 5 x 23 is 115.
Model - Representation of Thinking

503 - 399
I’m going to find the difference. 399 to 400 is 1, then 103 more is 104.
I’m going to find the difference. 399 to 400 is 1, then 103 more is 104.
I’m going to find the difference. 399 to 400 is 1, then 103 more is 104.

I’ll subtract 400, so 503 minus 400 is 103. But I subtracted too much, so 104.
I’ll subtract 400, so 503 minus 400 is 103. But I subtracted too much, so 104.
Model - Representation of Thinking

\[ \begin{align*}
? & \quad 399 \\
503 & \\
\end{align*} \]

\[ 1 + 103 = 104 \]

\[ 399 \quad 400 \quad 503 \]

\[ 103 \quad 104 \quad 503 \]
Model - Tool for Thinking

503 - 399
Model - Tool for Thinking

503 - 399
Model - Tool for Thinking
Model - Tool for Thinking
Model - Tool for Thinking
Model - Tool for Thinking

\[ 503 - 399 = 504 - 400 \]
Model - Tool for Thinking

\[ 503 - 399 = 504 - 400 = 104 \]
Verb

- Model - Demonstrate
- Model - Represent Thinking

Noun

- Model - Manipulative
- Model - Equation (function)
- Model - Modeling process
- Model - Representation of a Situation
- Model - Tool for Thinking/Computation
Verb
- Model - Demonstrate
- **Model - Represent Thinking**

Noun
- Model - Manipulative
- Model - Equation (function)
- Model - Modeling process
- **Model - Representation of a Situation**
- **Model - Tool for Thinking/Computation**
Model of a Situation
Model of Thinking
Model for Thinking (as a tool)

Fosnot & Dolk
DO

EXPRESS

REPRESENT

@pwharris
Models for Thinking

1 + 103 = 104

10 ÷ 2

23

115

230

5

10

230

115

5

230

104
Models for Thinking (as tools for reasoning)

\[ 1 + 103 = 104 \]

\[
\begin{array}{c|c|c}
10 & 23 & 230 \\
10 & 115 & \hline
5 & 5 & 230
\end{array}
\]

\[
\begin{array}{c|c|c}
1 & 23 & 230 \\
10 & 115 & \hline
5 & 5 & 230
\end{array}
\]

\[ \div 2 \]

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how you deal with the numbers or structure
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• Mistakenly think that all strategies are equal
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There’s a vast, unlimited, unknowable number of “strategies”
• Mistakenly think that all strategies are equal

• There’s a vast, unlimited, unknowable number of “strategies”

• Students forced to find “another way” often use less sophisticated strategies.
MODELS & MODELING MATH
MAKE THE RELATIONSHIPS VISIBLE
TEACH REAL MATH
TELL REAL MATH
EXPERIENCE REAL MATH
MATHEMATIZE
MIMICRY
TRICKS
MENTOR MATHEMATICIANS
MATH IS FIGUREOUTABLE!
It’s About Relationships

• Among the numbers and structures to solve problems

• Between teachers and students to mentor and nurture young mathematicians
QUESTIONS?
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