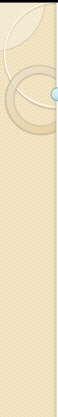
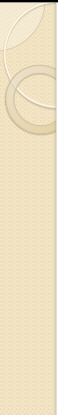


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emBracing the Vision
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April 2010



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Different by Design
Different to achieve certain goals relative to learning and teaching!




Write an equation that shows the relationship between feet and yards.
Let f = the number of feet
Let y = the number of yards

Syntax (words and their order) is emphasized rather than semantics (meanings).

NOT GOOD

Math Makes Sense!!



enVisionMATH
A Research-Based Program

SESSION GOALS

- **Effective Curriculum (International Studies)**
- **Effective Content Development**
 - **Develop the Concept**
 - **Solving Word Problems**

International Research
Effective Curriculum

- **Focus** (Not a “mile wide.”)
- **Depth** (Not an “inch deep.”)
- **Coherence** (More than a collection of activities)

enVisionMATH - NOT a Mile Wide

“All CA nothing but the CA,
so help me Arnold!”

Grade-Level Organization

Focus & Depth

20 Topics Grades 1-5
16 Topics Grade K
Customized Sequence Possible

EACH TOPIC
Focuses on One Strand
A Few Related Standards

National Council of Teachers of Mathematics (NCTM)

“A curriculum is more than a collection of activities: it must be **coherent**...”

Coherent Mathematics Content

- *Skills-Development Skeleton* – CA Standards
- *Concept-Development Skeleton* – 20 **Big Ideas** & related **Essential Understandings**. (UbD)

Big Ideas & Essential Understandings

“We understand something if we see how it is related or connected to other things we know.”

J. Hiebert, Signposts for Teaching Mathematics through Problem Solving In F. Lester & R. Charles, *Teaching Mathematics Through Problem Solving*, Grades PreK-6. NCTM: Reston, VA, 2003.

Research Effective Teachers

- ✓ **Have their own mathematics content knowledge anchored on big ideas.**
- ✓ **Use big ideas as the glue for teaching, learning, and assessment (connections).**

Ma, Liping. Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States. Mahwah, NJ: Lawrence Erlbaum, 1999.

Stigler, James. "The Teaching Gap: Reflections on Mathematics Teaching and How to Improve It." Paper presented at the Pearson National Educational Leadership Conference, Washington, D.C., March 2004.

Are you emphasizing

Skills

AND

Ideas/Understandings?

Research-Based Program

- **Effective Content Development**
 - **Develop the Concept**

**Research Fact:
Effective Curriculum & Instruction**

Understanding and skill are best developed through a *balance* between student-student interactive learning and the teacher providing information at the right time and in the right way.

A New Vision for Basal Programs

Site for Learning	Type of Learning Emphasized	
	Conceptual Understanding, Reasoning, Problem Solving	Skill Development
Interactive Learning Activities Outside of a Textbook	enVisionMATH	enVisionMATH
Textbook with Teacher Directed Lessons	enVisionMATH	enVisionMATH

**enVisionMATH
Four-Phase Instructional Model**

- 1) Daily Mixed Review
- 2) Develop the Concept: Interactive Learning
- 3) Develop the Concept: Visual Learning
- 4) Close/Assess - Diagnosis/Intervention

Develop the Concept: Interactive Learning

***Problem-Based
Interactive Learning***

Research shows that understanding develops during the process of solving problems in which important math concepts and skills are embedded (Lester & Charles, 2003).

Research Fact

“...if we want students to understand mathematics, it is more helpful to think of understanding as something that results from solving problems, rather than something we teach directly.” (Hiebert et al, 1997, p. 25)

All activities are NOT problem-based interactive learning experiences.

Non-Problem-Based Activity

- Totally or mostly teacher directed
- Low cognitive demand
- Too brief – no think time

LONGER activities like this are NOT going to provide better conceptual development!

Problem-Based Interactive Learning

Phase 1: Solving and Discussing a Problem

- Teacher poses the problem,
- Students work together; teacher facilitates,
- Students share their thinking and work.

Phase 2: Making the Important Math Explicit

- Teacher-Directed Instruction
- "Classroom Conversation"

10 to 20 minutes

Problem-Based Interactive Learning Benefits

- ✓ **Concepts and skills make sense.**
- ✓ **Concepts and skills are remembered.**
- ✓ **Concepts and skills are more effectively used in problem-solving situations.**
- ✓ **Learning gaps and misconceptions are confronted.**

Making the Transition to PBIL

Goals first 3 months:

- Establish a positive environment
- Become a facilitator rather than a director
- Promote student learning independence

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Develop the Concept:
Problem-Based Interactive Learning

Introduce new ideas by giving kids a chance to think (John Van de Walle).

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Four-Phase Instructional Model

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Visual Learning Bridge

Visual Learning Animation

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Four-Phase Instructional Model

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“Word Problems”

Biggest “leap” in teaching problem solving since 1985!

Why focus on word problems?

- **Mathematical literacy.**
- **About 50% of the state assessment items are word problems.**

Why focus on word problems?

- **Test data show that performance solving word problems is low for too many students.**
- **Teachers report that teaching word problems remains as one of their most challenging and frustrating tasks.**

Why focus on word problems?

- **Developing students' abilities to solve word problem is critical for algebra readiness.**

Solve

Carrie has 135 U.S. stamps. She has 3 times as many foreign stamps as U.S. stamps. How many stamps does she have all together?

Research Fact

Problem solving is NOT a skill.

Successful problem solvers are those most capable of using "quantitative reasoning."

Quantitative Reasoning

Understanding the quantities involved and how they are related, independent of the specific numbers.

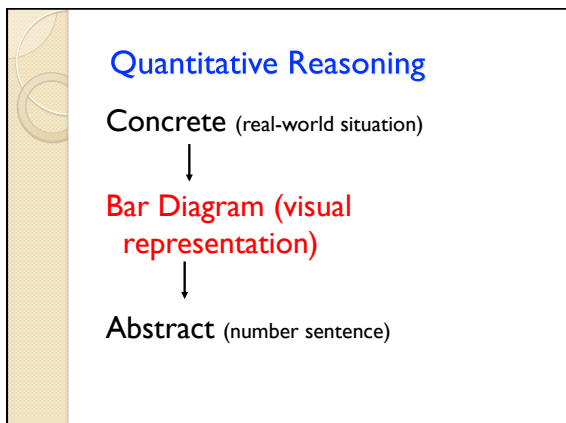
Research Fact

- Training children in the process of using diagrams to solve problems results in more improved problem-solving performance than training students in any other strategy.

(Yancey, Thompson, and Yancey, 1989).

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“Bar Diagrams”



Quantitative Reasoning

Carrie has 135 U.S. stamps. She has 3 times as many foreign stamps as U.S. stamps. How many stamps does she have all together?

U.S. stamps →

135

Foreign →

135	135	135
-----	-----	-----

 3 times as many

$(3 \times 135) + 135$ or
 $4 \times 135 = ?$

What operation(s)?

Rick has 147 apples.
 He ate 28.
 How many apples does Rick still have to eat?

$147 - 28 = ?$
 $28 + ? = 147$

Bar Diagrams- Joining Equal Groups

? Pens in all

Pens in each box

Tom has 4 boxes of projector pens. There are 5 pens in each box. How many in all?

Joining Equal Groups: Total Amount Unknown

$4 \times 5 = ?$

Bar Diagrams- Joining Equal Groups

45

Pam had 5 bags and put the same number of apples in each bag. She ended up with 45 apples in bags. How many did she put in each bag?

$5 \times ? = 45$
 $45 \div 5 = ?$

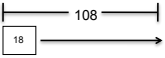
Bar Diagrams- Separating Equal Groups

45

Byron has 45 pigeons. He keeps them in 5 pens with the same number of pigeons in each. How many pigeons are in each pen?

$45 \div 5 = ?$

Bar Diagrams- Separating Equal Groups



A total of 108 children signed up for soccer. How many 18-person teams can be made?

$108 \div 18 = ?$

A Developmentally Powerful Sequence from Grade K-6

Bar Diagrams

Focus I: Number meanings & relationships

Bar Diagrams

Focus 2: Operation meanings & relationships

Bar Diagrams

Focus 3: Representing & solving word problems

enVisionMATH
A Research-Based Program

SESSION GOALS

- **Effective Curriculum (International Studies)**
- **Effective Content Development**
 - Develop the Concept
 - Solving Word Problems

Success Starts with YOU

We must believe that ALL students can understand mathematics, develop computational fluency, and become successful problem solvers.
