Tying it all together : Weaving in the strands of Mathematical Proficiency

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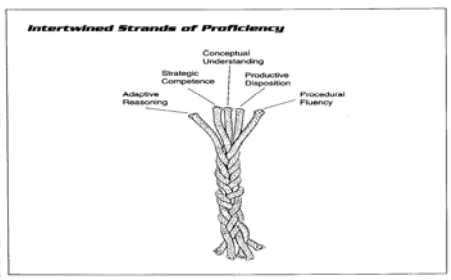
Presentation can be found on
http://mason.gmu.edu/~jsuh4/teaching/strands.htm

Mathematical proficiency

1. *Conceptual understanding –*
2. *Procedural fluency –*
3. *Strategic competence –*
4. *Adaptive reasoning-*
5. *Productive disposition –*

Kettle Math- example of what it is not.

Strands of Mathematical Proficiency



Mathematical Proficiency

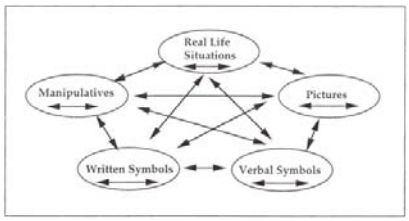
- *conceptual understanding* - comprehension of mathematical concepts, operations, and relations
- *procedural fluency* - skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
- *strategic competence* - ability to formulate, represent, and solve mathematical problems
- *adaptive reasoning*- capacity for logical thought, reflection, explanation, and justification
- *productive disposition* - habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

The Forgotten Standards...

NCTM Process Standard

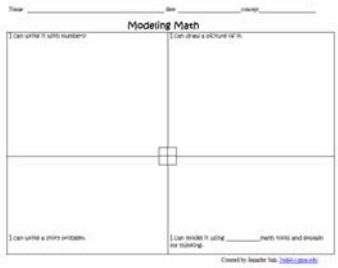
- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representations

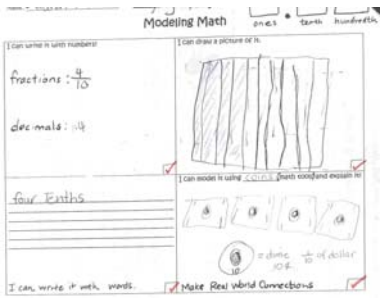
CONCEPTUAL UNDERSTANDING



Conceptual Understanding

- MODELING MATHEMATICS





Concept maps

Taboo

Pictionary

wiki-board

http://mathbridges.pbwiki.com/

Fraction

1) Region Model(Pattern Blocks) most concrete for students to understand. The region is the whole and the parts are congruent (same size and shape) Types of regions include circles, rectangle, square, triangle

Fraction Folding (FD 7,8,9,10)

Pattern Block (FD 35, 36, & FD 49-56)

Fraction Circles(Equivalent Fraction –Aims)

Length model

2) Length model(Tape measures) Any unit of length can be partitioned into fractional parts (Number line, ruler, long strip of paper, cuisinaire blocks)

- Cusinaire activity (Cusinaire riddles)
- Number Line Fraction (Fraction Bar game)

Set model

3) set model (2 color counters) uses a set of objects as whole; This sometimes causes difficulty because students don't see the set of objects as one complete whole. Children need many experience partitioning sets(background for division) then seeing if the sets can be partitioned into equal parts

- Color Counter activity (page FD3,4,5)
- Four bean salad

Area model

4) Area model(geoboards) more sophisticated version of the region model. The parts must have equal area but do not have to be in the same shape, Students need an understanding of area.

Geoboard activity

Strategic Competence

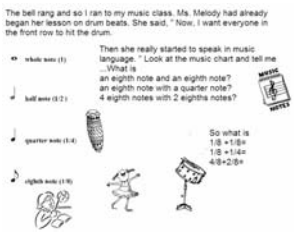
- Ability to formulate, represent, and solve mathematical problems
- Experience with problem solving strategies
- Flexibility of approaches

Math Happening

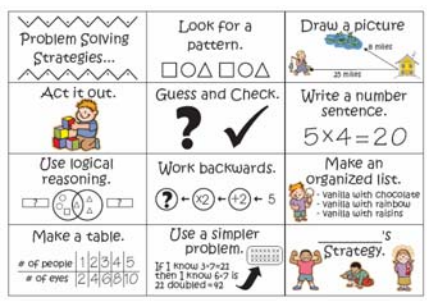
- **OBJECTIVE:** Share a real-life event (math happening) and pose a question that can be answered using the information given in the story. Illustrate the number sentence by drawing a picture.

Problem Posing

Math Curse...at Westlawn?

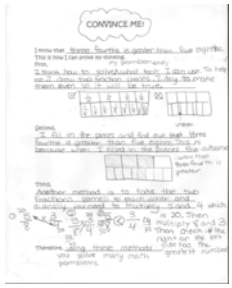


Strategy cards



Adaptive reasoning

- capacity for logical thought, reflection, explanation, and justification



Better Buy… adaptive reasoning

I went shopping to Costco and to Giant with my bargain shopper husband and compared prices on our snacks. What is a better buy?

Choose a better buy.

1) 4 oz can of peanuts for 45 cents
   10 oz can of peanuts for 90 cents

2) 14oz sauce for 79cents
   18oz sauce for 81 cents

3) 3oz bag of chips for 30cents or
   4 oz bag for 44cents

Procedural Fluency

procedural fluency - skill in carrying out procedures flexibly, accurately, efficiently, and appropriately

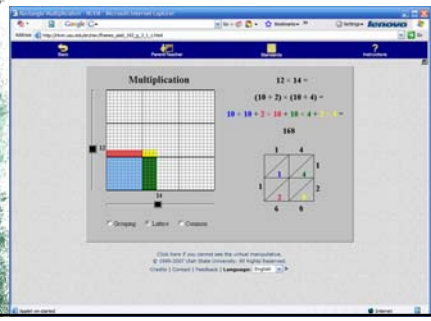
Challenge 24

Count down

Stand up, hand up and share

How does the lattice multiplication work?

http://nlvm.usu.edu/en/nav/frames_asid_192_g_2_t_1.html



Procedural fluency

Mental Computation

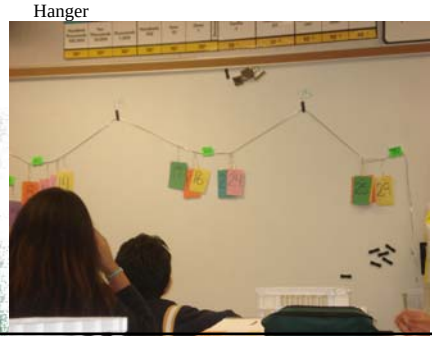
- Observing and using relationships
- Using patterns
- Using thinking strategies
- Recognizing different forms
- Connect number words and numerals to the quantities they represent, using various physical models and representations

Estimation

- Judging unreasonableness
- Using numbers flexibly
- Using referents and benchmarks
- Relative position and magnitude of whole/rational numbers

Rounding and Number Line

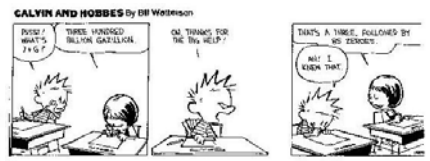
Materials: Clothesline and clothespin Hanger



Fraction Line up

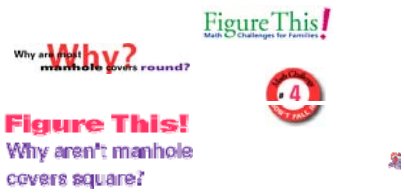
- Close to 0, ½ and 1
  - Fraction circles or fraction bar
  - Fraction mat with 0-1/2 – 1
- Number Sense with Fraction & Decimals
- Reflection questions:
- What's alike about all the fractions close to 1?
- What's alike about all fractions close to ½?
- What's alike about all fractions close to 0?

Judging Reasonableness…



Problem of the week

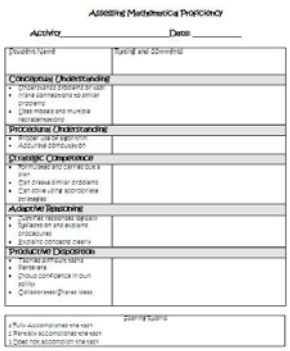
http://www.figurethis.org/
http://eduplace.com



Literature Connections

Present math activities in contexts.

Assessing math proficiency


Assessing Mathematics Proficiency

Activity _____ Date _____

Student Name	Rating and Comments
Conceptual Understanding	
• Understanding problems or can intake connections to similar problems • Uses models and multiple representations	
Procedural Understanding	
• Proper use of algorithm • Accurate computation	
Strategic Competence	
• Formulates and carries out a plan • Can draw similar problems • Can solve using appropriate strategies	
Adaptive Reasoning	
• Explains reasoning of calculations • Explains on and explains procedures • Explains concepts clearly	
Productive Disposition	
• Tackles difficult tasks • Persistent • Shows confidence in own ability • Collaborates/Shares ideas	

Scoring Scale

a Fully Accomplishes the task
b Partially accomplishes the task
c Does not accomplish the task

Publication Data:
Adding It Up: Helping Children Learn Mathematics, Mathematics Learning Study Committee, Jeremy Kilpatrick, Jane Swafford, and Bradford Findell, editors. National Academy Press, 2001. Hardcover, 480 pp, $29.95. ISBN 0-309-06995-5.