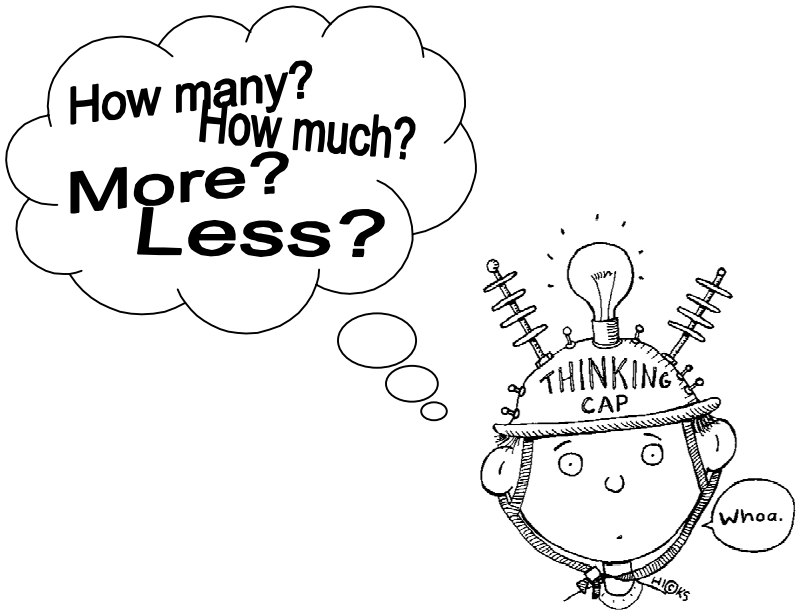
Giant Story Problems: Visualizing the Language of Math



Renée Goularte
www.share2learn.com

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CMC North - Asilomar - Dec. 2010

Visual Literacy

Visual literacy is the ability to interpret images as well as to generate images for communicating ideas and concepts.

Visual thinking is “the ability to turn information of all types into pictures, graphics, or forms that help communicate the information”

Visualizing is Thinking

Drawing information helps children to see how facts are connected.

Visual Literacy in Mathematics

Young children can benefit from visualizing addition and subtraction using simple bar graphs.

Spatial concepts are best shown in maps and diagrams.

Some children can interpret problems more successfully if they are encouraged to visualize the key elements in a map or diagram.

Graphing assists work in measurement and recording of data.

Re-composing helps understanding

Reading information in one form (such as words and sentences) and summarizing it in another form (such as a diagram or table) requires students to think about the meaning before they can re-compose the information. Re-composing is a key strategy in aiding comprehension.

Sources:

Visual Literacy in Teaching and Learning: A Literature Perspective - Suzanne Stokes
http://ejite.isu.edu/Volume1No1/Stokes.html

Visual Literacy K-8
~ http://k-8visual.info/using_Text.html

Giant Story Problems Lesson

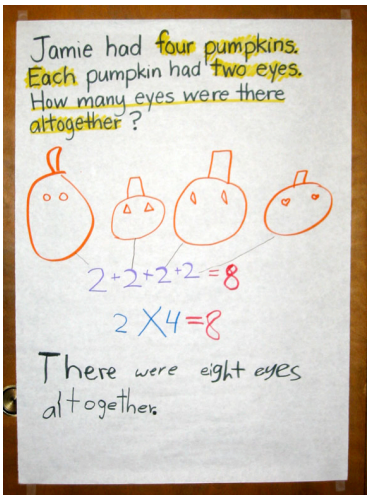
Students use language, symbols, and pictures in the problem-solving process.

Materials Needed:
large group: chart paper; markers; story problem written at top of chart paper
small groups: prepared story problems; white construction paper; colored markers
individual work: prepared story problems, unlined white paper, crayons or markers

Whole Class Introductory Activity:

Post a blank sheet of chart paper or butcher paper, on which you've written or glued a story problem, large enough so all students can read it. Choose volunteer students to do the following:

Read the problem aloud.
Underline key words in the problem.
Draw "the story" using simple drawings.
Write an equation that solves the problem.
Write a sentence that answers the question.
Double check to see that everything matches.



Story problem from a 2nd grade whole class lesson.

Partner or Small Group Work:

Small groups follow the same procedure as used in the whole group introduction. Prepared story problems printed in large font are distributed to the groups. Use challenging story problems. If each group has a different problem but the problems are related in some way, the sharing out time offers more opportunity for reinforcing concepts and strategies. Student groups share their strategies with the class, explaining why they drew what they drew, and and the reason they chose their strategies.Allow students to ask questions about strategies and follow up with questions such as the following for each group:

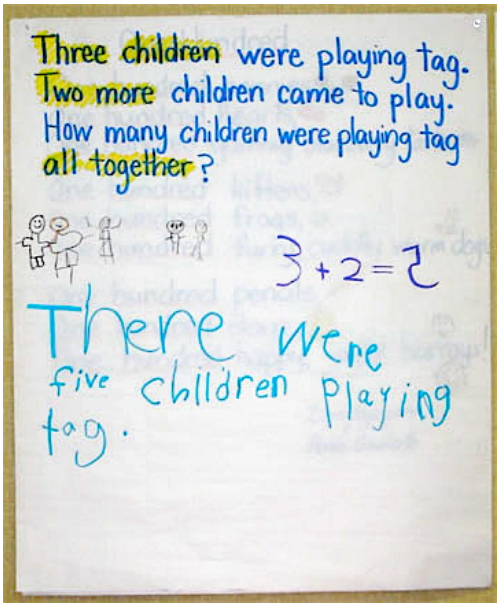
Does everything seem to work in this strategy?
Could it have been solved a different way?

Individual Work:

Students go on to solve individual story problems on their own using the same procedures. Story problems can come from the book or from a bank of teacher-prepared story problems. If desired, sorted into boxes by type (i.e., addition/subtraction; multiplication/division; fractions; two-step problems, etc.)

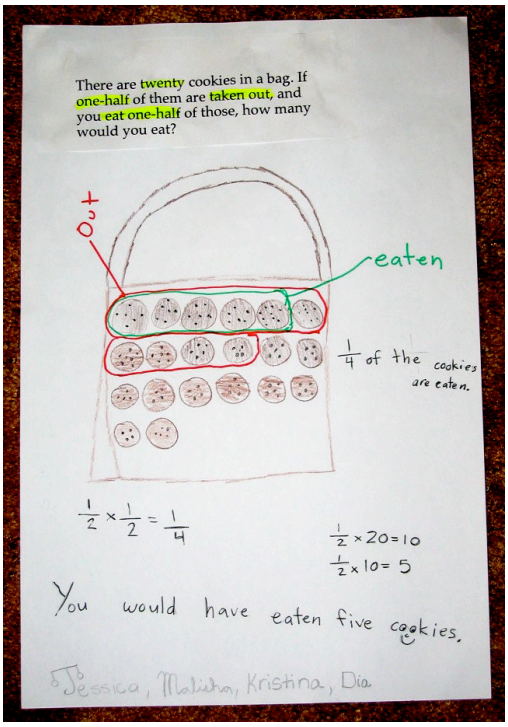
Giant Story Problems Samples

For an expanded lesson plan, go to www.readwritethink.org ~ in the "search keyword" box, type "Giant Story Problems."
For more information: http://www.share2learn.com/wlmathgoularte1.html



Kindergartners were introduced to story problems for the first time as a whole group in a shared reading/shared writing activity. Students identified number words as the teacher read the problem aloud, and then volunteer students did the drawing and the writing of the equation and the sentence that answers the question.

The problem at right shows a fifth grade group's work exploring multiplying fractions, a skill they had not yet been introduced to in their classroom. In this problem, students needed to identify one-half of one-half.



An Assortment of Pizza Problems

Eleanor is going out for pizza with friends, and she is watching her weight. If she plans to have one slice of pizza, would she be better off ordering

a personal pizza or a small pizza?
a small pizza or a medium pizza?
a medium pizza or a large pizza?
a large pizza or an extra large pizza?

Brian is hungry for pizza, and he wants to get the best deal. Would he be better off ordering

a personal pizza or a small pizza?
a small pizza or a medium pizza?
a medium pizza or a large pizza?
a large pizza or an extra large pizza?

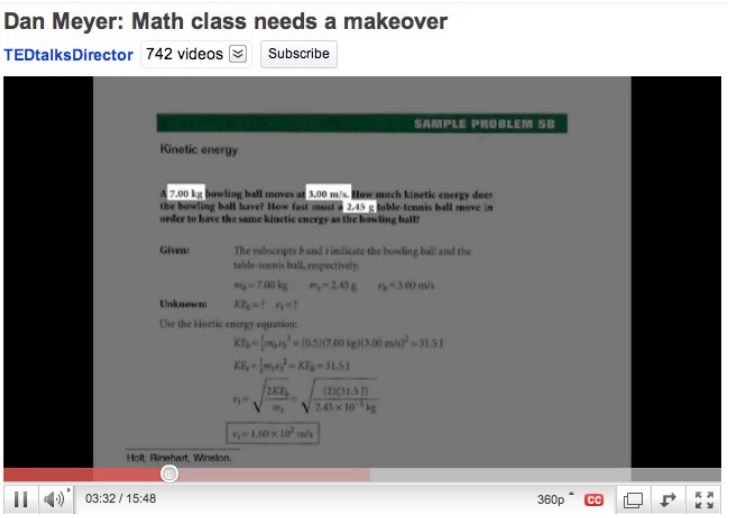
Consider:

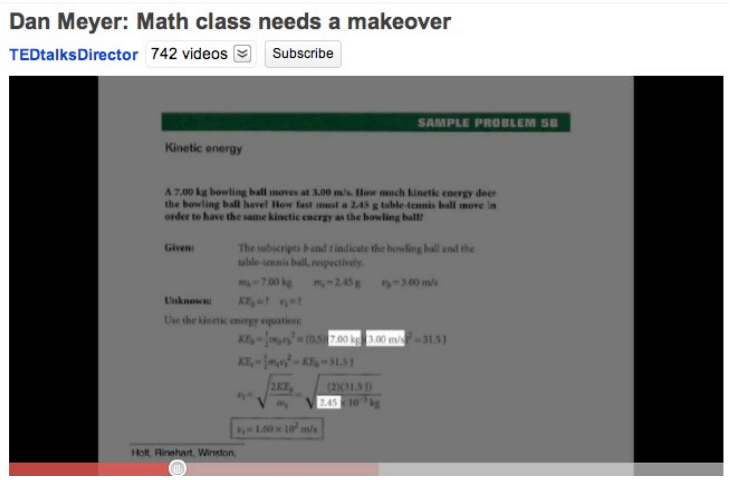
What do you need to know to answer these questions?
Where/how can you get the information?

TED talk: Dan Meyer
Math Class Needs a Makeover
VIDEO ~ http://www.ted.com/talks/dan_meyer_math_curriculum_makeover.html

Signs that math reasoning is being taught poorly:

1. lack of initiative
2. lack of perseverance
3. lack of retention
4. aversion to word problems
5. eagerness for formula





~ Food for Thought ~

Most word problems in math programs/textbooks offer exactly the information the students need…

… which the students then use to practice computations they've just "learned" with the help of examples…

… giving them little more than additional computation practice for lessons they've just "learned."

This does not teach students how to solve problems.

What if we gave less information, or too much information, so that students would need to make some decisions as to what the problem is, what information they need, and what strategies they might use?

Some Food For Thought About Problem-Solving

One Friday, Arnold Zwicky's granddaughter brought home this word problem:

Mother cat had 6 kittens. 5 kittens went to new owners. How many were left?

Her answer, duly checked off by the teacher, was "2 cats were left."

Is this word problem asking about cats or kittens? Are two answers acceptable?

What if this were on a standardized test?

_____

Read more at Arnold Zwicky's Blog
http://arnoldzwicky.wordpress.com/2010/07/31/data-points-n-ellipsis-ambiguity-73110/

A typical story problem might look like this:

There are 5,280 feet in a mile. If you live half a mile from school, how many feet from the school is your house?

Does this problem even make any sense? Does anybody care how many feet they live from school? Is there any problem-solving involved?

Consider these alternatives:

You live half a mile from school. How long does it take to get there?

You live half a mile from school. School starts at 8:00 am.

What would happen if students were asked to do problems like these? What would students do with these questions? What kind of math is involved?

Nine teachers are at a meeting. Four more teachers join them. A few minutes later, three of them have to leave. How many teachers are still meeting?

There are twenty-two cookies for four children to share. How many cookies can each child have?

Six children are reading in the library. Each child has three books. The librarian comes over and gives them three more. How many books do they have now?

Marcie's mother has eight candy bars. Marcie shares candy bars with three of her friends. How many candy bars are left?

Five fourth graders want to eat lunch in the cafeteria. Lunches cost $1.85 and milk is $.25 extra. Three students decide to drink water instead of milk. How much money do they spend all together?

A soccer coach promises to buy ice cream from an ice cream truck for each member of her soccer team. Ice creams are $.55 each. Will a ten dollar bill be enough for ice cream for everyone?

Samantha is having a birthday party and wants to give each guest a bag of favors. Each bag of favors will cost about $3.75. If she invites six guests, will $20.00 be enough money?

A class of twenty students has decided to have a pizza party. Each large pizza costs $12.99. How many pizzas should they buy, and how much money will each student need to contribute?

Harold is curious as to how many steps he has to take to walk a mile. What do you think?

What portion of a mile is a hundred yard dash?

How long would it take to walk to school if the school were half a mile from your house?

Four friends sharea pizza which is cut into eight slices. One person eats two slices; three people eat one slice each. What fraction of the pizza is gone?

A bag holds twenty cookies. If you take one-half the cookies out of the bag and eat one-half of those, what fraction of the cookies will you have eaten?

There are fifty M&Ms in a bag. One-fifth of them are green. How many M&Ms are are not green?

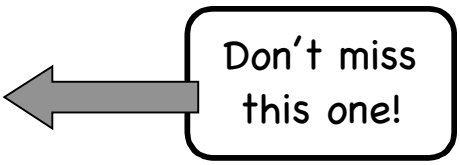
Giant Story Problems: Visualizing the Language of Math
Resources and Suggested Reading

On the Web

TED talk: Dan Meyer
Math Class Needs a Makeover
http://www.ted.com/talks/dan_meyer_math_curriculum_makeover.html

Dy/Dan (blog)
Unnatural Currents- http://blog.mrmeyer.com/?p=7728

Sir Ken Robinson: Changing Education Paradigms
http://www.youtube.com/watch?v=zDZFcDGpL4U



10 Ways to Create a Culture of Thinking (blog)
http://whatedsaid.wordpress.com/2010/07/20/10-ways-to-create-a-culture-of-thinking/

Arnold Zwicky's Blog: A blog mostly about language
http://arnoldzwicky.wordpress.com/2010/07/31/data-points-n-ellipsis-ambiguity-73110/

Learning to Think Mathematically: Problem Solving, Megacognition, and Sense-Making in Mathematics
Alan H. Schoenfeld, et al:
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.87.7976&rep=rep1&type=pdf

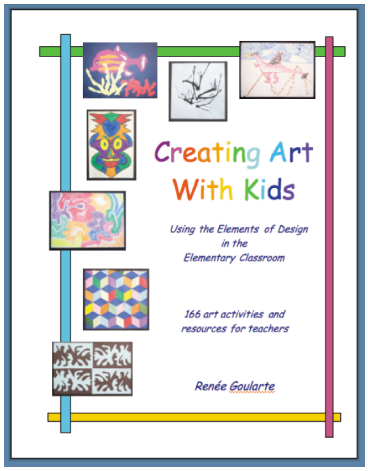
Visual Literacy K-8
http://k-8visual.info/

Visual Literacy in Teaching and Learning: A Literature Perspective
Suzanne Stokes
http://ejite.isu.edu/Volume1No1/Stokes.html

Books

Talking, Drawing, Writing: Lessons for Our Youngest Writers
Martha Horn and Mary Ellen Giacobbe. 2007. Stenhouse Publishers

Math is Language Too: Talking and Writing in the Mathematics Classroom.
Whitin Phyllis, and David J. Whitin. 2000. National Council of Teachers of English and National Council of Teachers of Mathematics.



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workshop ____ Internet ____ friend or colleague ____

other: _____