Effective Questioning and Classroom Discourse

Presented by

Karen Hardin

CAMT 2015

To question well is to teach well.
In the skillful use of questions,
more than anything else,
lies the fine art of teaching.

Earnst Sachs


29 x 25


What real world situation could this represent?


What is 29 x 25?


No use of paper and please!

How did you solve the problem?

Mathematical Process Standards

1. **Apply mathematics to problems** arising in everyday life, society and the workplace.

2. Use problem solving model that incorporates **analyzing** given information, **formulating** a plan or strategy, **determining** a solution, **justifying** the solution and **evaluating** the problem solving process.

3. **Select tools** such as real objects, manipulative, paper pencil and technology or techniques such as mental math, estimation and number sense to problems.

4. **Communicate mathematical ideas, reasoning** and their implications using symbols, diagrams, graphs and language.

5. **Create and use representations** to recognize, record and communicate mathematical ideas.

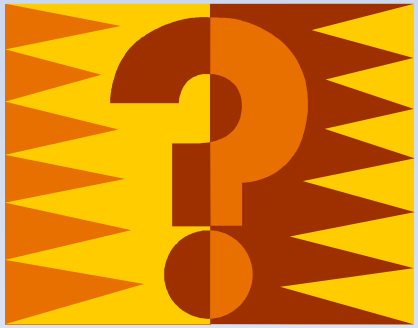
6. **Analyze** mathematical relationships to connect and communicate mathematical ideas.

7. **Display, explain or justify mathematical ideas** or arguments using **precise mathematical language** in written and oral communications.

Research shows classroom teachers spend anywhere from 35% to 50% of their instructional time conducting questioning sessions.

Kathleen Cotton. “Classroom Questioning.”
North West Regional Educational Laboratory.

What is the BEST question you have asked in your classroom?



Research shows 75% of the questions teachers ask are of a factual or literal nature.

The Art of Inquiry

Nancy Lee Cecil

While questions which elicit lower level thinking are an important part of teaching, they are useless unless they build toward questions which help kids develop higher order thinking skills.

Benjamin Bloom

Why do teachers ask questions in the classroom?

The Art of Questioning in Mathematics

NCTM Professional Standards

The Art of Questioning in Mathematics

NCTM Professional Standards

Help students work together to make sense of mathematics

Help students rely more on themselves to determine whether something is mathematically correct

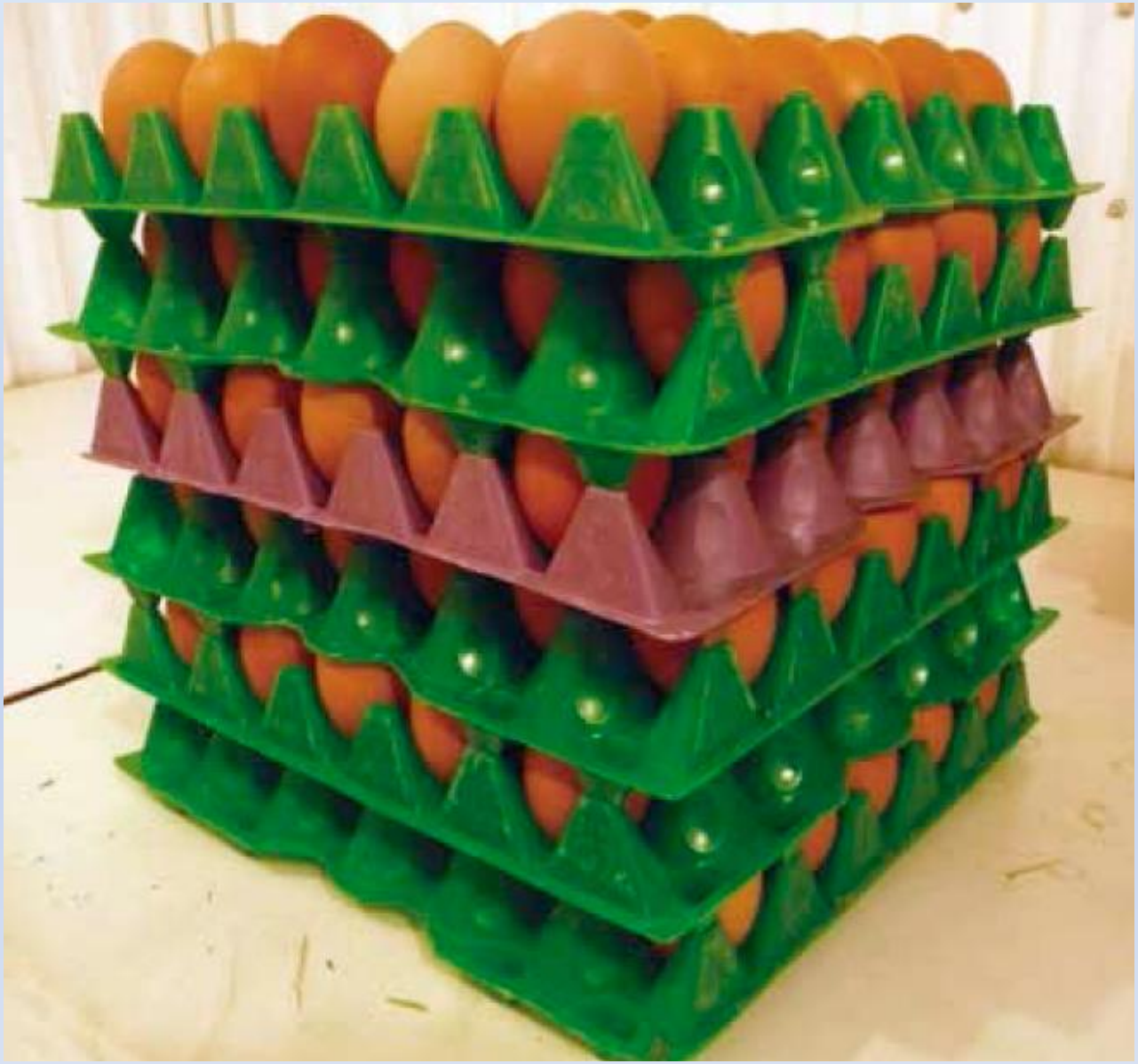
Help students learn to reason mathematically

Help students learn to conjecture, invent, and solve problems

Help students to connect mathematics, its ideas, and its applications

Eggsactly How Many?

I have a friend who buys his eggs directly from a farm. One day, he walked into the barn where the eggs are sold, and this is what he saw.



What questions do you think popped into his head?

NCTM
Teaching Children Mathematics
May 2015

Productive Talk Moves

1. Revoicing

"So you're saying that it's an odd number?

2. Restate someone else's reasoning

"Can you repeat what Joe just said in your own words?"

3. Apply their own reasoning to someone else's reasoning

"Do you agree or disagree? Why?"

4. Prompt students for further participation

"Would someone like to add on?"

5. Use Wait Time

"Take your time. We'll wait"

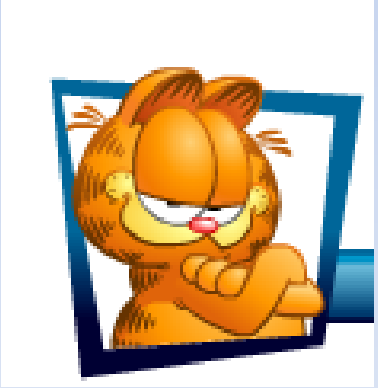
Classroom Discussions: Using Math Talk to Help Students Learn
Chapin, O'Connor, Anderson

Wait Time

Some call it laziness.

I call it deep thought.

Garfield



What are the Benefits of Silence?

For the students

- More meaningful answers
- Improved accuracy
- Improved length
- Fewer ‘no answers’

For the teachers

- Higher order questions
- Precise formulation of questions
- Varied and flexible questions
- Convey teachers’ attentiveness

Implementing Effective Discourse

- **Clarify Students' Ideas**
  - "You used the red trapezoid as your whole?"
  - "So, first you recorded your measurement in a table?"
  - "What parts of your drawing relate to the numbers from the story problem?"
  - "Who can share what Ricardo just said, but using your own words?"

Teaching Student-Centered Mathematics
John A. Van de Walle

Implementing Effective Discourse

- **Emphasize Reasoning**
  - "Why does it make sense to start with that particular number?"
  - "Explain how you know that your answer is correct."
  - "Can you give an example?"
  - "Do you see a connection between Julio's idea and Rhonda's idea?"
  - "Do you agree or disagree with Johanna? Why?"

Teaching Student-Centered Mathematics
John A. Van de Walle

Implementing Effective Discourse

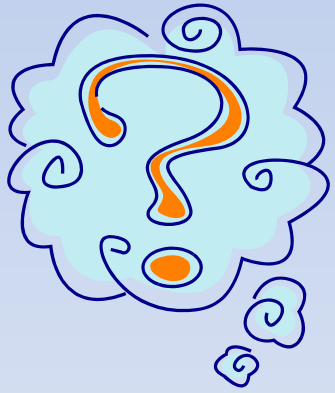
- **Encourage Student-Student Dialogue**
  - "Who has a question for Vivian?"
  - "Turn to your partner and explain why you agree or disagree with Edwin."
  - "Talk with Yerin about how your strategy relates to hers."

Teaching Student-Centered Mathematics
John A. Van de Walle

Every Day Counts Calendar Math©

A prudent question is one-half of wisdom.

Francis Bacon



Strategically timing when to ask specific questions

Before beginning a new unit: discover and honor what students already know and to create excitement about what is coming next.

During learning: encourage students to engage with one another, which can lead to more questions

End of a class period: help students synthesize what they have learned

The Curious Classroom: Answers About Questions

Catherine Rubin

Teaching Children Mathematics

Focus Issue: The Value of "WHY?"

Bees have 4 wings, and flies have 2 wings. There are some bees and some flies in a room. There are 24 wings in all. How many bees and flies could there be?

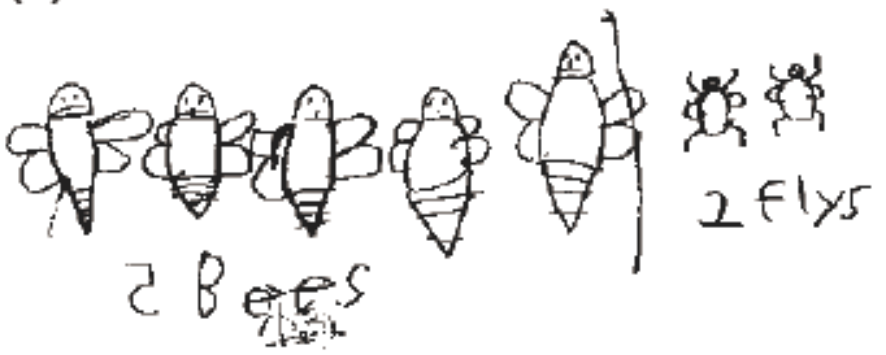
Do you have all the combinations?

How do you know?

FIGURE 1

(a)

(b)



I count by 2s

FIGURE 2

(a)

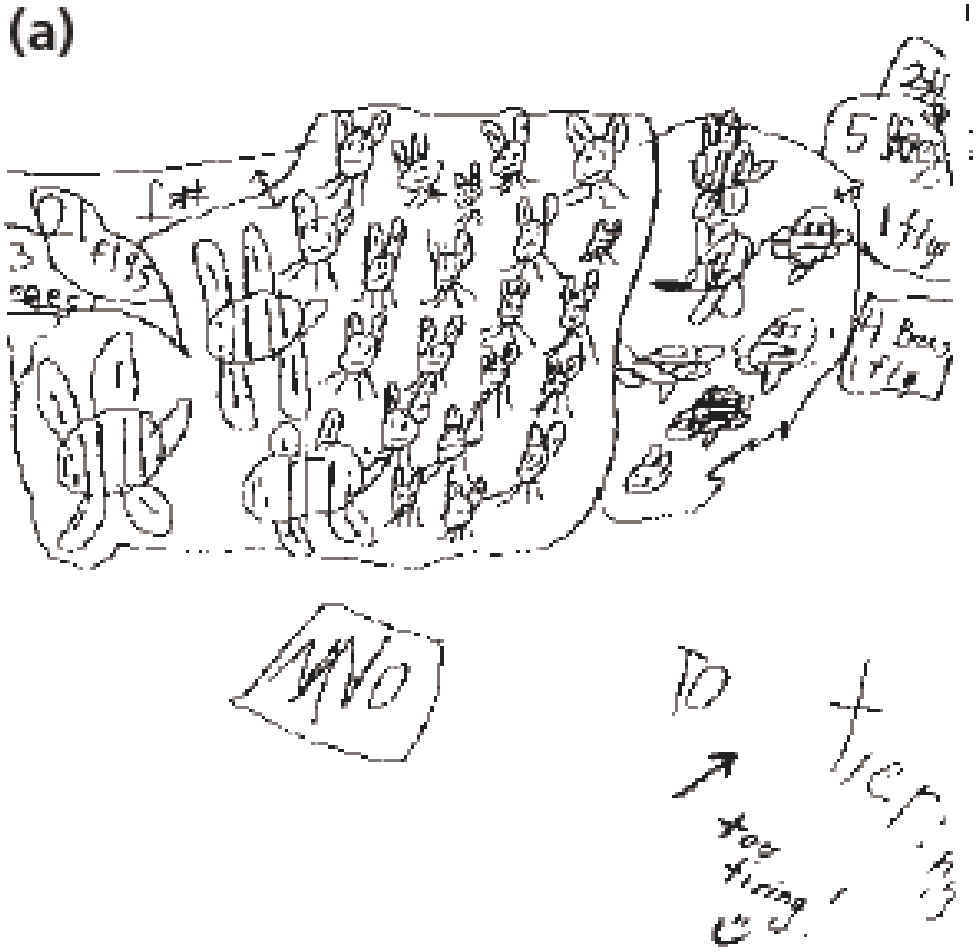
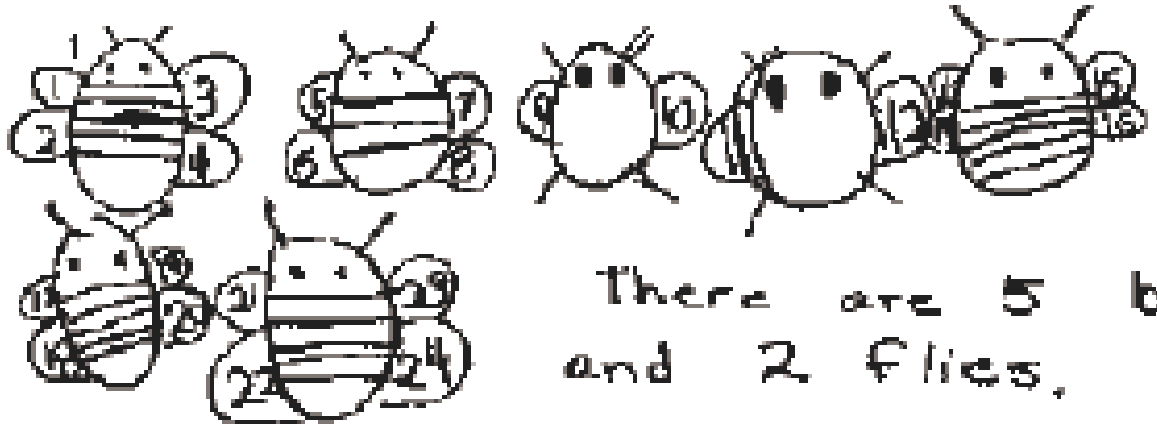


FIGURE 2

(b)

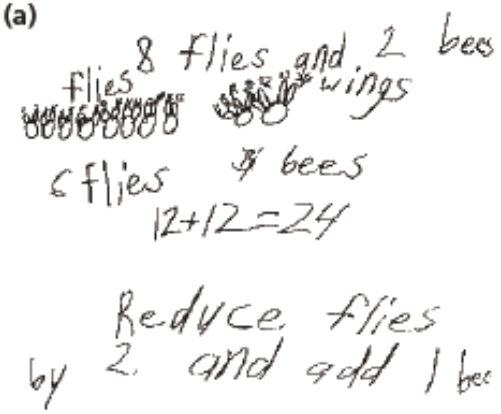


There are 5 bees and 2 flies.

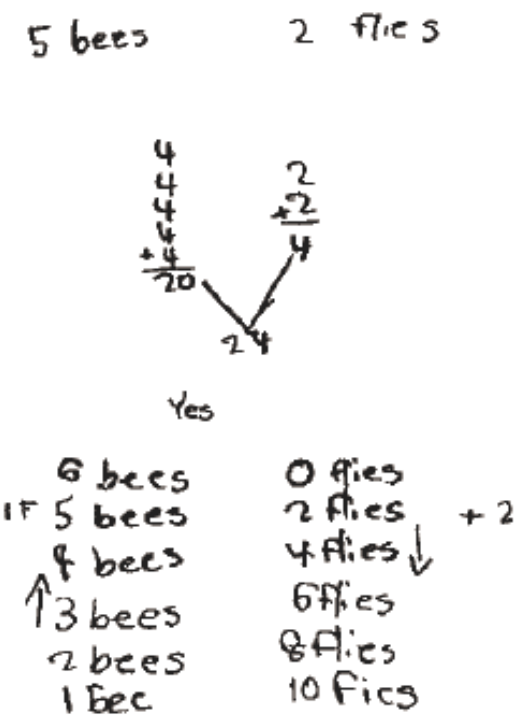
No, because there could be more flies or more bees.

FIGURE 3

(a)


8 flies and 2 bees
flies
wings
6 flies
4 bees
12+12=24
Reduce flies
by 2 and add 1 bee

(b)


5 bees
2 flies
4+4+4+4+4=20
2+2=4
24
Yes
6 bees
IF 5 bees
4 bees
3 bees
2 bees
1 bee
0 flies
2 flies
4 flies
6 flies
8 flies
10 flies
+2

Open Questions

The answer is 5. What is the question?

Why is 0 a special number?

Good Questions: Great Ways to Differentiate Mathematics Instruction by Marian Small

To question well is to teach well.

1860 edition of Barnard's
American Journal of Instruction