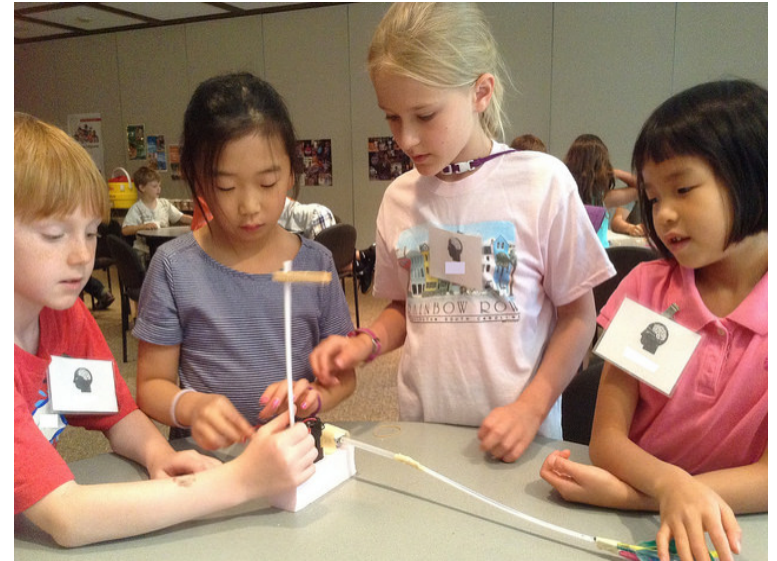


Developing Thinkers, Not Answer Finders



<https://www.flickr.com/photos/thebakkenmuseum/>

Problem Solvers, not Performers



- Estimating quantities



- Noticing similarities and differences



- Counting in many ways

The Power of Estimating

About how many
cheeseballs do you
think are in this
container?



ESTIMATION180.com

<http://www.estimate180.com/day-209.html>

The Power of Estimating

What's an estimate that is too high?



ESTIMATION180.com

<http://www.estimate180.com/day-209.html>

The Power of Estimating

What's an estimate that is too high? Is that a little too high or a lot too high?



ESTIMATION180.com

<http://www.estimate180.com/day-209.html>

The Power of Estimating

What's an estimate that is too high? Is that a little too high or a lot too high?

Too low?



The Power of Estimating

What's an estimate that is too high? Is that a little too high or a lot too high?

Too low? A little too low or a lot too low?



The Power of Estimating

Now that we've decided there are more than _____ cheeseballs and less than _____ cheeseballs, let's see how many there are...

Watch it at:

<http://www. estimation180.com/day-209.html>



<http://www. estimation180.com/day-209.html>

The Power of Estimating

- Applicable to real-life
- Reinforces that sometimes *close enough* is *right*.
- Can be done in almost any situation.



Tips for Building Good Estimators

- **DON'T** judge the estimate. Let them be wrong.
- **DO** ask and encourage questions and revisions.
- **DO** estimate frequently and in varied situations.



The Power of Noticing



Young children's ability to spot patterns can predict later mathematical achievement, more than other abilities such as counting.

– Rittle-Johnson et al, 2016

We live in a universe of patterns.
Mathematics is the study of patterns.

– Merliyn Buchanan, 2011

The Power of Noticing

Why
Doesn't
It
Belong
?



Adapted from <http://woddb.ca/>

Tips for Building Noticing Skills



- **DO** ask and encourage questions.
- **DO** ask, “What else?”
- **DON’T** value one “noticing” as better than another.

Opening Up “How Many?”



<https://www.stenhouse.com/content/how-many>

Opening Up “How Many?”



If I asked you the question, “How many?” about this image, what would you think I meant?

Opening Up “How Many?”



If I asked you the question, “How many?” about this image, what would you think I meant?

What else could I mean besides, “How many dice?”

Opening Up “How Many?”



How many...

...dice?

...red dice?

...white dice

...dots?

...1s?

...3s?

...black dots?

...white dots?

Tips for Opening Up Thinking



- **DO** ask, “What else?”
- **DO** ask, “How did you get that?”
- **DO** ask, “What’s another way to count how many?”
- **DON’T** limit answers/methods.