Early Mathematics: How Do We Measure Up?

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Welcome

- Use the Grid paper at your table to write one letter of your first name in each block. Cut or fold to size.
- Compare your name to others at your table.
- Order yourselves from shortest to longest

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Measuring Up 2

- In your table clusters, line up in order of height, from shortest to tallest –**without talking!!**
- How might the order be different from the one you did to compare length of names?

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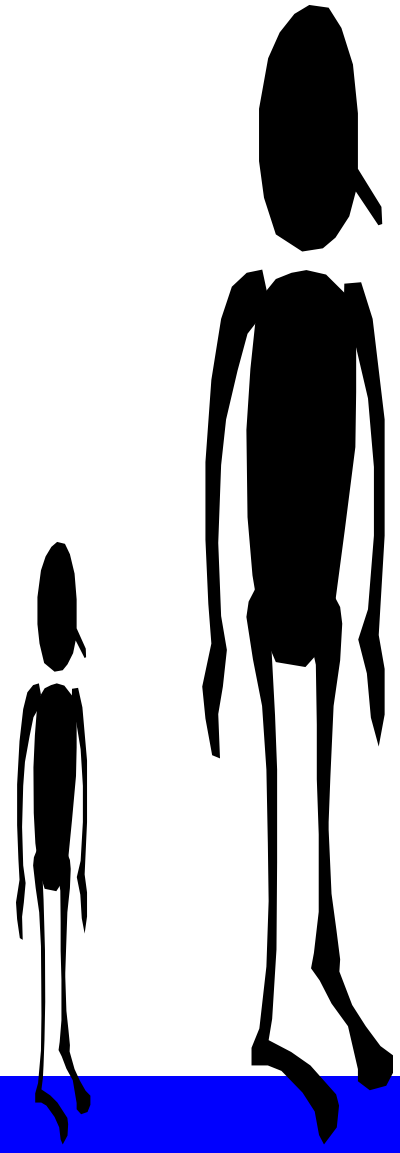
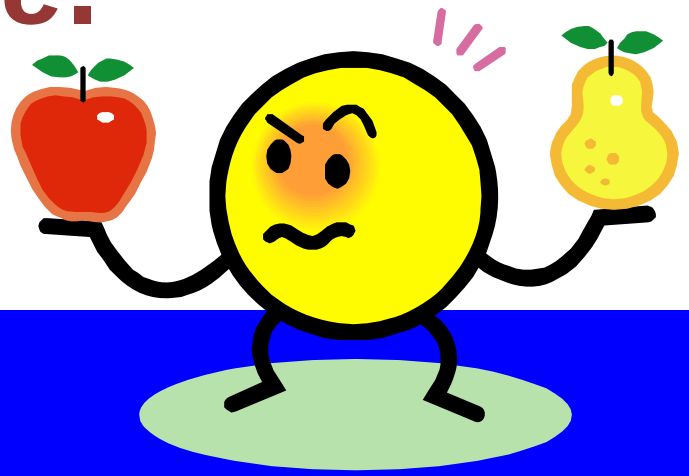
Measuring Up 2b

- Send the tallest person from your group to the front.
- Tallest order themselves from **tallest-tallest** to **shortest -tallest**.
- What thoughts do you have now about measurement?



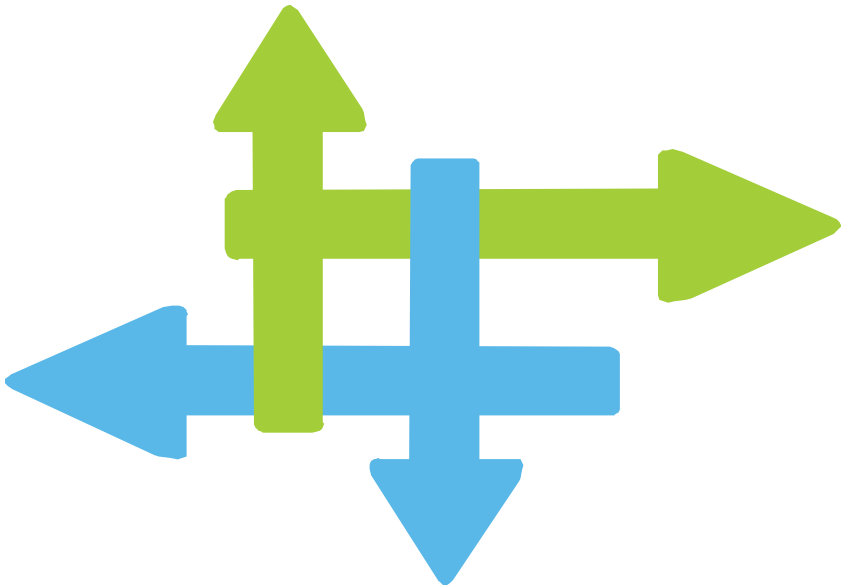
What's A Big Idea about Measurement?

All Measurement involves a *comparison* made in reference to a specified *attribute*.



What's Bigger?
Depends on what is being compared.

a) What attribute is being compared:
What kind of bigger is it?



What's Bigger?
Depends on what is being compared.

b) If we change the *attribute* OR the *objects* that are being compared, the answer may change.

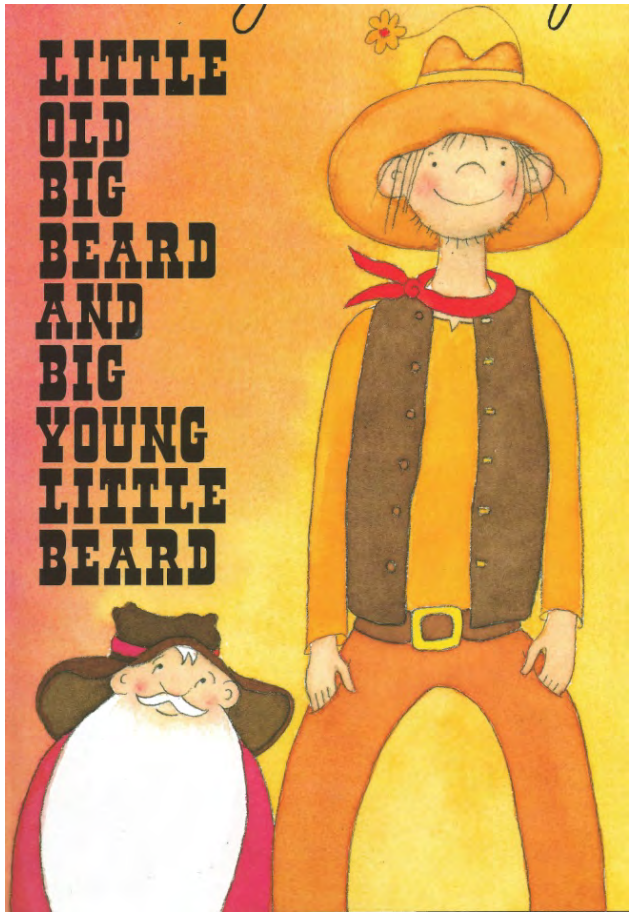
If A is bigger than B but smaller than C, How will A, B, and C compare?

When comparisons are made, it's another story.

The relationship between the terms being compared changes:

Something that is **big** in one comparison can be **little** when a different comparison is being made.

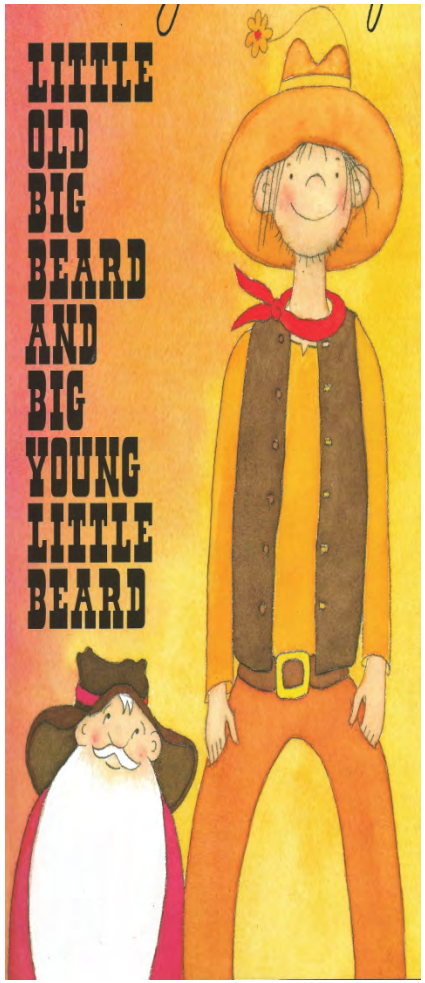
These cowboys' names are not *comparisons*—they are *descriptions*



LITTLE BEARD WAS CALLED
LITTLE BEARD
BECAUSE HE HAD
A LITTLE BEARD
ON HIS FACE.

BIG BEARD WAS CALLED
BIG BEARD
BECAUSE HE HAD
A BIG BEARD
ON HIS FACE.

Expressing relationships can get Confusing!!



LITTLE BEARD WAS BIG,
MUCH BIGGER
THAN BIG BEARD.

BIG BEARD WAS LITTLE,
MUCH LITTLER
THAN LITTLE BEARD.

LITTLE BEARD WAS YOUNG,
MUCH YOUNGER
THAN BIG BEARD.

BIG BEARD WAS OLD,
MUCH OLDER
THAN LITTLE BEARD.

OLD BIG BEARD WAS LITTLE
AND YOUNG LITTLE BEARD
WAS BIG.

If we want children to learn
We must Teach MATHEMATICS

We must teach for Meaning
Not test for Mastery

We must guide children to
explore the
Big Ideas
That inform Skills

SIP principle

Quality Learning

and Play

Both involve

Satisfying

Intentional

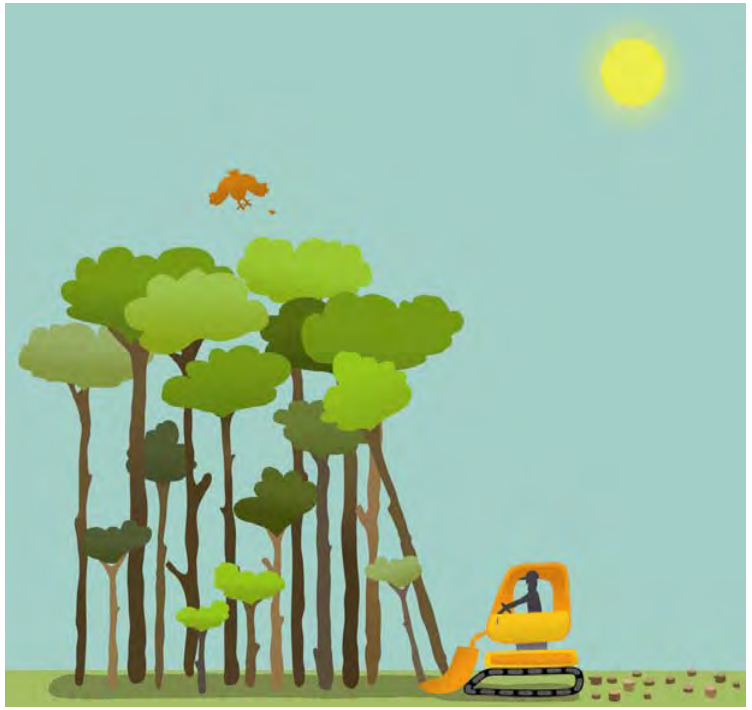
Problem-Solving

What's the Problem?

Officials are threatening to cut down trees near PS 58 school to make room for a parking lot.

Children in the school next door are upset.

Many classrooms have "adopted" a tree they visit throughout the school year.



They and their teachers decide to make “tree bracelets” as part of their campaign to save the trees.

Ms. Ritzko has a friend who can supply leather and cut it to make bracelets for the trees.

But he does not want to waste any material.

How might we use a another material to measure what length the leather strip needs to be to fit snugly around the tree?

Groups will work together to measure 3 trees:
Maple, birch, and sycamore.

- **At least 2 people in your group will measure each tree *girth*:**
  - **1 will use the paper tape**
  - **1 will use one of the other materials (yarn, ribbon,…)**
  - **Remember which tree you've measured**

Arrange the belts made by your group in order, from longest to shortest.

What do you notice?

- **Are the two belts for a tree (such as the maple) exactly the same?**

- **Compare the order of your belts with another group. Did they get the same ordering?**

Reflecting on Big Ideas and Skills in doing Measurement

Big Idea: All measurements are comparisons: the comparison may be direct or indirect.

Related Skills: Good choices about whether to use direct or indirect comparison depend on the context:

- **What is being measured?**
- **What is "good enough?"**

Big Idea: Measurements must be "fair."

Related Skills:

The same attribute must be compared.
[Establish *What Kind of Bigger* is it?]

Protocols such as using the same baseline must be observed.

Indirect comparisons must compare using the same unit.

What's the Problem?

Ms Ritzko's friend needs to know exactly what size the different bracelets will be so he plan how to make the cuts.

Often the measurement question of

What's Bigger? leads us to wonder

How Much Bigger is it?

What's the Problem?

In pairs or trios, use the post-it notes to mark one of the paper tapes into a tape measure.

Use the rulers to determine how much longer the longest and next longest tree bracelets are than the shortest one.

Reflecting on Big Ideas and Skills in doing Measurement

Big Idea: Quantifying a measurement helps us to specify and compare *How much/ how many more?* This calls for an *indirect comparison* using units. The units may be arbitrary or conventional.

- **Related Skills:** Making a good choice about whether to use arbitrary or conventional units, depending on the context, including

  - The need for precision

  - Issues of communicating the results to others.

- **Related Skills:**
- Small units may be lined up against two items to be compared and then counted to determine the difference in the totals. Care must be taken to make the measurement fair.

- A **measurement tool** may be marked off in unit increments and the result is expressed by naming **the number of units** and the dimension being measured.

Reflecting on Big Ideas and Skills in doing Measurement

Big Idea: Indirect measurements involve identifying a suitable unit and choosing a tool that will yield a "good enough" result, although no measurement is ever absolutely precise.

Related Skills:

Choosing a unit that is appropriate, given the nature of the problem situation:

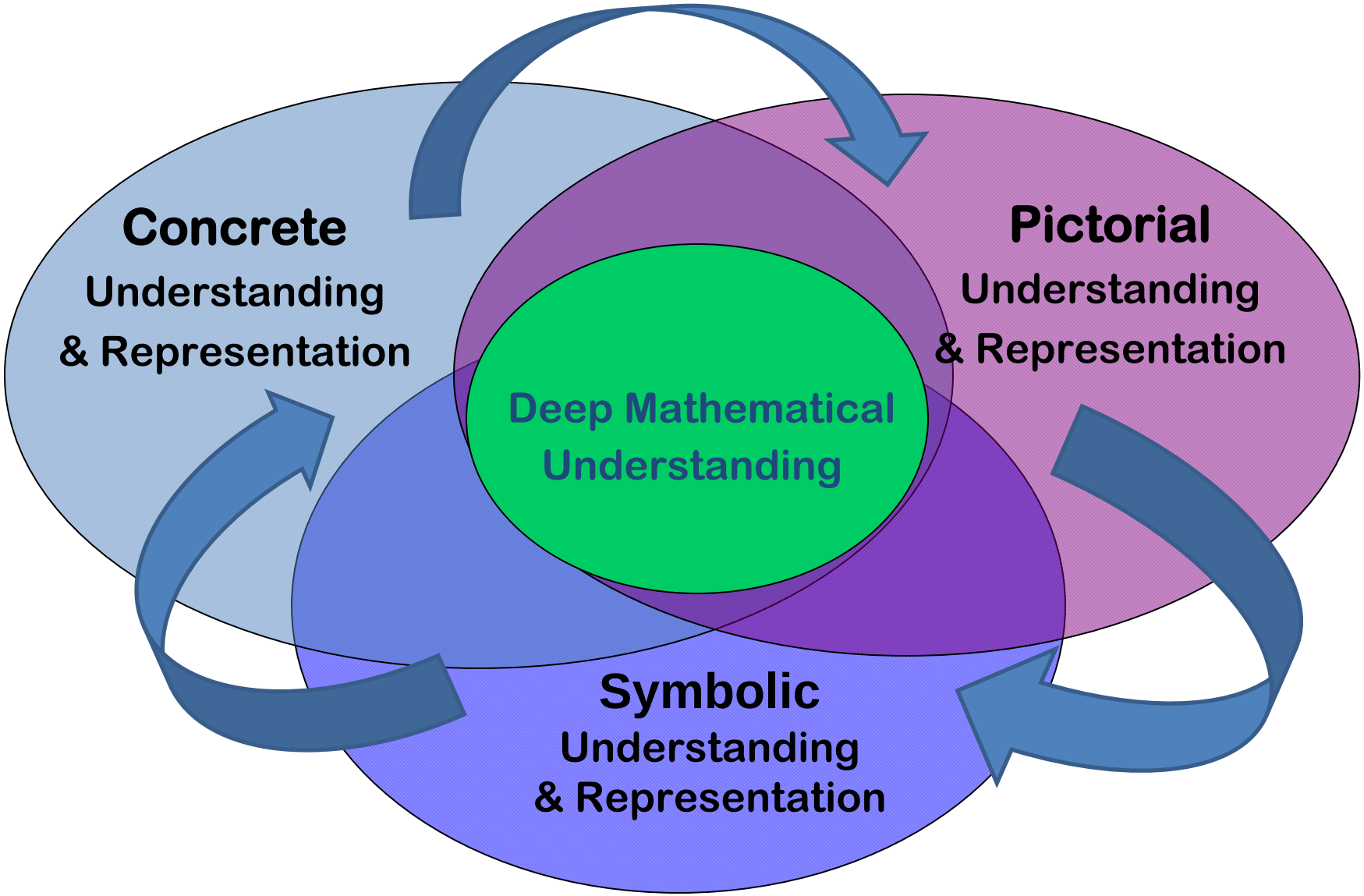
In Math Curse, by Jon Sciezka, a problem calls for measuring the length of the Mississippi River in m&ms—not a great idea!!

Making informed decisions about the measurement tool best suited to the given problem situation.

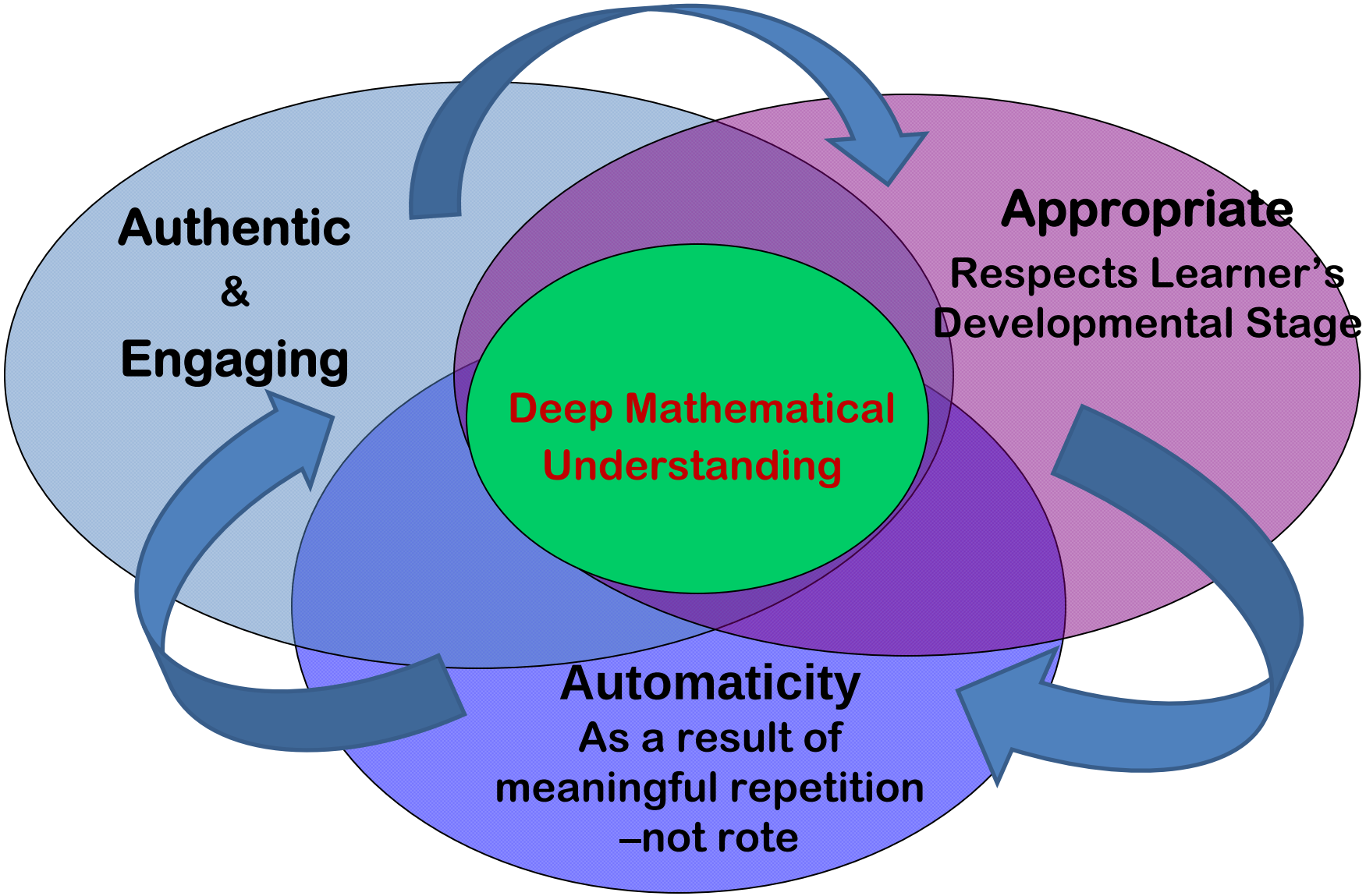
Using measurement tools skilfully.

Reflecting on Practice Measurement & Big Ideas about Teaching and Learning Foundational Mathematics

C-P-S Principle is dynamic



Learning by Heart



- No measurement is exact
- The larger the unit, the smaller the number of units needed; the smaller the unit, the larger the number of units
- Conventional units (inches, centimeters, lbs,liters etc) are useful in communicating measurements but many math all around us measurement problems can be done using arbitrary units
- Expression of indirect comparisons must include the unit and the number of units
- Indirect comparisons involve units
- Indirect comparisons allow us to make measurements that would be difficult to do directly
- To be fair, the measurement must follow certain rules, such as establishing a baseline
- To be fair, a measurement must involve a comparison between two things in reference to the same attribute (*What kind of bigger is it?)*
- Direct comparisons can be seen
- All measurement involves comparison

Points on the landscape of learning about measurement

The Last Word

What Young Children Think About Measurement

From *Wally's Story* by Vivian Paley