Early Mathematics: What's a Big Idea ?

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Welcome!

- My Grandpa is a funny guy.

He always tells people,

When I look around my house,

I can count

14 feet and 2 tails.

- Turn & Talk with a few partners:

Who's Grandpa counting?

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.***

The Essential ABCs

Always Be Conversing

Always Be Connecting

Always Build Competence

Number is Complex!

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A Big Idea About Number

Quantity (numerosity) is an attribute of a set of objects; we use numbers to name specific quantities.

Here's a Big Idea Problem: Naked Numbers look like Nouns

There is no such ***thing*** as ***3*** –
or any other number!

You can't find 3 in the world like a ball;
you have to construct the ***idea of 3*** in your head.

Number is an **ATTRIBUTE** of sets –
used to describe the group,
not an object in the group.

In math, this attribute is called ***NUMEROSITY***.

Children need many opportunities to develop the understanding that no matter how they are arranged or how sizes compare,

3 things are always 3 things.

Counting has plenty
of its own complexities.

Rote Counting Skills
don't count for much

Rational Counting
calls for
UNDERSTANDING

Rational Counting:
Stable Order Principle (Big Idea)

Each number represents a quantity one more than the number before it and one less than the number after it.

Stable Order Principle: What learning looks like (skills)

- **Mastery of the number name sequence used by culture**
- **Can count up from given number**
- **Can count down from given number**

Video Analysis:
Oral Counting

- What do these children know about counting?
- What counting skills have these children mastered?
- How can you tell?

Rational Counting:
1-to-1 Correspondence Principle
(Big Idea)

Each item in a collection
must be counted
once and only once.

1-to-1 Correspondence Principle: What learning looks like (skill)

One number is named
for each object pointed at.

Rational Counting:
Order Irrelevance Principle (Big Idea)

It doesn't matter in which order items are counted.

Order Irrelevance Principle: What learning looks like (skill)

To assure accuracy of counting,
some system is used
such as lining up,
pushing away
or somehow noting each item
as it is counted.

Rational Counting:
Cardinality Principle (Big Idea)

The last number name used
names the quantity
of objects in the set.

Cardinality Principle: What learning looks like (skills)

- When asked, “How many altogether?” names the last number (without re-counting).
- When given a story problem, can model the count, using manipulatives, drawings & words.

Video Analysis:
Finding an Unknown

- What skills has this child mastered?
- What beliefs does this child seem to have about doing math?
- What Big Ideas does this child seem to understand?
- How can you tell?

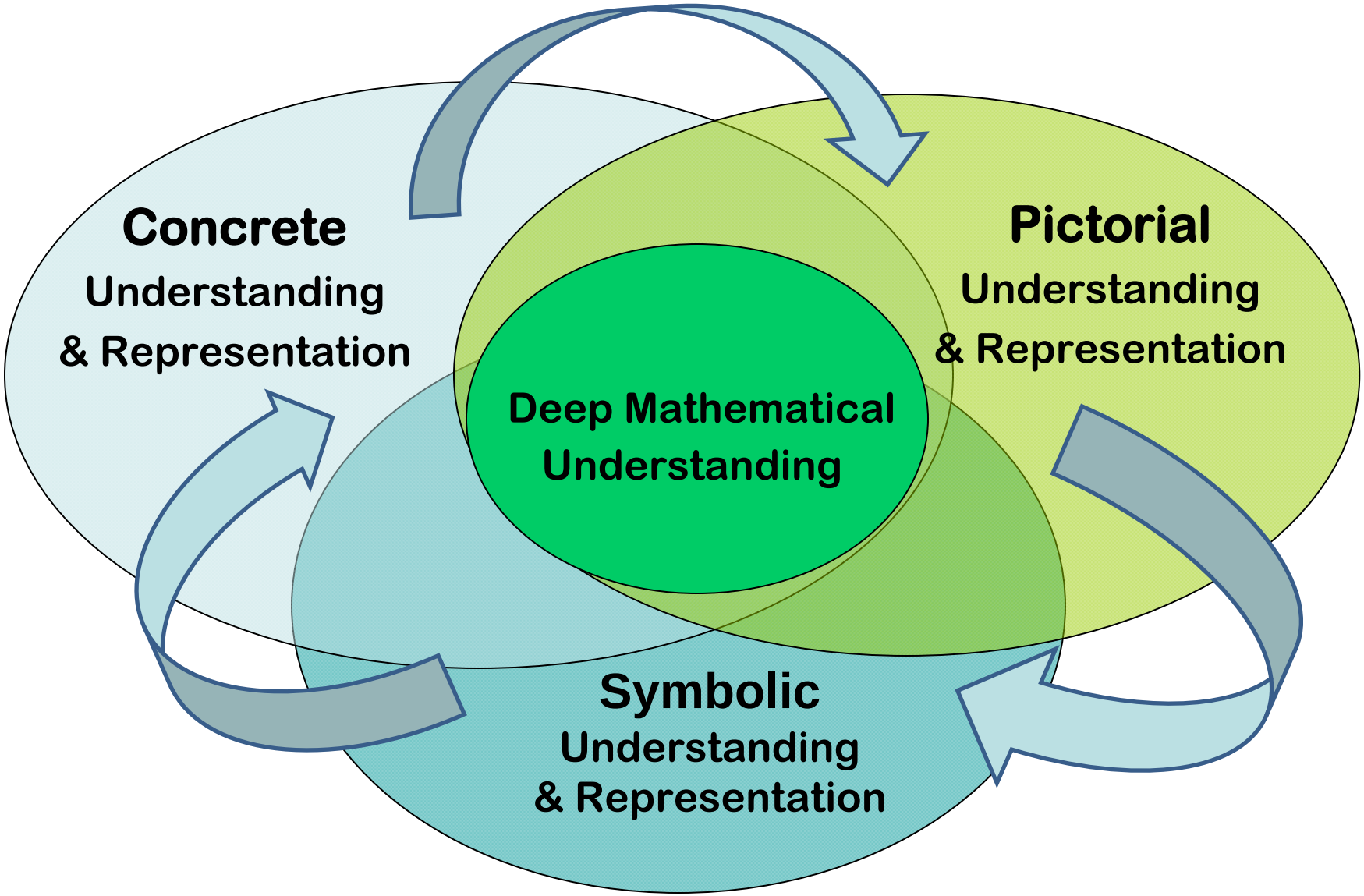
The C-P-S principle: Understanding…

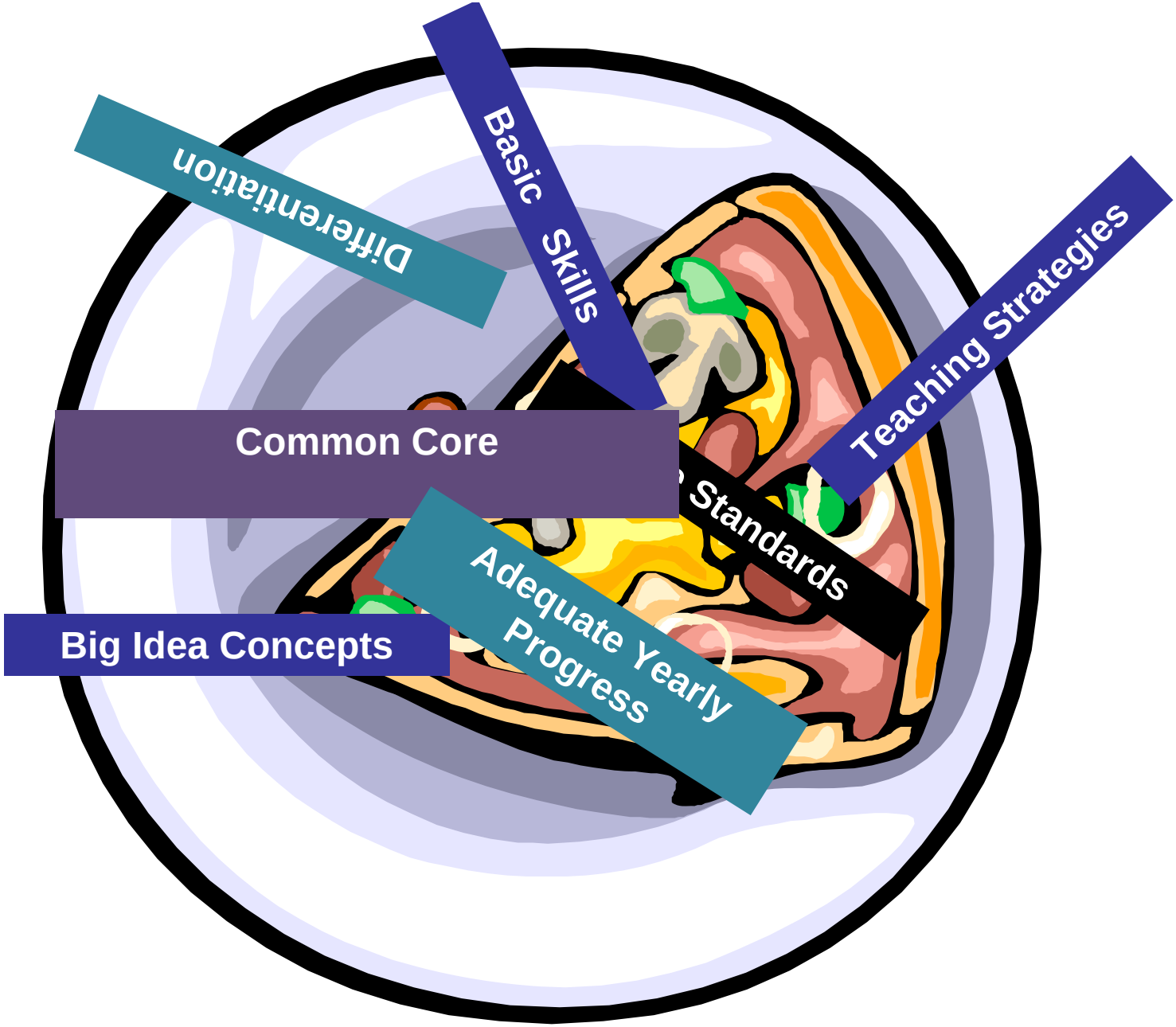
Starts with the **Concrete** (hands-on experience) - putting one cup with one plate for each person at a table, touching each item as we count, or stacking two piles of blocks to make one "bigger" - taller - than the other.

Moves into the **Pictorial** - the child can look at (or create) pictures or tally marks and know how to count or compare sizes visually, without actually having hands-on proof.

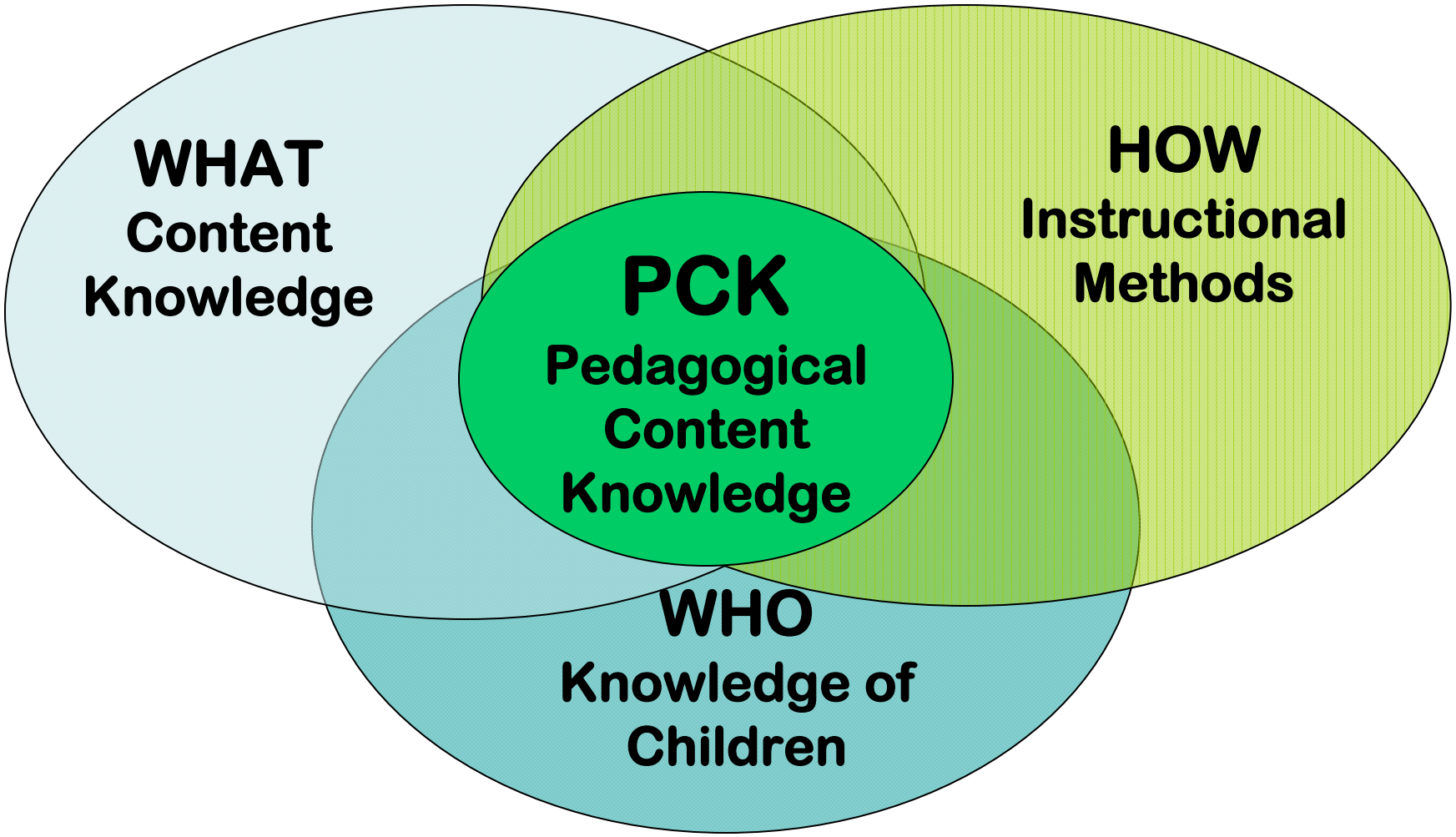
And finally progresses to the **Symbolic** - the child knows that number word *five* and numeral *5* stand for 1,2,3, 4, 5 items.

C-P-S Principle is dynamic




Differentiation
Basic Skills
Teaching Strategies
Common Core
Standards
Adequate Yearly Progress
Big Idea Concepts

Early Mathematics Teaching

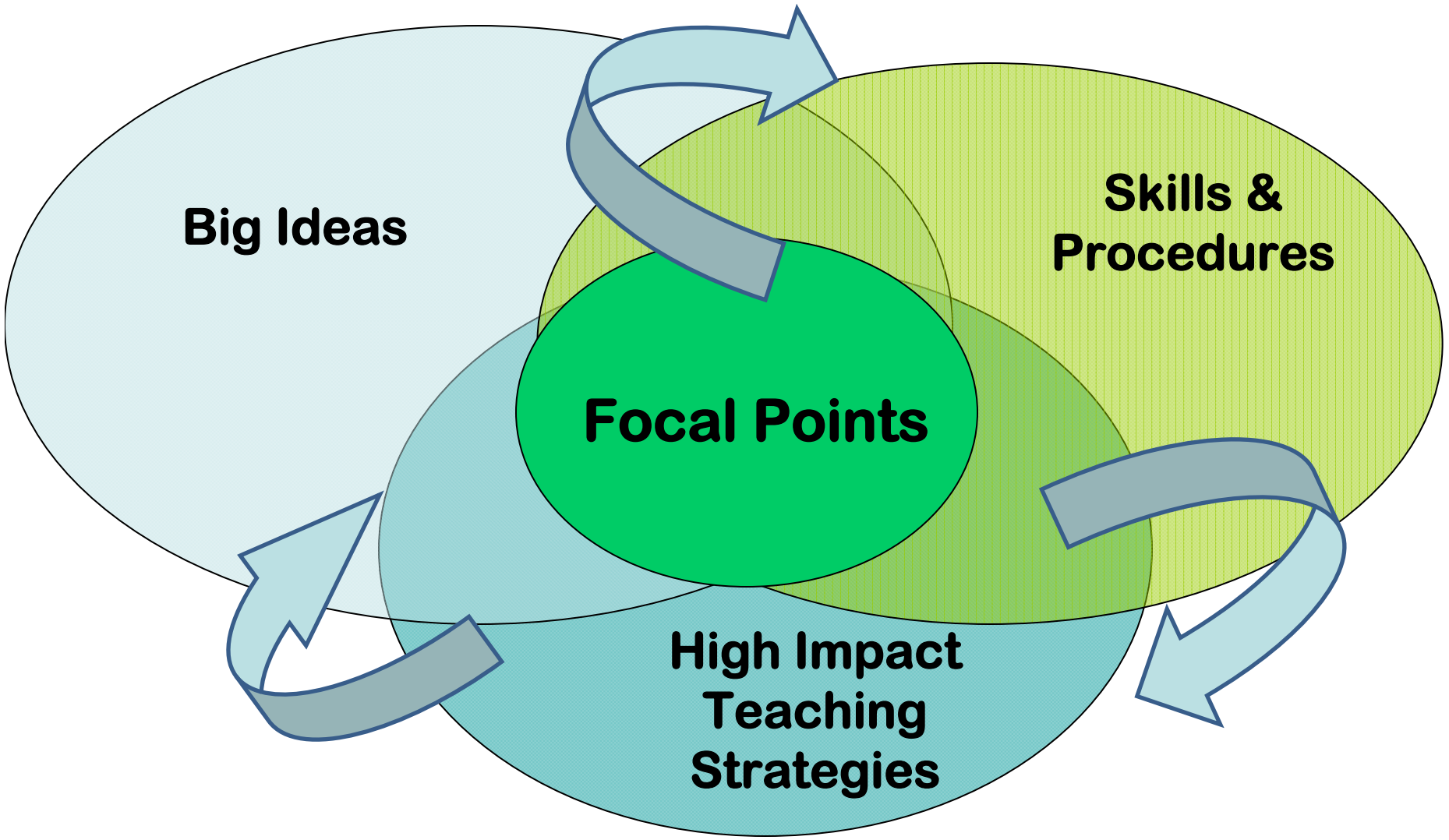


Shulman, 1986, 1987

From Common Core Intro:

- **These Standards define what students should understand and be able to do in their study of mathematics.**
- **Asking a student to understand something means asking a teacher to assess whether the student has understood it.**
- **But what does mathematical understanding look like? One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student's mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from.**

Teaching for Understanding is Dynamic



Big Ideas & Skills: Number Sense

Topic	Big Ideas	Skills and Procedures
Numerosity	● ***Quantity (numerosity) is an attribute of a set of objects; we use numbers to name specific quantities***	•**Pre-Emergent Number Sense:** Confuses the different uses of number; can sense quantities of 3-5 things but considers larger collections as "many," •**Emerging Number Sense**: Can compose and decompose sets of 10 and less and up to 20: Understands hierarchical inclusion in these quantities. •**Developing Number Sense**: Can compose and decompose larger numbers - up to 100 by end of first grade.
Counting	● Rational counting, that is counting with meaning rather than rote recitation of numbers, involves 4 principles ○ **Stable Order** ○ **One to One Correspondence** ○ **Order Irrelevance** ○ **Cardinality**	●The 4 principles of rational counting tend to emerge in the order given. ●The 4 principles are first mastered for smaller amounts (1-10) and with experience and cognitive development extended to increasingly larger numbers.

How do the Big Ideas help teachers?

Understanding the Big Ideas of early math develops teachers' adaptive expertise in teaching & learning foundational mathematics with their young students.

- Big Ideas help teachers focus & clarify their goals for children's learning.
- Big Ideas help teachers be more flexible & responsive concerning how children are actually thinking about & doing math in their classrooms.

Thank you for coming!

Feel free to contact us with questions.

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