



It Makes Sense

Using the Rekenrek to Build Number Sense

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Number Sense is

....good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms.

Hilde Howden, 1989



Number Sense

- Spatial relationships or subitizing.
- One More or Less
- Benchmarks 5 & 10; how it relates to 5 and 10
- Part/part-whole; how a whole can be broken into parts



Van de Walle, J., A., Lovin, L., H., (2006), *Teaching Student Centered Mathematics*
K - 3, Boston Pearson Education



Fluency Standards

Kinder: K.OA.5
Fluently add & subtract within 5

1st grade: 1.OA.6
Demonstrate fluency for addition & subtraction within 10

2nd grade: 2.OA.2
Fluently add & subtract within 20 using mental strategies




Structuring Numbers

"Through inquiry and discussion, the teacher draws attention to part-whole constructions, working with numbers as parts of other numbers and to relational thinking, making relationships between numbers.

The instructional settings enable students to reason.

As facility develops, the students are weaned off the settings towards solving verbal and written tasks."

Robert Wright, David Ellemor-Collins, Pamela Tabor, 2012




Building Strategies

1. Engage in numerical reasoning to build number knowledge:

- Students will think, reason and communicate about numbers.


2. Develop fluency based on numerical sense:

- Students will move away from counting to using strategies for addition and subtraction, which rely on grouping




Our Rules for Teaching Number Sense

- Students are reasoning, the teacher is not explaining
- Engage student in discourse through classroom discussions and partner talk in which they explain their reasoning
- Provide a context to connect mathematics to the real world
- Plan for moving away from models and toward more symbolic




Sequence of Instruction

- Introduce the rekenrek
- Making & Reading Numbers
- Quick Images: using mental imagery to imagine numbers and then describe number
- Add and subtract
 - parts/whole
 - Related to 5
 - Related to 10



Making Numbers

- Make 7. What does 7 look like?
- Make 9. How do you know you made 9?
- Put 6 on the top and 5 on the bottom. How many? How do you know?
- Make 8...
...in one push. ...on two bars. What do you notice?
- Make 16, and this time use 2 pushes. How do you know it is 16?



Number and Operations in Base Ten K-NBT

Work with numbers 11 – 19 to gain foundations for place value.

● K-NBT 1. Compose and decompose numbers from 11 – 19 into tens and some further ones: by using objects and record each composition or decomposition by a drawing or equation; understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.



Number Sense is not something that adults can easily impose.

- Counting is a important phase
- Develops gradually from the big ideas of part-part-whole construction of numbers
- Opportunities to share, justify, discuss their strategies



Mental Strategies

- Counting on
- Making tens $9 + 7 = 9 + 1 + 6 = 10 + 6$
- Decomposing a number leading to a ten $14 - 6 = 14 - 4 - 2 = 10 - 2$
- Related Facts, using properties such as commutativity or fact families
- Doubles
- Doubles plus one
- Relationship between addition and subtraction, using the inverse operation
- Equivalent but easier or known sums



A Gradual Release of the Tool

1. Add the top and bottom number to make the total using mental imagery; **Quick Images**:
2. Addition and subtraction story problems; students **move the beads on the rekenrek**
3. Addition and subtraction story problems with students: **seeing the first number and not moving the beads**
4. Addition and subtraction **bare number** problems with a context, students imagine the rekenrek
5. Task posed in pure **symbolic notation**
...Pose written tasks $8 + 5$,





Without Focused Instruction

When instruction does not help or encourage children to construct concepts or look for patterns or relationships they will not invent reasoning strategies and thus continue to rely on counting strategies.

Arthur Baroody, 2006

Number sense instruction for fluency lays the foundation for all further learning in mathematics.

References

1. Principles to Actions, NCTM 2014.
2. Developing Numerical Fluency, Kanter, Leinwand, 2018.
3. Developing Number Knowledge, Wright, Ellemor-Collins, Tabor, 2012.
4. Children Learn Mathematics, editor; Marja van den Heuvel-Panhuizen, 2001.
5. "Why Children Have Difficulties Mastering the Basic Number Combinations and How to Help Them", Arthur J. Baroody, Teaching Children Mathematics, 2006
6. Elementary and Middle School Mathematics, John Van de Walle, 2001
