

Step Back and Let Them Think: Discovering Number Concepts Through Investigations and Math Talk

K-2

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What does it mean to be mathematically proficient?

A focus on:

- Conceptual understanding
- Computational fluency
- Application (problem solving)

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

These standards view mathematicians as thinkers, communicators, reasoners, and problem solvers.

How do we shift instruction?

- Step back and let them think.
- Give math a context.
- Make math visual.
- Get them talking.
- Watch and listen to students and adjust our teaching to meet their needs.

From *Math in Practice: Guide for Teachers* (Heinemann)

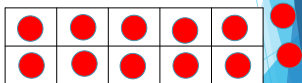
Sample K-2 Investigations

Math Topic: Understanding Teen Numbers

Read *Grandma's Tiny House* by JaNay Brown-Wood

What do you notice?

Show 14.

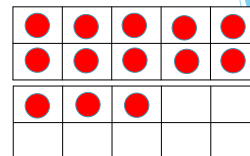


Record and discuss their findings.

Total Counters	On the ten frame	How many more?
14	10	4
15	10	5
12	10	2
17	10	7

What do you notice?
Tell your partner what you think 13 will look like.
Try it. Were you right?
Why did you think that?

Explore in a Different Way
Show 13 on a double ten frame.



What do you notice?
Do more trials, record, and discuss.

Use varied materials for repeated explorations:

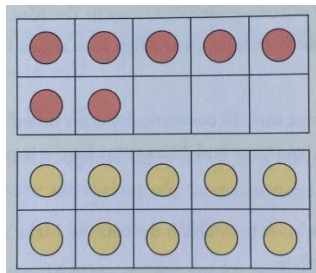
- Linking cubes to make ten and some more
- Rekenreks to show ten and some more
- Make connections between models and numbers: number tents to combine 10 and 5 into 15

Math Topic: Adding 10 to a Single-digit Number

Read *Ten Flashing Fireflies* by Philomen Sturges

How many fireflies are in the jar? What if you caught 10 more? How many would you have?

Create a model to show it.



Record the results of students' investigations:

$$1 + 10 = 11$$

$$2 + 10 = 12$$

$$3 + 10 = 13$$

$$4 + 10 = 14$$

$$5 + 10 = 15$$

$$6 + 10 = 16$$

$$7 + 10 = 17$$

$$8 + 10 = 18$$

Turn and talk:

What do you notice? Does it make sense?

Predict the sum of $9 + 10$. Were you right? Try it and see.

What happens when you add ten to a number?

Alternate way to record: Shade numbers on 1-20 chart and observe.

Math Topic: Adding 1 to a Number

Read *One More Dino on the Floor* by Kelly Starling Lyons

Record and discuss results.

$$3 + 1 = 4$$

$$5 + 1 = 6$$

$$7 + 1 = 8$$

$$2 + 1 = 3$$

What do you notice?

What is $4 + 1$? How do you know?

Try it. Were you right?

Could you add 1 without using the counters? How?

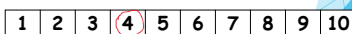
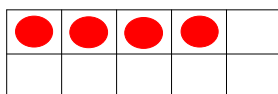
How?

What happens when you add 1 to a number?

Show 3 dinos.

Add 1 more on the floor.

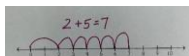
$$3 + 1 = 4$$



Math Topic: Exploring the Commutative Property

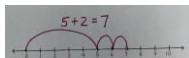
Molly had 2 flowers and she picked 5 more.

How many flowers did she have?



Molly had 5 flowers and she picked 2 more.

How many flowers did she have?



Try some similar problems and record the equations.

Class Data

$$2 + 5 = 7$$

$$5 + 2 = 7$$

$$2 + 1 = 3$$

$$1 + 2 = 3$$

$$2 + 7 = 9$$

$$7 + 2 = 9$$

What do you notice?

Why is this happening?

Show $2 + 3$. Predict $3 + 2$.

Check it.

What can you tell me about the order of the addends when we add?

Math Topic: Place Value with 2-digit Numbers

Read *Too Many Mangos* by Tammy Paikai

How many bags of 10 mangos?

1. Have partners count out 25 unifix cubes.
2. Have them put the cubes on ten frames and then check the total.



Create a chart to record students' data.

MATH PRACTICE



Observe and Consider

Number of Counters	Filled Ten Frames	Leftover Ones
25	2	5
32	3	2
14	1	4
26	2	6
38	3	8

Can you figure out how many ten frames will be filled without actually filling them? How?

Math Topic: Comparing 3-digit Numbers

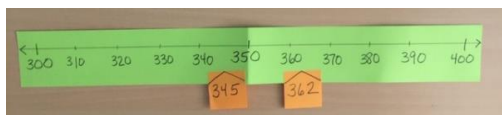
Read *How Many Seeds in a Pumpkin?* By Margaret McNamara

Use number lines to show the number of seeds in some pumpkins.

Class Data

345 317 425 163
362 328 406 128

What do you notice?
Does it make sense? Why or why not?
Predict which is greater 312 or 321?
Try it. Were you right?
How can you tell which is greater by looking at the numbers?



Math Topic: Mentally Subtracting 100 from a 3-digit Number

Read *Too Many Pumpkins* by Linda White

Pose:

Rebecca Estelle baked 241 pumpkin cookies. She packed 100 cookies to send to town.

How many cookies did she have left?

Retell it.

Visualize it.

How many are left?

Hundreds	Tens	Ones
100	10 10 10 10	1
2	4	1

Observing and Discussing

241 379 219 425
141 279 119 325

What do you notice?
What digits changed? Why?
Predict: $267 - 100$
Check your prediction with a model.
Tell your partner how to subtract 100 from a 3-digit number.

Reflecting on the Investigations

- Who did the thinking?
- How did the materials help?
- How did the charts help?
- What questions did I ask to prompt discovery?

How we teach is as important as what we teach.

Teacher Resource Books by Sue O’Connell

Published by Heinemann (www.heinemann.com)

Math in Practice (www.mathinpractice.com)

This series is filled with lesson ideas, instructional strategies, practice tasks, and many online printable resources to make teaching K-5 math more meaningful and more fun. There is a book for each grade level K-5 that contains a wealth of grade-specific activities, as well as a *Guide for Teachers* filled with instructional strategies and an *Administrator’s Guide*. Visit the website or www.mathinpractice to view the materials.

Putting the Practices into Action - Implementing the Common Core Standards for Mathematical Practice K-8 with John SanGiovanni

The Standards for Math Practice are the heart and soul of the Common Core State Standards. This book explains each standard in teacher-friendly terms and highlights practical activities to make the standards come alive in classrooms. It contains PLC study group questions and online resources.

Mastering the Basic Math Facts for Addition and Subtraction ***Mastering the Basic Math Facts for Multiplication and Division*** with John SanGiovanni

Through investigations, discussions, visual models, children’s literature, and hands-on explorations, students explore the math operations, and through engaging, interactive practice achieve fluency with basic facts. A teacher-friendly CD filled with customizable activities, templates, recording sheets, and teacher tools simplifies your planning and preparation. Over 450 pages of reproducible forms are included in English and Spanish translation.

The Math Process Standards Series

Each book in this series is a practical guide for helping students refine their skills in the highlighted math process (problem solving, communication, reasoning, representations, connections). You will find specific teaching strategies and tips to help all students strengthen their skills. Included with each book is a CD filled with teacher tools and customizable student activities to allow you to change names, data, or spacing for a quick way to differentiate instruction within your classroom.

Introduction to Problem Solving ***Introduction to Communication***
Introduction to Representation ***Introduction to Reasoning and Proof***
Introduction to Connections

All books in this series are available for Grades PK-2, Grades 3-5, and Grades 6-8.

Now I Get It: Strategies for Building Confident and Competent Mathematicians, K-6

Good teaching is the critical factor that helps students “get” math. This book is a practical handbook for the teaching of mathematics, with chapters addressing the teaching of problem solving, the use of manipulatives, differentiating instruction, effective teacher questioning, increasing math talk, and much more. The book includes a CD with over 100 pages of resources to support teachers including manipulative templates, math facts game templates, a bibliography of math-related literature, center ideas, math websites, problem-solving and writing tasks, and a variety of other practical resources.

Coming mid-2021:

Math be the Book (grade-level books (K-5) to explore teaching math through children’s literature)

For additional resources, visit Sue’s website at www.qualityteacherdevelopment.com

Follow Sue on Twitter @SueOConnellMath

Join the Math in Practice Facebook group!