

Deepening Number Sense Through Stories: The Power of Context to Expand Students' Thinking

K-2

National Council of Teachers of Mathematics

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"Understanding number and operations, developing number sense, and gaining fluency in arithmetic computations form the core of mathematics education in the elementary grades."

Principles and Standards for School Mathematics
NCTM, 2000

How do we develop a deep understanding of numbers?

What We Learn – a Focus on Number Concepts

- Counting skills
- Composing and decomposing numbers
- Place value
- Patterns and properties
- Understanding of operations
- Multi-digit computations

How We Learn It

- Models
- Math talk
- Progressions
- Context

Highlighted Literature to Explore Number Concepts

Counting Concepts/Counting Collections

***Grandma's Purse* by Vanessa Brantley-Newton**

Fill a purse with collections and have students count them.

Have students count sets of pennies and show the quantity on ten frames.

Oops!

Grandma Mimi's purse got knocked over and everything fell out!

Work with your partner to dump out your bag of items from Grandma's purse. What is inside?

Sort the items and count how many of each are in the bag so you can tell us what is inside.

- How did you sort them?
- How many bear counters were in the bag?
- How many cubes were in the bag?

Put the items in the bag and move to the next bag.

Watch and listen as they sort and count.



Alike and Different



Extend

- Students create their own bags for collections.
- Bags are filled at home with 1-10 of a couple items.
- In school, students share and count items in the bags.



MATH BOOK

MATH BOOK

More Book Choices:

***The Puddle Pail* by Elisa Kleven**

***Abuelita's Secret* by Alma Flor Ada**

Exploring One More and +1

Ten Pigs: An Epic Bath Adventure by Derek Anderson

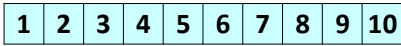
Have students act out the story with counters on a time frame. What do they notice as each pig jumps in the tub. Can they predict what comes next?



Pigs in the Tub	How many when 1 more jumps in?
1	2
2	3
3	4
4	5



What do you notice?
 Predict 1 more than 5.
 Try it. Were you right?
 How do you know how many more when 1 pig joins?



One More Dino on the Floor by Kelly Starling Lyons

Have students act out the story with counters on a time frame. Discuss the connection between one more and +1. Have students write the +1 equations. How would you add 1 without using counters?

Lesson: Dinosaurs on a Ten Frame

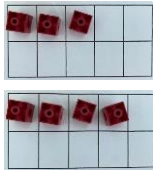
Reread the story.

Students place counters to show the dinos on the floor.

As each new dino joins, students add 1 more counter and tell you how many are on the dance floor then.

Record the equation on the board.

$$3 + 1 = 4$$



$$3 + 1 = 4$$

$$5 + 1 = 6$$

$$2 + 1 = 3$$

$$7 + 1 = 8$$

Record and discuss results.

What do you notice?
 If there were 10 dinos and 1 more joined, how many would there be?
 Try it. Were you right?
 Could you figure it out without using counters? How?
 What happens when you add 1 to a number?

Exploring One Fewer and -1

Ten on a Sled by Kim Norman

Ten Sparkly Snowflakes by Tiger Tales

Have students follow the action in the stories by moving a counter on a number path to show each quantity and then discuss their observations.

Decomposing Numbers

Quack and Count by Keith Baker

Have students write their own stories about the ducklings and show the decomposition.

Explore: 7 Ducklings

Reread the story and reenact the ducklings' adventures.



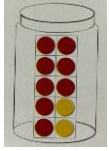
Do we have more ducklings when we split them apart? How many will there be when we put them back together?

Ten Flashing Fireflies by Philemon Sturges

Have students shake and spill 10 two-color counters to explore possible ways the fireflies can be decomposed.

Explore: Shake and Spill

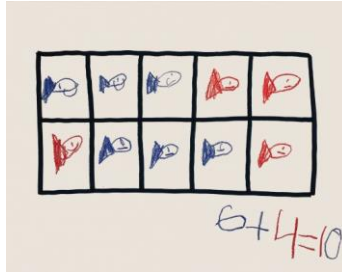
Spill 10 two-color counters to show the fireflies.
 Did anyone have just 1 red?
 How many yellow?
 What do you notice about numbers that make 10?



Fireflies in the Jar	How Many more to Make 10?
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1
10	0

MATH BOOK

Extend: 10 Animal Art



Students create their own problem situations.

More Book Choices:

Ten Magic Butterflies by Danica McKellar

Monster Math Picnic by Grace Macarone

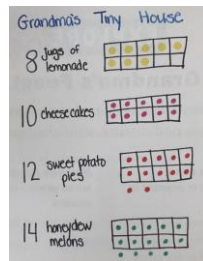
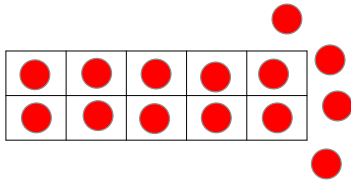
Understanding Place Value

Grandma's Tiny House by JaNay Brown-Wood

Use ten frames to show each number in the story. Is the quantity more than 10? How many more?

What do you notice?

Show 14.



Is 12 more than 10? How do you know?
 Is 14 more than 10? How many more than 10?

Another Book Choice:

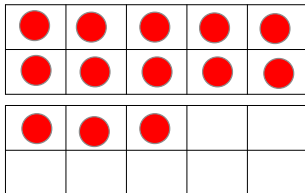
20 Big Trucks in the Middle of the Street by Mark Lee

Thanking the Moon: Celebrating the Mid-Autumn Moon Festival by Grace Lin

Ma-Ma put 10 mooncakes on the plate. How many would be on the plate if she put 10 more?

What if Mama put 10 more mooncakes on the plate? How many mooncakes would be on the plate then?

$$3 + 10 = 13$$



MATH BOOK

Try more. Record the data.

$$3 + 10 = 13$$

$$5 + 10 = 15$$

$$8 + 10 = 18$$

$$6 + 10 = 16$$

Turn and talk:

What do you notice?

Does it make sense?

Predict the sum of $9 + 10$.

Try it and see if you were right.

Could you add 10 to a number without using the ten frames and counters? How?

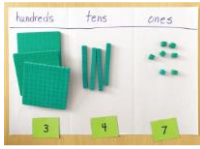
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Max's Words by Kate Banks

Max and his brothers had large collections. Count a classroom collection (e.g., linking cubes) to see how many total cubes are in the collection. Will grouping them by tens and hundreds help simplify the counting?

Describing Collections

Benjamin sorted his stamps into 3 piles of hundreds, 4 piles of tens, and 7 ones. Use your place value mat to show how many stamps he had.



$$300 + 40 + 7 = 347$$

$$200 + 50 + 9 = 259$$

$$100 + 80 + 2 = 182$$

MATH BOOK

Another Book Choice:

Too Many Pumpkins by Linda White

Comparing Numbers

How Many Seeds in a Pumpkin? by Margaret McNamara

Compare three-digit numbers by placing them on a number line. What do you notice about which number is greater? Relate comparing numbers to counting.

Comparing Numbers with a Number Line



Where would you place 362?
Where would you place 345?

- Which shows more seeds?
- How do you know?

Practice: More Pumpkin Seeds



Draw 3 blanks.

Take turns spinning and placing the number in a blank.

Then, compare to see who has more seeds.

The one with the greater quantity gets a pumpkin seed (counter).

The one who has the most pumpkin seeds wins.

Benefits?

Think About These Tasks

- In what ways do the tasks allow students to visualize and make sense of number concepts?
- Are the tasks prompting students to talk about numbers?
- In what ways do the story contexts help bring meaning to the number concepts?

Resources

Padlet of K-2 Children's Literature Related to Math Skills/Concepts

<https://padlet.com/sueoc46/j3uevoy154m1fuhb>

Padlet of Grades 3-5 Children's Literature Related to Math Skills/Concepts

<https://padlet.com/sueoc46/who7w8089bm6r6k2>

Padlet of K-5 Culturally Diverse Children's Literature with Math Connections

<https://padlet.com/georginarivera123/2ygfo12jusaomm7s>

Download a list of 120 children's books and associated math topics at:

www.MathbytheBook.com

Teacher Resource Books by Sue O’Connell
Published by Heinemann (www.heinemann.com)

***Math by the Book* (www.mathbythebook.com) Sue O’Connell and colleagues**

This series explores the teaching of math concepts through children’s literature. Lessons, word problems, discussion questions, differentiation ideas, and practice tasks are all included to teach grade-specific skills and concepts through the story context. There is a book for each grade level K-5, including a wealth of online resources, and each book includes ideas for twenty skills taught during that year.

***Math in Practice* (www.mathinpractice.com) Sue O’Connell and colleagues**

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.com 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. Online resources are filled with customizable activities, templates, recording sheets, and teacher tools to simplify 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.

For additional resources, visit Sue’s website at <https://www.qualityteacherdevelopment.com/>

Follow Sue on Twitter @SueOConnellMath

Join the Math in Practice Facebook group!

Coming soon from Hand2Mind: Navigating Numeracy K-5 Center Kits -

<https://www.hand2mind.com/supplemental-curriculum/math/navigating-numeracy-learning-progression-centers>