# Module 2:

# Learning Number Sense through Talking about Math

**[TAB PAGE]**

# Module 2: Learning Number Sense through Talking about Math

## Objectives

- Gain an understanding of number sense in the early childhood classroom
- Use number talks to increase number sense
- Learn math instructional strategies and activities to develop number sense using five frames and ten frames

## Standards

Count to tell the number of objects

| Pre-K Standards | Kindergarten Standards |
|---|---|
| **PK.CC.4.** Understand the relationship between numbers and quantities with concrete objects up to 10. | **K.CC.4.** Understand the relationship between numbers and quantities; connect counting to cardinality. |
| **PK.CC.4a.** Use one-to-one correspondence to accurately count up to 10 objects in a scattered configuration. | **K.CC.4a.** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object |
| **PK.CC.4b.** Understand that the last number name said tells the number of objects counted, up to 10. | **K.CC.4b.** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. |
| **PK.CC.5.** With guidance and support count to answer "how many?" questions about as many as 10 things arranged in a line or as many as 5 things in a scattered configuration; given a number from 1-10, count out that many objects. | **K.CC.5.** Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or any as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. |

## TEAM Alignment

- Teacher Content Knowledge
- Activities and Materials
- Questioning
- Thinking

## Reflection

- How do you get your students to think and talk about math?

- What kinds of things do you do in your classrooms that promote mathematical thinking?

***Early Math: How Children "Think Math"***

***How to help children explore and expand math skills***

Sarama, Julie & Douglas H. Clements.

Retrieved from http://www.scholastic.com/teachers/article/early-math-how-children-quotthink-mathquot

Jeremy and his classmate, Stacey, were arguing about who had more dessert. "She has more!" declared Jeremy. "I do not!" said Stacey. "We have the same." "No. see, I have one, two, three, four, and you have one, two, three, four, five."

"Jeremy, one of my cookies broke in half. You can't count each half. If you're counting pieces, I could break all yours in half, then you would have way more than me. Put the two halves back together and count. One, two, three, four. Four! We have the same."

**Math in the Making**

Good early mathematics is broader and deeper than early practice in "school skills." High-quality mathematics is a joy-not a pressure. It emerges from children's play and their natural ability to think. The mathematical thinking that Stacey aptly explained to Jeremy was not only engaging-it also involved a high level of thinking. Stacey had to argue about what the unit was-what it was they were counting-and how the two halves were equivalent to one whole unit. Jeremy also exhibited excellent mathematical thinking skills in knowing that counting was the best way to compare two amounts.

**Identify Learning Areas**

What mathematics can young children learn? It can be broken down into two main areas: (a) geometric and spatial ideas and (b) numeric and quantitative ideas. Young children possess intuitive and informal capabilities in these areas. Three other mathematical themes that should be woven through experiences in these two main areas are: (a) patterns, (b) sorting and sequencing, and (c) measurement and data.

**Plug Math into Routines**

Encouraging mathematical development can become part of your everyday routine. Suggest that children count to 15 (slowly!) while they wash their hands before snack. Point out places in their world where numbers are used, read books and sing songs with numbers in them. These are easy activities that don't take long. However, they build the foundation for the type of numerical reasoning that Stacey displayed.

**Encourage Geometric Thinking**
Children are also naturally interested in shapes and spatial ideas. To encourage geometric thinking and reasoning, play "I Spy" using shape descriptions. Ask children what shapes they see in the classroom.

**Make the Connections**
Ask children questions, such as, "What number do you think will be on the next page? How do you know?" This encourages children to see counting as a pattern, a pattern through which they have the ability to predict what comes next. It also connects patterning to numbers. Likewise, when children naturally talk about relative size ("You have the biggest shovel"), encouraging them to measure to "prove" their prediction connects numbers and geometry.
Mathematical thinking comes naturally to young children and can develop substantially during the early years.

## Reflection

1. What do you think the author means by “good early mathematics is broader and deeper than early practice in “school skills”?”

2. Describe the mathematical thinking that Stacey and Jeremy used in their conversation.

3. What routines are suggested to help build a foundation for numerical reasoning?

## Group Discussion

Talk with the people at your table about your answers. Using chart paper, generate a list of routines you use to develop mathematical thinking for number sense with your students.

**Key Idea #2**

Incorporating math into all content areas and daily routines promotes mathematical thinking by students.

# Number Talk Routines in the Early Childhood Classroom

## What is a Number Talk?

- A Number Talk is a short, ongoing daily routine that provides students with meaningful ongoing practice with computation. A Number Talk is a powerful tool for helping students develop computational fluency because it prompts students to use number relationships and the structures of numbers to add, subtract, multiply, and divide.
- Number Talks should be structured as short sessions alongside (but not necessarily directly related to) the ongoing math curriculum. Math Talks are not intended to replace current curriculum or take up the majority of the time spent on mathematics. Teachers should spend only 5-10 minutes on Number Talks.
- Number Talks are most effective when done every day.
- The purpose of a Number Talk is to help students develop computational fluency as well as number sense.
- During a Number Talk, the teacher only serves as a recorder and facilitator without teaching new content.

## What can math talk look like in pre-K?

- “Preschool teachers who use numbers in their everyday speech may aid their students' math abilities, according to new research published in January's *Developmental Psychology* (Vol. 42, No. 1). Even seemingly trivial instances of "math talk," such as saying "You two get your coats," instead of "You guys get your coats," may be related to improvement in four- and five-year-olds' math skills, says study author Raquel Klibanoff, PhD, who conducted the research as a postdoctoral fellow at the University of Chicago.”
- “Those students who were in classrooms where the teachers used many instances of math talk tended to improve more over the course of the school year than students who were less exposed to math vocabulary, the researchers found. What's more, the improvements were unrelated to general teacher quality, the complexity of the teachers' sentence structure or student socioeconomic status.”

Retrieved from http://www.apa.org/monitor/feb06/math.aspx

## Conducting a Number Talk

- In Kindergarten, use pictures or models such as 10 frames. Your questions can simply be "How many?" In pre-K, teachers can incorporate math talk into everyday routines such as, "You two go get water" instead of being more general.
- Students should also be given the option of using manipulatives to solve the problems.
- Ask for four to five answers and write them down whether they are right or wrong. When you first start, you may consider just having students share answers without writing them down, especially in Kindergarten.
- Ask for explanations for the process of solving and write them down. Write exactly what the student says and ask for clarification. In the beginning, especially in Kindergarten, you may not want to write everything down, but rather focus on the "math discussion." Be sure to repeat back what the child has said so he/she feels heard.
- Ask students what mistakes they made.
- Give the same response to each student whether they are right or wrong. Give the same response for each strategy. You do not want students coming up with "crazy" ways to solve a problem just to impress you. You also don't want students to worry about being wrong.

- Retrieved from http://www.cobbk12.org/bullard/numbertalksk-2.pdf and based on *Number Talks* by Sherry Parrish, Math Solutions 2010.

## Number Talk Video

The following video shows a teacher doing a number talk with her class. Focus on the teacher and what she does on the video.

https://www.youtube.com/watch?v=62epCIFdRa0

**What did the teacher do in the video to help develop number sense?**

This next video is another teacher doing a very similar number talk. This time, focus on what the students say and how they show their thinking.

https://www.youtube.com/watch?v=8D-qejdIlFg

**What were some math strategies the students used in identifying the number sets?**

**Key Idea #3**

When using Number Talks, the teacher should shift from thinking "What answer did you get?" to "How did you get that answer?"

## Group Activity

With the people at your table, decide who will be the "teacher" and conduct a number talk. The rest of you will be the "students." Using the dot plates you made this morning, practice doing a number talk. Use the table below as a guide:

| Teacher's Role | Students' Roles |
|---|---|
| Give students a signal to use to show when they have an answer ready to share. | Hold fist on chest, thumb up when they know the answer |
| Hold up a dot card for a few seconds and ask "How many do you see? Give some think time. | Give the answer when called on |
| Call on several students to give their answer | Explain how they saw the amount |
| Restate a student's strategy for telling how many they saw | |


**Talk with the people at your table about number talks. What are some tips you can share? What suggestions can you make?**

## Number Talk Resources

http://thekindergartenconnection.com/number-talks-in-kindergarten/ (blog that shows a great number talk routine)

http://bpsassets.weebly.com/uploads/9/9/3/2/9932784/number_talks_kindergarten_resource.pdf (number talk information and dot cards that can be used)

# Using Five Frames and Ten Frames

**What are Five and Ten Frames?**

Five and ten frames are equal-sized rectangular boxes in a row where each box is large enough to hold a counter. The five frame is arranged in a one-by-five array. A ten frame is a set of two five frames or a two-by-five array.

Five frame:

| | | | | |
|---|---|---|---|---|

Ten frame:

| | | | | |
|---|---|---|---|---|
| | | | | |

**How do Five and Ten Frames help students?**

Five and ten frames help students to relate given numbers to five and 10 by providing a visual image. The frames may be filled in from left to right so that students can learn to *subitize.* Using five and ten frames encourages counting strategies beyond counting by one. Students learn to think about combinations of numbers that make other numbers, e.g., seven is two more than five, or nine is one less than 10. These number relationships help build the foundation for the development of more complex mental computations. Students start with the five frames before moving to ten frames and may explore double ten frames later to develop a better understanding of place value.

**What materials are needed to use frames?**

It is recommended that every child have a five frame to begin and, when developmentally ready, they should also have a ten frame. Blackline masters of frames can be mounted on cardboard. Students also need counters (at least 10 per child) to place in and beside the frames for counting.

## Classroom Activities

- Give each student a five frame. Orally give students a number to fill in on their five frame, explaining to them to only put one counter in each space. Ask them to explain ways they have displayed the quantity.
- Once the students have displayed a number, ask "How many more counters are needed to make five?" This reference to five build student thinking and understanding of what five is as an anchor number.
- Call out numbers greater than five and have students place those additional counters outside the frame so they see that seven is two more than 5.
- Once students have had experience with five frames, repeat the above activity with the ten frame cards.
    - **Note:** When using the ten frames, ask students to fill the top row up first, before moving on to the second row, as this will provide a "standard" way to show numbers and reinforce the concept of fives and tens as anchors.
- Using two-sided counters, find all the ways to make five (or 10).
- When students have had experience with five or ten frames play a game by quickly flashing a filled frame and ask how many dots there were. Encourage students to share strategies of how they could tell without counting. This is an example of how five and ten frames can be used in Number Talks.
- Call out numbers as a shared class experience and students build that number on their frames with two-color counters. Ask different students to share how they built their number.
- Hold up a frame with some boxes already filled and say "I wish I had five (or 10)." Students figure out how many more counters are needed to make that number.
- One student arranges counters on the ten frame and hides it from a partner. The partner can ask "Yes or No" questions to figure out the hidden number. Is the top row full? Are there more than three spaces empty?
- Dot Card/Ten Frame Match --Students match a dot card to a ten frame with the same amount.

Adapted from *Teaching Student-Centered Mathematics: Volume One, Grades, K-3*. John Van de Walle, Boston: Pearson, 2006. ISBN 205-40843-6 Retrieved from http://www.edugains.ca/resources/LearningMaterials/ManipulativesSupport/TipSheets/Manipulatives_Frames-five-ten.pdf

## Five/Ten Frame Resources

### Interactive resources

http://illuminations.nctm.org/activitydetail.aspx?id=74

http://illuminations.nctm.org/activitydetail.aspx?ID=75

https://www.youtube.com/watch?v=t8U_zZ-rW1E ten frame flash video

### Classroom lesson ideas

http://www.k-5mathteachingresources.com/ten-frames.html

http://www.k-5mathteachingresources.com/kindergarten-math-activities.html

http://mathplc.com/sites/default/files/DotCardTenFrameActivities.pdf

## Make and Take Activity

Using the dot stickers and five/ten frames, create some frames with different combinations of numbers. Talk with the people at your table about ways you use five and ten frames in your classroom. Make a list here, and be ready to share some of your ideas with the room.

## Reflection

Ways I can use Five/Ten Frames in my classroom:

**Key Idea #4**

Five frames and ten frames are one of the most important models to help students anchor to five and 10.

Retrieved from http://mathplc.com/sites/default/files/DotCardTenFrameActivities.pdf

## Literature Connection

A great way to tie in literacy with math instruction is using books to practice number sense. Read the book through the first time so the students are familiar with the story. Re-read it and let them practice with the frames and manipulatives to make the amounts in the story. You can also read to a particular page in the book, and then do a number talk about what they see. You can have the student's make predictions about what number will come next in the story.

***My Little Sister Ate One Hare*** by Bill Grossman

In this funny counting book, a hungry little sister eats everything from one hare to 10 peas. Great for using ten frames while reading.

***Ten Apples Up on Top*** by Theo LeSieg

A lion, dog, and tiger try to do tricks while counting the apples on their heads.

## Vocabulary Connection for Five and Ten Frames

- **More**: a bigger group of something
- **Less**: a smaller group of something
- **Five Frame**: a box used to show five things
- **Ten Frame**: a box used to show 10 things

Can you think of other math vocabulary that students need to know?

## Listening and Speaking Connection

How can you incorporate listening and speaking skills into the activities shared today? What questions can you ask students? What type of responses should you hear?

| Possible Teacher questions | Possible Student Responses |
|---|---|
| How did you know how many more dots you needed to make 10? | I counted six and saw four boxes were empty, so I needed four more to make 10. |
| How did you know there were six dots on the 10 frame so quickly? | I saw that the top row was full and there was one more on the bottom row. |
| What other ways could you make eight on the 10 frame? | I could put five red circles and three blue circles.<br>I put four on the top row and four on the bottom row. |

**What other questions could you ask?**

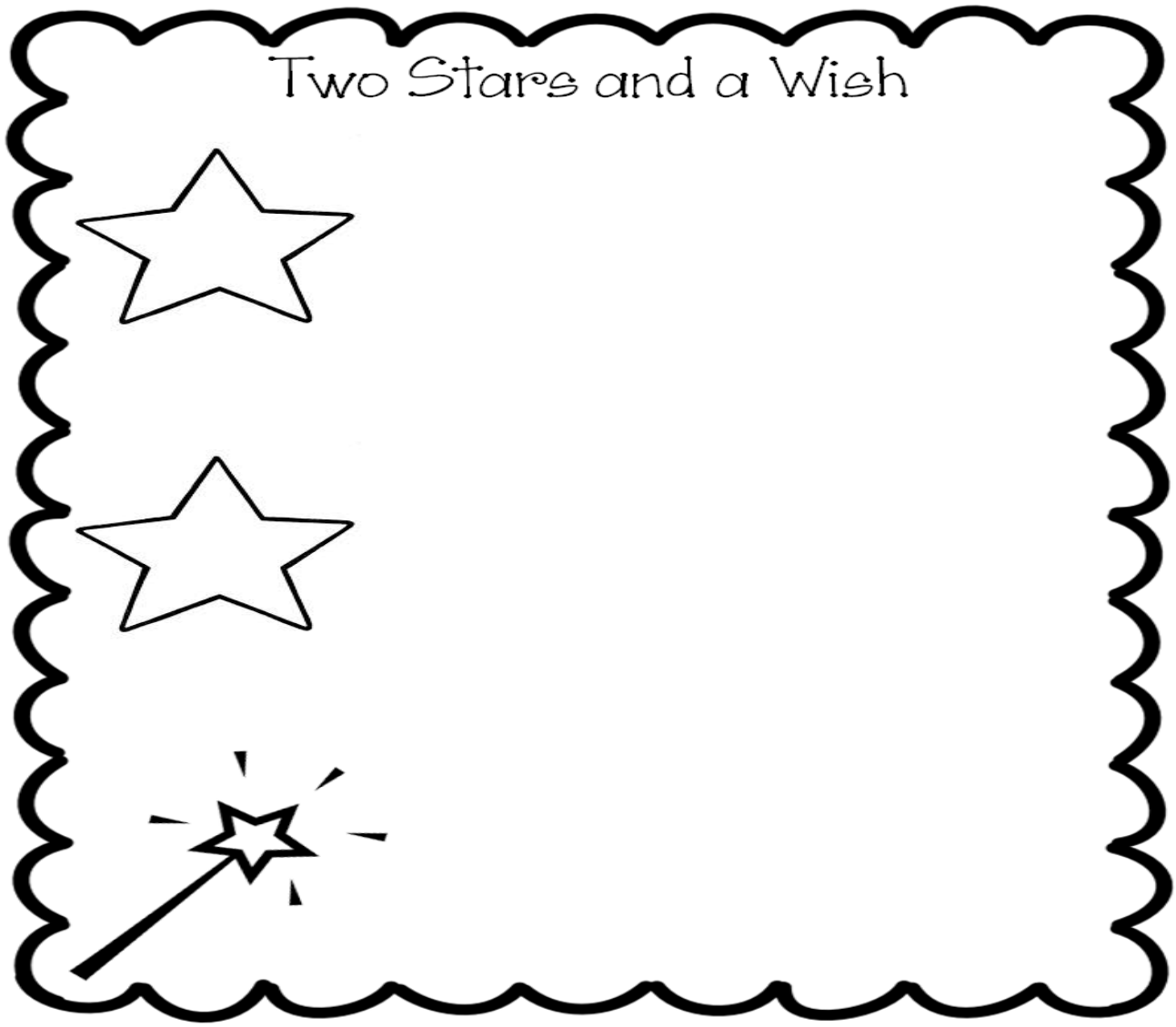
## Writing Connection: Math Journals

- Using the 10 frames you made, play Ten Frame Flash, and then have students copy it in their math journals.
- After reading the book, *Ten Apples Up on Top* have students draw themselves and write about how many apples they could hold on their head. Give them red stickers (apples) to show the number.
- Tell students to divide their journal paper into 4 sections and give them a number to represent 4 different ways on a 10 frame. (you can buy 10 frame stamps from Oriental Trading)


**Talk with the people at your table. What is one idea from this morning that you want to use in your classroom? Why?**

## Closing Activity: Two Stars and a Wish

Think about all we have learned today. In the space provided, please list two things that you "shine" at in your classroom. These may be ways your classroom is rich in numeracy, activities you do to encourage mathematical thinking, or books you read that help children with number sense. List these beside the stars. Then, think of one "wish" you have to improve upon in your teaching. It may be something new you want to try, or something you already do.

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