

Using Visual Tools to Support Early Numeracy

NCTM Annual Meeting and Exposition 2014

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In order to have computational fluency, students need to have strong number sense and work with numbers in flexible and fluent ways. Students need a strong foundation with concrete and pictorial experiences and representations before moving to more abstract mathematics. Visual tools such as concrete materials, dot patterns, five and ten frames, hundred grids and numberlines can lead to students being able to visualize these tools and scaffold their thinking towards mental mathematics and abstraction.

Create various learning opportunities for students to think about number in different ways and with different representations nurturing both flexibility and fluency in working with numbers.

Using Materials

Provide multiple experiences with a variety of concrete materials (pebbles, beads, cubes, etc) for students to count and represent quantity in different ways.

Dot Patterns

Provide students with experiences using dotted dice, dominoes etc. Provide visual practice with subitizing by using dot pattern cards (available through BC Early Numeracy resources) with prompts such as What number of dots are there? How do you see them? (ie for the traditional five dot pattern, students may see this as 4 and 1 or 2 and 1 and 2, etc)

Ten Frames

Begin by developing a strong sense of five-ness using five frames and providing students with ways to decompose/partition five in many ways. Move to using ten frames, building on five and create a visual model for ways to make 10 (leading to a significant mental math strategy). Using a double frame helps students work with the “teen” numbers, building on 10 and then stretching out the ten frame to a row of ten helps students move towards using the hundred chart/grid.

Numberlines

Beginning with physical numberlines that students can move their bodies along (like hopscotch) help students develop a sense of “jumping” from number to number. This can also be modeled with materials. Introduce numbered numberlines to 10 and then specific ranges that you are working within, then moving to marked (with evenly spaced hashmarks) numberlines for students to use as a tool, adding their own numbers as needed. Experiences with a variety of numberlines often leads to students using them as a visual mental tool as they calculate questions. Students

eventually are able to use open numberlines to represent and record their various mental math strategies in adding single and multi-digit numbers.

Children's Literature to support the use of ten frames

Splash! by Ann Jonas

Provide each student with 12 small counters (like Unifix cubes). Read story and have children build how many animals are in the pond as the animals jump in and out. When there are more than ten in the pond, use the language of “10 and 1 or 10 and 2” to help build understanding of numbers beyond 10. A related activity is Build and Change from BC's Early Numeracy Project: Assessing Early Numeracy (see Resources below).

Seals on the Bus by Lenny Hort

In this story, more and more animals get on the bus. Use the ten frame to model the animals getting on the bus...if there are only 10 seats, how many more animals until the bus is full? This helps students think about the “missing part” of 10, for example, 6 and what makes 10? Students can create their own stories using seats on a bus, train or boat.

How Many Feet in the Bed? by Diane Johnston Hamm

Students can model the story using counters and their ten frames with family members jumping on the bed until there are “ten feet” in the bed. For K students, it can be confusing that they add 2 counters for each person (2 is to represent how many feet per person) so this might need to be modeled and clarified.

10 Little Rubber Ducks by Eric Carle

A box of 10 rubber ducks falls of a container ship and they float out to sea. Students can model adding (+1) each duck to the ten frame as it is found. New stories can be created once all ten ducks are found...if three decided to float away together, how many would be left? etc. As an extension, the story begins showing many boxes full of 10 ducks each. Have students use their ten frames to model groups of 10 to practice counting by 10s. If there were 8 boxes of ducks on the ship, how many ducks were there? Etc.

One Dog Canoe by Mary Casanova

In this story, a girl and her dog head out on a lake in their canoe and are joined by several animals until the inevitable happens. Kersplash! After reading the story, students could model with a tenframe...if there are enough spots for two on each seat (ten in all), who/what could go in the canoe?

Other Recommended Titles

Math Fables by Greg Tang

for subitizing, decomposition, partitioning

Ten Black Dots by Donald Crews

for recognizing dot patterns, subitizing, decomposition, participating, building on 5

iPad apps used for representing and sharing

DoodleBuddy – used as a drawing app for students to represent numbers in different ways; can create ten frames using the dots and lines background and drawing over it and then can use the stamps to fill in ten frames

Sketch – can take a photograph of a ten frame of set of materials and then annotate it using the drawing pen on the app

Haiku Deck – powerpoint-like slides for the iPad, students can add photographs and add captions

ShowMe – a screencasting app in which students can record their voices explaining their mathematical thinking while annotating a drawing or photograph (other similar apps include Doceri and ExplainEverything)

Finding Sums (an iPhone app) – students use five frames, ten frames, double ten frames and hundred grids as visual supports as they practice computation questions

Resources:

BC Early Numeracy Project

Support documents (Assessing Early Numeracy, Supporting Early Numeracy, Whole Class Instruction) available at:

<http://www2.gov.bc.ca/gov/topic.page?id=26B1853A967F46B49BD13C4E5B9049B2>

Power of Ten

<http://poweroften.ca>

Ten frame cards and other instructional materials

Eyes on Math: A Visual Approach to Teaching Math Concepts

by Dr. Marian Small

Developing Five-ness in Kindergarten

Teaching Children Mathematics, November 2007, Volume 14, Issue 4, page 226

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