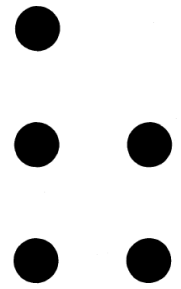


Subitizing



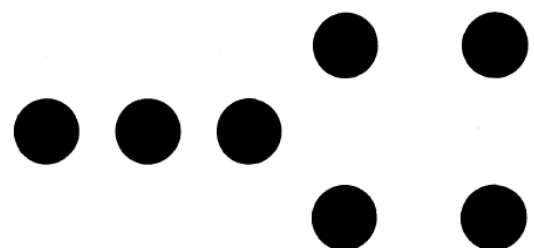
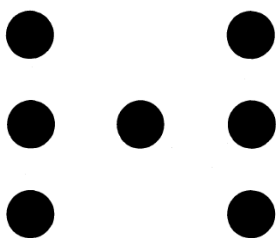
What is it?

Subitizing is the ability to see a small quantity of objects and know at a glance how many. There are two types of subitizing – perceptual and conceptual.

- Perceptual subitizing is recognizing the quantity of a small group of objects without using other mathematical processes.
- Conceptual subitizing involves a more advanced organizational role and involves being able to visualize patterns, decompose and see a quantity in parts. For example, when seeing a dot pattern of six on a die, it may be seen as three and three. Although we tend to focus on spatial patterns, subitizing can also be used with temporal and kinesthetic patterns such as finger, rhythmic and auditory patterns.

Why is it important?

Subitizing has proven to be a key indicator of students' mathematical development and thus should be taught, experienced and practiced in primary classrooms. There are direct links to students' future number system knowledge and understanding as well as computational fluency. Research studies have determined that being able to subitize quantities up to and including 4 by age 5 is a significant milestone. (Desoete & Grgoire, 2006; Fischer, Gebhardt and Hartness, 2008; Landerl, Bevan & Butterworth, 2004; Nichols, 2006; Yun et al, nd).



What to think about?

- Begin with subitizing quantities of 2, 3 and 4 with students.
- Children usually find rectangular arrangements (arrays) the easiest to subitize, followed by linear, circular and scrambled arrangements.
- Arrangements should not be embedded in a pictorial context, simple shape forms should be used, regular arrangements usually with symmetry should be emphasized, and the arrangements should have good figure-ground contrast.

What to do?

Begin with an opening conversation by holding up dot cards for a few seconds and ask students to call out what how many dots they see. As quantities increase, have students explain how they saw the dots, for example if they broke a larger quantity into two parts (conceptual subitizing). The students can also have a set of counters in front of them and when a dot card is held up, they visualize the amount and then build the set with the counters. Ten frames can also be used like this in a mini-lesson.

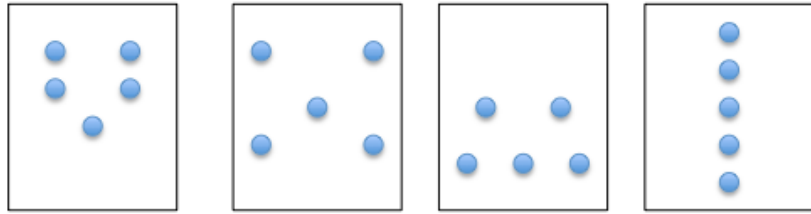
Quick Images/Flash and Say Flash and Describe Flash, Visualize and Build

After this opening, students could move to investigating materials with the focus on thinking about numbers. By presenting a collection of dot cards alongside a basket of glass gems on a mat, you are inviting students to re-



create the dot patterns, strengthening their understanding of visual patterns. By adding dotted dice or dominoes, a provocation is suggesting interacting with the materials in game play while practicing subitizing. Likewise, a collection of ten frame cards, mats or open frames could be presented in a provocation for students to continue their exploration of subitizing and visual patterns.

Different arrangements lead to different ways of visually decomposing that quantity:



What to look for?

Begin with very small quantities of 2, 3 and 4 in different arrangements.

Are students instantly able to recognize the amount as a whole or are they visually counting the dots?

The human brain can generally perceptually subitize a quantity up to and including seven items. This develops over time and you may see a range of quantity that your students can subitize. Start where your students are and build from there.

To what quantity are your students able to subitize?

Does the arrangement of the visual pattern affect the quantity they can subitize?

When moving to quantities of 5, 6 and 7 look for whether students are using perceptual or conceptual subitizing. Ask: “How did you see those dots?” “Could you see those dots in a different way?”

How are your students subitizing?

Can they visualize the dot patterns in more than one way?

What next?

1) If a student is having difficulty subitizing, reduce the quantity of dots and ensure that the dots are darkly coloured against a light background and that the dots are not too close together. Place a dot pattern card in front of a child and have him or her look at it carefully, counting the dots then cover it up with his or hand, visualizing (make a picture in your head) the dots. Then ask the child to uncover the dot pattern and call out how many. Also, have the student use materials such as glass gems or other same-shaped counters to build and represent the same quantity in many ways. For example, have the child count out three counters and then line them up, make a triangle, make an L, etc, counting after each change to ensure that there is conservation of quantity – that there is are still three! Students might like to create their own set of dot cards using circle stickers or bingo dabbers to take home to play games with.

What next?

2) If a student is fluent and confident when subitizing you may consider using visual referents for estimating larger quantities, if the student has an understanding of greater numbers. For example, show a dot card of 5 and have the student quickly identify that quantity. Then look at a large quantity of the same-sized dots (ie 20) and have them use the 5 as a visual referent to help estimate the larger quantity. Students that are fluent subitizers can also begin to use different visual patterns beyond dots and ten frames such as twenty frames and open hundred grids. Confident subitizers can also begin to apply this skill to mental math strategies by being able to visualize quantities in ten frames and combining the dots or filled spaces to add and subtract.

References

Subitizing: What is it? Why teach it? by Douglas Clements, Teaching Children Mathematics, March 1999, pages 400-405.

Number Sense Routines: Building Numerical Literacy Every Day in Grades K-3 by Jessica Shumway

Number Talks by Sherry Parrish



Real World Connections

We use subitizing in many ways – to help us “chunk” and remember phone numbers, digit grouping of large numbers, recognize numbers on cards, dice, etc during games and to help us visualize and estimate quantities or measurements.

Children’s Literature

Ten Black Dots by Donald Crews

The Cheerios Counting Book by Barbara Barbieri McGrath