Teaching number sense

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What is it?

Number sense involves understanding numbers; knowing how to write and represent numbers in different ways; recognizing the quantity represented by numerals and other number forms, and discovering how a number relates to another number or group of numbers. Number sense develops gradually and varies as a result of exploring numbers, visualizing them in a variety of contexts, and relating to them in different ways.

In the primary and intermediate grades, number sense includes skills such as counting; representing numbers with manipulatives and models; understanding place value in the context of our base 10 number system; writing and recognizing numbers in different forms such as expanded, word, and standard; and expressing a number different ways 5 is "4 + 1" as well as "7 - 2," and 100 is 10 tens as well as 1 hundred.

Number sense also includes the ability to compare and order numbers whole numbers, fractions, decimals, and integers and the ability to identify a number by an attribute such as odd or even, prime or composite-or as a multiple or factor of another number.
As students work with numbers, they gradually develop flexibility in thinking about numbers, which is a distinguishing characteristic of number sense.

Why is it important?

Number sense enables students to understand and express quantities in their world. For example, whole numbers describe the number of students in a class or the number of days until a special event. Decimal quantities relate to money or metric measures, fractional amounts describing ingredient measures or time increments, negative quantities conveying temperatures below zero or depths below sea level, or per cent amounts describing test scores or sale prices. Number sense is also the basis for understanding any mathematical operation and being able to estimate and make a meaningful interpretation of its result.

Number sense develops as students understand the size of numbers, develop multiple ways of thinking about and representing numbers, use numbers as referents, and

develop accurate perceptions about the effects of operations on numbers (Sowder 1992).

How can you make it happen?

In teaching number sense, using manipulatives and models (e.g., place-value blocks, fraction strips, decimal squares, number lines, and place-value and hundreds of charts) helps students understand what numbers represent, different ways to express numbers, and how numbers relate to one another.

When students trade with place-value blocks they can demonstrate that the number 14 may be represented as 14 ones or as 1 ten and 4 ones. They can also demonstrate that 10 hundred is the same as 1 thousand. By recording the number of each kind of block in the corresponding column (thousands, hundreds, tens, or ones) on a place-value chart, students practice writing numbers in standard form.

Using fraction strips, students find that 1/4 is less than 1/3 and that it names the same amount as 2/8.

Using decimal squares, students see that 8 tenths can be written as 0.8 or 8/10. By pairing up counters to identify even numbers and marking these on a hundred chart, primary-grade students discover that beginning with 2, every other number is an even number.

Intermediate-grade students can mark multiples of 3 and 6 on a hundred chart and find that every number that has 6 as a factor also has 3 as a factor. Using a number line, students see how fractions with different denominators relate to the benchmark quantities of 0, 1/2, and 1.

From these concrete experiences, students build the foundation for number sense they will bring to computation, estimation, measurement, problem-solving, and all other areas of mathematics.

How can you stretch students' thinking?

Help students identify whole-number relationships that are different from decimals, fractions, and integers. Students may unsuccessfully try to apply these relationships to decimals, fractions, or integers.

For example, while a three-digit whole number is less than a four-digit whole number, a three-digit decimal may be greater than, less than, or equal to a four-digit decimal (34.5 > 3.456, 1.11

The whole number 6 is greater than the whole number 5, but when unit fractions have these numerals as denominators, the relationship is reversed, and 1/5 > 1/6. Similarly, -5 > -6. Encourage students to use manipulatives and models to explore any misconceptions.

When can you use it?

Reading/English

For students in primary grades, read and discuss any of the many available counting books that illustrate numbers up to 10, 20, and so on.

Have students in intermediate grades identify ways that numbers are represented in print. Ask them questions such as, "When are numbers shown in standard form? Word form? Short-word form? When are actual numbers used? When are rounded numbers used?"

Writing

Ask students to write about number representations by defining and giving examples of different forms of numbers-standard, expanded, word, and short-word.

Math

Ten More and Ten Less
This lesson teaches primary students to use manipulatives to identify the number that is one more or one less than a given two-digit number.
Number Theory

This lesson asks intermediate and middle-school students to think about the many ways numbers can be described.

Odd and even numbers

A hundreds chart is used to show the alternating pattern of odd and even numbers, and students are asked to extend the pattern to identify additional odd and even numbers.

Social studies

For students in primary grades, find and discuss different ways numbers are used in the environment (e.g., addresses, time, temperatures, grades, speed limits, phone numbers, on recyclable plastics).

Have students in intermediate grades find population figures for town or city, state, and country. Then ask them to compare and order the populations they found with those other students found.

Science

For students in primary grades, represent numbers with concrete objects. Choose linear measurements relating to science, such as the sizes of dinosaurs, and represent lengths using pieces of string or yarn. Label the strings, and then compare and order them. Make comparisons between string lengths, string length and classroom dimensions, string length and students' height, and so on.

Have students in intermediate grades discuss and practice writing numbers using scientific notation. Have them find examples of measures written with scientific notation and identify the situations in which they are used and why.

Source:

Teacher Vision staff