Developing Number Sense including the Basic Facts

Composition of numbers is the foundation of computational fluency. Students must know all the parts that make up a number in order to be fluent with basic facts (Postlewait, Adams, Shih 2003, p. 354). These number relationships play a significant role in fact mastery.

> Children should master the basic facts of arithmetic that are essential components of fluency with paper-and-pencil and mental computation and with estimation. At the same time, however, mastery should not be expected too soon. Children will need many exploratory experiences, and the time to identify relationships among numbers and efficient thinking strategies to derive answers to unknown facts from known facts. Practice to improve speed and accuracy should be used but only under the right conditions; that is, practice with a cluster of facts should be used only after children have developed an efficient way to derive answers from those facts. (NCTM 1989, 47)

According to John Van de Walle there are three components essential to promoting meaningful addition and subtraction fact mastery. These components are;

1. Help children develop a strong understanding of number relationships and of the operations.
2. Develop efficient strategies for fact retrieval through practice.
3. Provide drill in the use and selection of those strategies once they have been developed.

(Van de Walle, 2006, p. 95)

Strategy practice must directly relate to one or more number relationships. Van de Walle suggests several number relationships that help children develop an understanding of basic facts. These strategies should be made explicit in the classroom. Strategies for addition facts are:

a. one-more-than and two-more-than facts or counting up
b. facts with zero
c. doubles
d. near doubles
e. make ten facts
f. commutative property
g. compensation

Van de Walle suggests using “think-addition” as a powerful strategy for developing fluency with subtraction facts. An example of the “think-addition” strategy is when solving 8-5, think “five and what makes 8?”

Other strategies for subtraction mastery are:
a. counting back
b. counting up
c. doubles
d. fact families
e. subtracting from ten (Buchholz, 2004, p. 365)

Using strategies to solve problems develops over time. It is through class discussions that students begin to match strategies to numbers in problems. Helping students make the connections is a key objective of the classroom teacher. "Students do not immediately see these connections and may not see them at all unless they are examined and discussed." (Huinker, 2003 p. 352). Van de Walle writes that teachers need to plan lessons in which specific strategies are highlighted. These lessons include simple story problems designed to make certain strategies explicit. The second type of lesson revolves around a collection of facts for which a specific type of strategy is appropriate. (Van de Walle, p. 96). An example of this type of lesson is a series of problems where using doubles would help solve the problems.

> Knowledge of the addition combinations (facts) should be judged by fluency in use, not necessarily by instantaneous recall. Through repeated use and familiarity, students will come to know most of the addition combinations quickly and a few others by using some quick and comfortable strategy that is based on reasoning about numbers. (Russell and Economopoulos, 2008, p. 192)

As students are working to develop understanding of the number combinations they are working on the part-part-whole relationship. They understand that there are parts within a number (7 include 6+1, 4 + 3, etc.). They also begin decomposing larger numbers. Teachers can develop number talks that focus on the connection between knowing "number facts" and knowing larger number combinations. For example a teacher could pose these problems (one at a time) on the board:

4 + 5 = ___
40 + 50 = ___

3 + 3 = ___
30 + 30 = ___

4 + 2 = ___
40 + 20 = ___

6 + 2 = ___
60 + 20 = ___

After the class solve the first equation show the second related equation. They can solve with cubes until the connection is made. Do several similar problems so the children can start making the connection between knowing number combinations for one digit number and how they relate to two digit numbers.

Sources:

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