Important Addition Strategies

Children who struggle to commit basic facts to memory often believe that they have to memorize "hundreds" of facts because they have little or no understanding of the relationships among them. Children who commit the facts to memory easily are able to do so because they have constructed relationships among the facts, and between addition and subtraction in general, and they use these relationships as shortcuts. Here are some strategies that are important:

- Double plus or minus—for example, $6 + 7 = 6 + 6 + 1$ (or $7 + 7 - 1$) $= 13$.
- Working with the structure of five—for example, $6 + 7 = 5 + 1 + 5 + 2 = 10 + 3 = 13$.
- Making ten—for example, $9 + 7 = 10 + 6 = 16$.
- Using compensation—for example, $6 + 8 = 7 + 7 = 14$.
- Using known facts—for example, $6 + 8 = 14$, so $7 + 8$ must be $14 + 1 = 15$.

Memorization or Automaticity.

Memorization of basic facts usually refers to committing the results of unrelated operations to memory so that thinking through a computation is unnecessary. Isolated additions and subtractions are practiced one after another as if there were no relationships among them; the emphasis is on recalling the answers. Teaching facts for automaticity, in contrast, relies on thinking. Answers to facts must be automatic, produced in only a few seconds; counting each time to obtain an answer is not acceptable. But thinking about the relationships among the facts is critical. A child who thinks of $9 + 6$ as $10 + 5$ produces the answer of 15 quickly, but thinking rather than memorization is the focus (although over time these facts are eventually remembered). The issue here is not whether facts should eventually be memorized but how this memorization is achieved: by drill and practice, or by focusing on relationships.

Isn't memorization faster? Interestingly, no! Kamii (1985) compared two first-grade classrooms in the same school. In one, the teacher focused on relationships and worked toward automaticity. In the other, children memorized facts with the help of drill sheets and flash cards. The children in the classroom in which automaticity was the goal significantly outperformed the traditionally taught students in being able to produce correct answers to basic addition facts within three seconds—76 percent compared with 55 percent. Some of the most difficult facts for the traditional students were $8 + 6$, $5 + 7$, $5 + 8$, $9 + 5$, and $7 + 6$. These were solved easily by the other group with strategies like double plus or minus, working with the structure of fives, and making ten.

When relationships are the focus, there are far fewer facts to remember, and big ideas like compensation, hierarchical inclusion, and part-whole relationships come into play. Also, a child who forgets an answer has a quick way to calculate it.