

Rita's Story

By Randy Philipp

The video of Rita that you observed was made in November of Rita's second-grade year. Her teacher had not taught the standard algorithm for subtracting multi-digit numbers, but the teacher had been providing her students with opportunities to solve multi-digit problems with invented solution strategies and manipulatives. These types of solution strategies made sense to the children. Thus, Rita was comfortable using the base ten blocks and the hundreds chart.

Rita's father, who was studying to be an elementary school teacher, thought that his daughter should know the standard algorithm for subtracting, so he researched how to teach it and showed it to Rita. He tried to explain it carefully, and he used base ten blocks to demonstrate the algorithm. This instruction took place a few days before the session was taped. Subsequently, Rita's father told Rita's teacher that teaching her the algorithm at that time was "a big mistake." Rita thought that she was supposed to use it, but she did not understand it at all.

A few days after the taping session, Rita, with the encouragement of her teacher, was back to using strategies she understood. According to Rita's teacher, convincing Rita that understanding was more important than memorizing was difficult.

When the interviewer returned to the school, about a month after videotaping the session, Rita ran to her, saying, excitedly, "I figured it out; I figured it out!" The interviewer asked, "What did you figure out?" Rita replied, "You aren't taking 3 from 0; you are taking 3 from 70!" When the interviewer saw Rita a couple weeks later, she noticed that Rita used mostly invented algorithms to solve multi-digit subtraction problems. She asked Rita about the way her dad had taught her, and Rita told her, "That way is okay, but this way always makes sense to me, and the other kids understand too."

So that is the rest of the Rita story. Regarding Rita's comment, "You aren't taking 3 from 0; you are taking it from 70," note that when children learn the multi-digit subtraction algorithm, they can learn the algorithm without attending to the underlying issues of place value. For example, they might be thinking of $70 - 23$ as if it is comprised of two separate subtraction problems, each involving ones:

$$\begin{array}{r} 7 \quad 0 \\ -2 \quad -3 \end{array}$$

Rita may have been thinking about the algorithm this way, which would have explained why she was thinking about subtracting 3 from 0. When she reverted to approaches that made sense to her, she recognized that both the 20 and the 3 were being subtracted from 70. If children add an additional rule that says something to the effect that "When you cannot subtract 3 from 0, 'go next door and borrow' [as I have been told by some students]," then children can get correct answers without thinking about the 7 as representing 7 tens.