The "Foreign" Language of Math

by Kathryn Stout

Sometimes the errors kids make in solving math problems have nothing to do with skill in computation or basic reasoning; it's just a misunderstanding of the language used. For example, how would your students (of any age) write A less than B? A – B or B – A? Are they uncertain? What if you substitute numbers for the letters? Do they revert to the habit of putting the larger number first regardless of the language? If so, they are likely to write five less than four incorrectly as 5 - 4 instead of 4 - 5.

What if you said a rectangle's width is six less than the length. Knowing "is" would be written with an equal sign, would they simply record numbers and symbols left to right: $w = 6 - l$ instead of the correct $w = l - 6$?

Sometimes when kids see variables (letters) instead of numbers they forget that order can make a difference. In that case, it may just be a matter of giving them simple numbers and asking them to see if they get the same answer. For example, asking if the answer to 6 – 2 is the same as to 2 – 6. (They may need to see the problem written vertically if that's the format they practice.)

When children discover a rule rather than merely memorize it, there is a greater chance that it will be retained and used. Even very young children can make discoveries. Have them subtract simple numbers to discover whether or not order makes a difference. As they experiment, connect the trials to the written equation so that they'll connect the language to the mathematical form.

For instance, when they begin with 7 blocks, write a 7. As they take away 5, write – 5. After they count the remaining blocks, fill in the final symbol (=) and number: 7 – 5 = 2. Then have them count out 5 blocks as you write 5. Ask if they can take away 7 as you continue writing: 5 – 7 =. "Can I write 5 – 7 = 2?" No, there aren't two left. Continue in this manner, but using number cards for children that seem confused. Leave the symbols for minus and equal in place, letting them see you reverse the number cards as they work. The added help of seeing the number cards being switched helps them connect this action to the word "order" when you ask, "Can I subtract in any order?"

Language involving division may also cause confusion. How many ways can your students write "three divided by four"? Have they learned to read a fraction top to bottom (numerator, bar line, denominator) as "numerator divided by denominator"? In other words, can they read ¾ as both three-fourths and three divided by four? 3 ÷ 4 is usually read correctly because it moves left to right: three divided by four.

The tricky part seems to be in translating both of the above forms into the common form used for actual computation. Will students revert back to a left to right approach, incorrectly writing $3\overline{)4}$, forgetting that in reading such a problem left to right they typically say three "into" four, never using the words "divided by" at all? If so, they need to practice pointing to the number on the right (dividend), then the division sign, then the number on the left (divisor) as they read the problem out loud. In this case, ¾ would be written $4\overline{)3}$ and read "three divided by four."

When language interferes with understanding, I've found it helpful to dictate a mathematical expression for the students to either write mathematically or to illustrate with manipulatives. For example, I might say, "Show me six more than two." If a student writes 6 + 2, or begins with six blocks and adds two, I would ask "How many did I have at first, six or two?" (2) "How many do I add to it?" (6) In this way I am directing them to consider the language. Six more than two means I have two and add six more. For purposes of this lesson, then, only 2 + 6 would be considered correct.

For division, I usually have students practice all three forms. Sometimes I make an illustration with maniupulatives to check their understanding of the concept involved. If they aren't sure which number represents the groups and which represents how many in each group, we continue to practice that. For instance, I may show them 6 groups of 4. They would read it as "Twenty-four divided by six is (or equals) four." Then we would proceed with the various ways to write "twenty-four divided by six." Finally, they would practice writing all three forms of several division problems which I present orally.

The greater the variety in language used during all math practice, the better. However, occasional practice using dictation can help fill in any gaps. Use expressions such as: more than, added to, in addition to, greater than, less than, fewer, subtracted from, take away, find the difference, divided by, times, double, triple, half of. Use simple numbers as well as problems with an unknown (variable), instructing students to use a letter to represent it. Here are a few examples to get you started:

Say: 6 fewer marbles than 12. Students write: 12 – 6
Say: Two times the width. Students write: 2w
Say: Find the difference between 26 and 42.
Students write: 42 – 26.
Say: 8 divided 2. Students write: 8/2 or 8÷2 or $2\overline{)8}$
Say: Take 16 away from 25. Students write: 25 – 16

Checking a student's understanding of what he is being asked to do takes little time, but can save a great deal of frustration. Most children spend some time solving practice problems independently. Occasional teacher dictation of mathematical expressions may be just what they need in order to have greater success solving those tough word problems on their own.