

Adjusting Mathematical Language to the Common Core

In this *Kappan* article, Valerie Faulkner (North Carolina State University) presents a number of changes in the way elementary mathematics is conceived in the Common Core. Implementing the new standards means letting go of a lot of old habits:

- *Old habit to eliminate: Defining equality as “same as.”*

The problem: This is mathematically incorrect and leads to misconceptions.

New habit to adopt: Defining equality as “same value as.”

For example, $3 + 4$ tells a different math story than $4 + 3$, but they yield the same value of 7.

- *Old habit to eliminate: Calling digits “numbers.”*

The problem: Failing to distinguish between digits, numbers, and numerals

New habit to adopt: Clearly distinguishing between numerals and numbers (which are essentially the same) and digits.

For example, 73 is a numeral that represents the number value 73 and has two digits – 7 and 3.

- *Old habit to eliminate: “Addition makes things get bigger.”*

The problem: When negative numbers are introduced, the old habit has to be debugged.

New habit to adopt: Addition is about combining.

- *Old habit to eliminate: “Subtraction makes things get smaller.”*

The problem: As with addition, negative numbers make this wrong.

New habit to adopt: Subtraction is about difference.

• *Old habit to eliminate: When borrowing, saying, “We don’t have enough ones so we need to go to the next place.”*

The problem: Students don’t understand that in the number 10, there are ten ones, but in the decimal system, we don’t “see” them.

New habit to adopt: “We can’t see the ones we need, and we need to find those ones.”

- *Old habit to eliminate: “You can’t take a big number from a little number.”*

The problem: The statement is intended to help elementary students deal with borrowing, but it’s mathematically inaccurate and leads to problems later on.

New habit to adopt: “We could take a larger number from a smaller number, but we would get a negative number. You will learn about these later, but right now we will learn to solve this problem using all positive numbers.”

- *Old habit to eliminate: “Let’s ‘borrow’ from the tens place.”*

The problem: This doesn’t prepare students for more-difficult borrowing and fractions.

New habit to adopt: Use “regrouping,” “trading,” or “decomposing” instead.

- *Old habit to eliminate: Multiplication “makes things bigger.”*

The problem: This is true only when using positive whole numbers and will confuse students later on.

New habit to adopt: Teach the three structures of multiplication: repeated addition; finding how many unique possibilities there are when matching one set with another; and finding a total amount or area when two sides are known.

- *Old habit to eliminate: Division “makes things smaller.”*

The problem: As with multiplication, this is not true a lot of the time.

New habit to adopt: Teach the different structures of division: repeated subtraction of groups; answering the

question “how many for each one?”; and finding a side when an area and another side are known.

- *Old habit to eliminate: “Doesn’t go into” (for example, 7 doesn’t go into 3).*

The problem: Even elementary school children understand intuitively that sometimes cookies need to be split up when they don’t divide up exactly.

New habit to adopt: Prepare students for later learning by using accurate mathematical language. A teacher might say, “We could divide 3 by 7, but the result won’t be a whole number. When you begin working with fractions, you will solve problems like this regularly. Here we want to consider numbers that divide into other numbers without creating fractional parts or leftover pieces.”

- *Old habit to eliminate: Saying “and” means decimal point.*

The problem: In common parlance and math parlance, “and” generally means to combine, add to, or augment. Insisting on using “and” only when there’s a decimal buries the opportunity to have a discussion that focuses on considering unit sizes and different ways to form a number.

New habit to adopt: Don’t create false rules for language. In other words, it’s not a big deal to call 145 “one hundred and forty-five.”

- *Old habit to eliminate: Canceling out – for example, “These eights cancel out.”*

The problem: Students don’t notice how often properties are used and how important they are.

New habit to adopt: Explicitly use and discuss the idea behind simplifying. A teacher might say, “Here I have an 8 divided by an 8, and we know that anything divided by itself equals 1. So you can see here that we have simplified this expression without changing its value.”

- *Old habit to eliminate: Referring to “the answer.”*

The problem: If the goal is to find answers, there’s a tendency to forget the most important part: How did we do that? Why did we do that? How did you know that?

New habit to adopt: Use “the model” or “the relationships” or “the structure” or “justify your answer.”

- *Old habit to eliminate: Guess-and-check as a strategy.*

The problem: While this sometimes involves using number sense, it’s not logical or mathematical and doesn’t prepare students for more difficult challenges.

New habit to adopt: Teach systematic math representations – bar models, for example – to teach students to think like mathematicians.

“Why the Common Core Changes Math Instruction” by Valerie Faulkner in *Phi Delta Kappan*, October 2013 (Vol. 95, #2, p. 59-63),

<http://www.kappanmagazine.org/content/95/2/59.full.pdf+html>;

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