

## **Presentation to the National Mathematics Advisory Panel**

Cambridge, Massachusetts, September 14, 2006

by **Nancy Holland Buell**

President, Association of Teachers of Mathematics in Massachusetts

Mr. Chairman and members of the Panel, I thank you for this opportunity to speak to you. I am not a researcher. I have never conducted, nor ever expect to conduct, randomized trials nor a scientifically-based research study. However, I bring to you my observations from 34 years as an elementary classroom teacher and over 10 years as an elementary mathematics consultant assisting school districts and teachers in over a dozen states in their efforts to improve the mathematics learning of their students.

I applaud you for considering what happens in elementary classrooms as you focus on the mathematics that leads to algebra. I believe much more could be going on in elementary classrooms to lay the foundations for algebra, but that most elementary teachers are unaware of the opportunities to explore such ideas or do not see them as important for their students.

When an elementary teacher is confronted with a 736 page textbook or ten curriculum units to teach in the course of a year, she knows she can't do it all. It is the classroom teacher who makes the subtle choices about what gets taught and what gets skipped. She does this based on her sense of what is most important for her students this year, not for building a foundation for future years. If she doesn't think that preparing her students for algebra is part of a second grade teacher's job, if she doesn't even see the opportunities for her students to explore early algebraic ideas, her students will not have a rigorous mathematics program.

Let me give you a simple example. A teacher might ask second graders to make a list of equations that equal 14. She might let students share their ideas and then move on to another part of her lesson. Or a teacher might take one of the shared equations, let's say  $10 + 4 = 14$  and ask, "What if I change the 10 to an 11?" The class could generate a list of related equations for 14:

$$10 + 4 = 14$$

$$11 + 3 = 14$$

$$12 + 2 = 14$$

$$13 + 1 = 14$$

$$14 + 0 = 14$$

The teacher might then ask them to think about how the second addend is changing as the first addend goes up by 1. As students, even young students, pay attention to how numbers behave and make rules for what they see happening, they are beginning to work with early algebraic ideas.

Two observations I would like to make about this particular example. Even if the teacher's guide suggests having this discussion, teachers will only do so if they see it as a valuable use of their limited time. If they don't understand the underlying mathematics the children are exploring, they are likely to skip the part of the lesson that highlights that mathematics.

Secondly, you will notice that the example used small numbers, numbers that are not particularly challenging for second graders. Indeed, it is the familiarity and understanding students have of these small numbers that allows them to pay attention to the mathematical ideas related to how the numbers are behaving. Again, if teachers don't understand the purpose of working with the small numbers, they are likely to view the activity as too easy and move on to other work with larger numbers.

Let me be clear. We want second graders to work with larger numbers as well. However, working with small numbers allows them to focus on how the numbers behave rather than on how to find the sum of two large numbers. Students need to work with different size numbers for different purposes.

I have worked with teachers who use *Investigations in Number, Data and Space* and with teachers using *Everyday Mathematics*. Both of these curricula provide many opportunities for students to explore early algebraic ideas as they develop fluency with basic facts and operations. However, if the teacher doesn't understand the mathematics or doesn't think the explorations further her goals for her students, the opportunities will be missed. The enacted curriculum is not always the intended curriculum.

How do we deepen elementary teachers' mathematical understandings and broaden their vision of what is important for their students to learn and to explore? In addition to more preservice mathematics courses, I believe we need programs that help teachers develop their own mathematical understandings *and at the same time* help them see the connections between those understandings and the mathematics they teach at their grade levels.

If we are going to change what students know and are able to do, we must change what teachers know and what they do.

Thank you for the opportunity to address the Panel.

Nancy Holland Buell  
nhbuell@rcn.com