

# DOINGWHATWORKS



## PRESENTATION

4:30 min

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## Problem Solving in Pre-Algebra

Worthington Hooker School, Connecticut  
June 2008

**Topic** IMPROVING MATHEMATICAL PROBLEM SOLVING IN GRADES 4 THROUGH 8

**Practice** PROBLEM-SOLVING INSTRUCTION

- Highlights**
- » Seventh-grade math teacher Beth Klingher describes a pre-algebra lesson in which students represent the information from a word problem both in a table and in a graph.
  - » Using visual representations helps students interpret the information in a problem and get started on finding a solution.
  - » Students move from concrete to abstract in problem solving through practice, connections across problems, and showing problems in many different ways.
  - » Ms. Klingher explains her goal of getting students to take a real-world problem, make a table or graph, and then translate the problem into an equation.

**About the Site** Worthington Hooker School  
New Haven, Connecticut

### Demographics

- » 89% White
- » 6% Hispanic

- » 3% Asian
- » 1% Black
- » 15% Free or Reduced-Price Lunch
- » 3% English Language Learners

The Worthington Hooker School mathematics program exemplifies the goals of the New Haven School District in holding high expectations for all students, and preparing them for STEM career options. The school implements these features:

- » Focus on fewer topics at deeper level of understanding;
- » Cross-grade units with “significant tasks”;
- » Benchmark testing four to seven times a year;
- » Extensive focus on number sense and fractions;
- » Problem solving as part of regular instruction;
- » Encourage students to grapple with problems and engage in mathematical reasoning;
- » Roles for specialist teachers (physical education, music, visual arts) in providing additional math practice;
- » Bi-monthly school-level data team meetings; and
- » Monthly coaches meetings at a district level to review results of school-level data team meetings.

## Full Transcript



### Slide 1: Welcome

Welcome to Problem Solving in Pre-Algebra.



### Slide 2: Introducing Beth Klingher/Problem context

I am Beth Klingher. I teach seventh- and eighth-grade math here at Worthington Hooker School in New Haven, Connecticut.

The lesson was a pre-algebra lesson. It involved making a table of data and then transferring that data into a graph. It was a word problem involving a race between two children. The goal here was really to have the kids take a real-life situation and be able to take that information and put it into a numeric representation, which was a graph.



### Slide 3: Purpose of the problem

Many children could have approached the lesson in many ways. It involved building on some of the algebra skills we have been using for the past week or so, so that actually gave them the preparation for then taking this data from their table and building a graph of it.



### Slide 4: Interpret information in the problem

One of the things I was looking for was to see if they could take a problem—a word problem—and interpret what the important facts were to begin with. After they built the graph, there is a secondary step of looking at the graph and seeing, “How does this graph actually relate to the word problem? What do the lines mean?” One line represented one child in the race; another line represented another child in the race. And actually looking at the intersection point and understanding that that intersection point represented where one child overtook the other in the race.



### Slide 5: Attack the problem

I am a big proponent of open-ended word problems, problem-solving skills. One of the things I really work with my students on is learning how to attack an open-ended problem and to be able to productively struggle with that problem. It’s not obvious at first what the answer is, but they can use all of the number sense skills that they have to attack that problem, and trying to encourage them to get over their initial frustration in handling a problem and to persevere and to work through the problem.



### Slide 6: Use visual representations

I use visual representations quite a lot. If somebody looks at a problem and they are frustrated, they don't know where to begin, I always say, "Draw a picture of what's going on. Get something down on paper that gets you moving." And that's a great way to start working. It's also a great way to solve many problems because a picture really helps you orient things, whether it's something broken up into parts or something—as an example, today's lesson, we had a race. Well, you can actually show the race at different points in time with a picture, and that really helps you visualize what's going on. Many students who may have little blocks against things, it would get them moving and understanding how a problem could be solved.



### Slide 7: Move from concrete to abstract

It's difficult to get students to move from the concrete to the more abstract. I think one of the ways you can help is a lot of practice because the more practice you have with the concepts, the more you can start to understand how one concept is connected to another or one problem is connected to another, and you start understanding kind of a bigger-picture view of it.

The other way I think is to show problems in many different ways—visually, with manipulatives, with numbers—and all of a sudden instead of it just being an equation, you can see how the conceptual or the concept can pull it together. For example, today's lesson, they had a table, so they can look concretely at where the racers were at each point in time. And that concrete table is then brought into the visual graphic, which is a little less concrete.



### Slide 8: Add a challenge

One of the additional challenges I gave the students was to take the information that they had gleaned from the problem, the table and the graph, and then move to the next step, which is writing a linear

equation. Now we haven't spent a lot of time on equations this year, but a lot of them are ready for taking that next step, that more conceptual step.



### Slide 9: Summarize lesson

The lesson today was really the first time the students were taking some real-world examples and applying some of their algebra skills to those real-world examples. We do it throughout the year with word problems, but this is the first time we really graphed a real-world problem. So my hope is that by the end of the year, the students will have a solid understanding about how to take a problem, a situation, and not only to make a table and graph, but then to write an equation based on that problem.



### Slide 10: Learn more

To learn more about Problem Solving in Pre-Algebra, please explore the additional resources on the Doing What Works website.

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