

# DOINGWHATWORKS



## PRESENTATION

6:11 min

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## Cross-Multiply? Not So Fast!

Howard County Public Schools, Maryland

February 2011

**Topic** DEVELOPING EFFECTIVE FRACTIONS INSTRUCTION FOR K-8

**Practice** RATIO, RATE, PROPORTION

- Highlights**
- » James Ro and Jackie Price describe their team teaching in an inclusion math classroom.
  - » The class lesson shows different ways to address proportions through three different types of activities, attempting to have students think outside of the cross-multiplication strategy.
  - » In the warm-up, students are challenged to use blocks as a visual representation to solve a series of problems involving sharing two bowls of salsa among four people. Most students add groups until they get the answer; some who are struggling need help in breaking the problem down into unit rates.
  - » The second activity involves use of buildup strategies. The teachers' intent is to have students understand that there are more efficient approaches than cross-multiplying for some problems.
  - » Students work in pairs, teaching solutions to each other and explaining their thinking out loud.
  - » Mr. Ro reflects on why students have a difficult time with the way fractions are used in ratios and rates.

- » The third activity in the lesson is a set of problems in a real-world context that involve comparing unit rates in purchasing, substituting different quantities within the same ratio, using a scale drawing, and figuring out miles per gallon.

## About the Site **Howard County Public Schools Ellicott City, Maryland**

### Demographics

- » 55% White
- » 22% Black
- » 16% Asian
- » 5% Hispanic
- » 9% Special Education

Howard County Public Schools instituted a consistent, districtwide math curriculum that focuses on problem solving, communications, connections, and reasoning. The program features the following:

- » Math coaches supporting classroom instruction in all schools, including working with small groups of students and providing demonstration lessons;
- » Use of models, manipulatives, and visual representations to support fractions instruction;
- » Emphasis on mathematical discourse and communication to explain reasoning; and
- » Small professional learning communities to support classroom teachers in strengthening their understanding of math content and reviewing student work.

## Full Transcript



### Slide 1: Welcome

Welcome to Cross-Multiply? Not So Fast!

## Slide 2: Introducing James Ro and Jackie Price



**James Ro** I am James Ro, I teach eighth-grade pre-algebra and geometry at Elkridge Landing Middle School.



**Jackie Price** Hi, I am Jackie Price, and I am the special educator. We have an inclusion classroom with students with a variety of needs that we as teachers together work to support while we teach math.



## Slide 3: Structure of the lesson

**Ro** Today's lesson was geared towards attacking proportions in different ways. We teach 80-minute classes, and so for today we had three distinct parts that we wanted to accomplish. First, in our warm-up, what we tried to do is we tried to get them to think—just basically, building strategies or looking at unit rate in solving for proportions. We wanted them not to gravitate towards the cross-multiplication method; we wanted them to kind of start from the basics. After the warm-up, what we wanted to do is we wanted to kind of discuss the various strategies that will build up and eventually get to cross-multiplication. After that we wanted them to get some real-life experience about how this would work.



## Slide 4: Warm-up

**Price** For the warm-up we had this scenario that they were at Chili's and they had certain numbers of bowls of salsa and people; so we said that two bowls of salsa could serve four people. So we used that as our scenario, and then we had questions that went with it. So we asked the students to use the blocks as a visual representation to show us how they would solve the problem outside of

cross-multiplying. And they worked in pairs to complete the activity.



### Slide 5: Adding groups and unit rates

**Ro** Conceptually, I guess there were a couple of different ways that we saw students attack with these blocks. The first problem was set up so that it had a very integral relationship, meaning they could just simply keep adding those groups until they got the answer. And I saw many groups do that with the first problem.

**Price** With the one pair that I was working with, they were kind of struggling with how to really break it apart, and because they are so used to the procedural steps of following cross-multiplying that it was hard for them to go outside of that and think about another strategy. And so we really broke it down into the unit rate of how many people per bowl, and then we kind of set up a chart. But I really had to ask them questions and say, “So if we had this many people, how many bowls?”

**Ro** If you put them in a restaurant and you told them to do the same thing, I think they would get it more quickly. I could see that kind of tension between what you learn in the classroom and what’s generally taught about numbers, and I think that’s why we had a lot of students who just gravitated “cross-multiply, cross-multiply” rather than think outside the box.



### Slide 6: Practice problems

**Ro** You can use cross-multiplication for any kind of proportion problem. There are more efficient ways of solving using some build-up strategies or unit rate strategies. I know I tell them, you know, “We might give you many options; you kind of choose which one that you

understand the best.” We wanted them to partner up and practice problems where they would practice various strategies, and we had them do it: one person from the pair do one set of problems and the other one the other set of problems. And then they teach it to each other, so maybe they see different ways of being efficient.



### Slide 7: Math discourse

**Price** Especially being in an inclusion setting, we definitely have students who are not always going to get it the one way that we show them.

**Ro** We try to give opportunities where students really bounce off each other’s ideas. We really want them to talk with each other, see what they are thinking, and then explaining it out loud.



### Slide 8: Challenging part-over-whole concepts

**Ro** The versatility of the way the fractions are used, I think that’s hard for kids to grasp. In elementary school you are taught that a fraction is a part over a whole, and when you get to ratios you are comparing two different quantities of the same unit, and in a rate you are doing two different units. When they see a ratio it’s kind of hard to visualize it in the same way they have seen fractions before as a part over a whole. One great example is slope—rise over run—and students can get the concept of rise over run, but I think some students are like, “Why do we put it as a fraction?” I think that’s where we have to really tie in that relationship in a fraction, how they are all really kind of the same thing, just expressed in different ways.



## Slide 9: Real-world café problem

**Ro** I think one of the focuses this year is really bring what they do out there when they go home, and making that come to life rather than what they are just learning in the classroom, you know if you were to build a café.

The first part was purchasing a lot, and it was really to compare unit rates. So right off the bat, I didn't want to make them think, "Okay, everything is a proportion; everything is a proportion, where I set it up and cross-multiply." And I noticed some people were trying to cross-multiply, but that wasn't going to work. When you are comparing two companies, you know, how do you tell which one you are going to choose? Usually the cheaper amount of money per square foot was what we were hinting at.

The second step was a mixture problem—mixture ratio of how to make mortar with sand and cement with the ratio of three to one. If we purchased nine tons of sand, how many tons of cement will we need in order to make a proper mixture for the mortar?

So after that we do a little scale drawing. On the map, from one point to another, if the scale is two centimeters equals five miles, and you measure it, and it's eight centimeters, how far you are going to drive? And then within that question, we pose a challenge problem. Let's say your Volvo drives 17 miles per gallon—how many gallons are you going to use driving to the store and then back?



## Slide 10: Wrap

**Ro** I think today's class was a good example about what they were thinking about, and that helps us as teachers whether to maybe next class go over a concept or spend

a little bit more time on this concept, rather than just moving on ahead. So it gives us a good gauge of how they are thinking and what they see from their eyes.



### Slide 11: Learn more

To learn more about ratio, rate, and proportion, please explore the additional resources on the Doing What Works website.