 **VIDEO**
5:21 min

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A Learning Trajectory for Fractions

Tollgate Elementary School, Colorado
February 2011

Topic DEVELOPING EFFECTIVE FRACTIONS INSTRUCTION FOR K-8

Practice INITIAL FRACTION CONCEPTS

- » Several mathematics coaches discuss the learning trajectory of fractions using an iceberg graphic organizer to guide their discussion of progression of concept development.
- » They place operations with fractions as the challenge at the tip of the iceberg and then unpack the concepts that students need to master to be competent with operations.
- » The coaches identify early foundational concepts such as informal sharing experiences with the concept of same-sized shares and finding fractions of sets at the bottom of the iceberg.
- » They acknowledge the importance of helping students access a variety of models of partitioning and understanding when different models can be helpful.
- » In the middle of the iceberg, they place the concepts associated with comparing and ordering fractions and finding equivalent fractions.
- » The coaches discuss how to use the iceberg graphic to help teachers work with struggling students by understanding prerequisite concepts they might have missed along the way.

About the Site **Tollgate Elementary School** **Aurora, Colorado**

Demographics


- » 45% Hispanic
- » 31% Black
- » 18% White
- » 5% Asian/Pacific Islander
- » 2% American Indian/Alaska Native
- » 65% Free or Reduced-Price Lunch


Tollgate Elementary School focuses on developing mathematically powerful students using the districtwide curriculum developed by Aurora Public Schools. Features of the program include the following:

- » A district mathematics coach and a school teacher leader who support classroom instruction, including collaborative lesson planning and demonstration lessons;
- » Use of models, manipulatives, and visual representations to support fractions instruction;
- » Ninety-minute blocks of math instruction, which allow for a number talk, whole-group lesson, small-group work, independent work time, and assessment; and
- » Emphasis on mathematical discourse and communication to explain reasoning.

Full Transcript



 **00:05** Renee Sherry: Maybe we could talk a little bit today about what do we see as the learning trajectory when it comes to fractions. From the very beginning in Kindergarten, or even before they come to Kindergarten, up through operations and proportions.

 **00:21** Ken Jensen: What's the tip of the iceberg?

Sherry: Well, it seems to me operations with fractions would be the tip because that's what I see if people are rushing anywhere, they're rushing to the operation. And that's what I see as the top.

Jensen: So by this you mean adding, subtracting.


Sherry: Multiplying and dividing fractions.

Jensen: So all the calculations working with those kinds of fractions.


Sherry: Mixed, yeah.

Jensen: So working with fractions. Okay.


Kim Pippenger: So you want to put an example up?

 00:49 Jensen: Sure, so maybe $\frac{3}{4} + \frac{5}{8}$ and thinking about what they would do with the denominator in something like that and what they might need to be able to make sense of. I mean, we talk about needing a common denominator, but do we talk about why you need a common denominator? That might be something that goes back down into this part down here.

So I'm wondering, what kinds of things do go towards the bottom of this iceberg in terms of getting students to be able to make sense of what this means so they can make sense of the answer when they're done?

 01:25 Pippenger: So I think they come in with a lot of those informal experiences. I mean, even like just cutting a sandwich in half and having a sense of if the halves or relatively equal or not.

Sherry: And I think even beyond halves. I mean, if you have more than one brother, and you have to share your cookie, they can...I've seen kids even be able to do thirds and fourths, but knowing the concept that they want the pieces to be the same size.


 01:54 Jensen: How can we build their understanding, so make that connection between what kids are really coming with, what they already know, and where we need to get them, say, by third grade?

Sherry: I think we need to probably do a little bit more work about having younger kids find fractions of sets, and maybe not even using

that word, but if these are all M&M's and we have to split them between us, that's also partitioning.

Pippenger: Yeah, that sharing piece.


Sherry: And I'm not sure we always hit on that as much as we possibly could. As I'm thinking back along the iceberg, I'm thinking that the preformal kids are coming with some knowledge around splitting things into equal pieces.


 **02:42** Jensen: And they're coming in really with all three models that you can access.

Sherry: Right.


Jensen: We've got to help teachers access what kids are coming with.


Sherry: Right.


 **02:54** Pippenger: I think what you're getting at with the models, too, is that different models are going to help kids see different things, and so it's possible that even though I may have some of these earlier experiences, when you give me sort of a different model or a different context, I kind of go back to the beginning again. And that gets to that decision making that we want kids to have about which model is going to help me, when is the number line going to help me, when is the array model going to help me, when is the pattern block going to help me. So how do we start building that decision making with kids, too?

 **03:24** Sherry: I think the next one is comparing—which one's bigger, which one's smaller—and then being able to order a set in the trajectory.

Pippenger: I think, too, as much as we want learning to be linear, it's not. I mean, kids, especially tangled kids that are a little bit older, tend to have pieces from higher up on the iceberg and then missing pieces from lower on the iceberg. I mean, not always, so I think we can't get too locked into first they do this, then they do this.

 **03:53** Sherry: I mean, after I think of order and being able to compare two fractions from the same whole, I think what I think about next as far as the learning trajectory would be equivalent fractions. There's a reason we find equivalent fractions, and that's for the use for further on in operations or for whatever the use is. Have we helped our teachers understand that it's not just an exercise in finding equivalent fractions, that's there's a use and a purpose for it? It has to do with teacher confidence.

 **04:28** Pippenger: And I think it has to do with knowing that progression as well. So knowing my kids have come from some place, and if they're not right here with me, I know I can go back and I can kind of fill in some gaps for them. And then I also know that this math is going some place important.

 **04:44** Jensen: That leads into where I think the power of the iceberg really comes in. I can think about a teacher who wants to get at this particular concept [in] sixth grade. This is the sixth-grade activity right here, and if the only thing the teacher says is "Find a common denominator, multiply both—the three and the four by two—and go," and the teacher doesn't understand all these things that are down here, they don't have anything to pull from to make sense of this.