MALLORY WILLIAMSON: A surprising fact was a lot of the students, when we're discussing how do we create a line plot, they had to refresh their memories about how to rename to equivalent fractions. Oftentimes they were getting the concept of a line plot and a number line confused. And you can create a number line to then create a line plot, but the purpose of a line plot is to plot the data that's been provided to you. So, having those discussions between listing the amounts from least to greatest, and you don't necessarily need all the eighths that were included when they listed them. However, if they did include them, it was acceptable. So, I was surprised to see that, and I was also surprised how a lot of students decided to draw pictures or models to support their answers, but at the same time a lot of them did not favor a number line, which is very similar to a line plot. So, when they went to go explain or model their—like how they found their solution, they were very hesitant to even try a line plot as a strategy.

I want to spend more time on how using a number line to find a solution. I think that's a valid strategy that can be used in fifth grade. A lot of the students easily were able to connect repeated addition to multiplication, so I don't need to spend a whole lot of time on that, but I do think that spending more time on the model factor or how to analyze a model or create a model, using multiple amounts of data. I think it's easy for them to model what one-third plus, you know, two-thirds is, or something that's like that with, you know, same denominators or like-denominators, but to have all of this data and then create a model, they don't necessarily know what's the most efficient way to do that.

It was interesting to see one of the groups start off with they know that halves is equivalent to fourths, and fourths is equivalent to eighths. So ultimately, they're going to have to create a number line in eighths, so a lot of the students started off with the halves or fourths before then going back and editing their line plot and recreating them into eighths. Another misconception or something that I saw that was a great discussion piece was, in one of the problems, in the first problem it asked you to repeatedly add three-fourths four times, or three-fourths and multiply it by four. So, a lot of the students, when they ask you, or you ask them, "Do you know how to model three-fourths?" they can easily show you that representation, but then to repeatedly add it, you have to keep drawing. One group shaded in what the answer would be, twelve-fourths, and could show you how and explain how they labeled each part, and one group actually drew a array model four times, and shaded in three parts out of the 4, four different times.

So, making that connection's really hard for them. If you are going to shade in repeatedly and you don't want to draw all of those arrays, we recommend using different colors to kind of understand that concept and how repeated addition is used to find that solution. But when you're using all the same color like a pencil, it's hard to see where you're repeatedly adding three-fourths over and over again. So, some groups decided to use that particular model, three-fourths, as that array over and over again, and other groups decided to draw the solution and label how they were able to connect the dots from three-fourths to the twelve-fourths, which is equal to three.

I think for lower-level learners, the advantage for separating your arrays where you can easily see the connection, "This three-fourths is modeled this way," and so they're able to see, "If I write out three-fourths four times, I can easily see four different groups of three-fourths." When

you shade all of them in at once, whether you're using different colors or labeling them, I think someone who is quick with their fluency is able to understand each group, "This is one group of three-fourths, and three-fourths, six-fourths, nine-fourths, twelve-fourths." So, sometimes I ask them to explain or label a little bit more in detail so they actually understand what is taking place, the concept that's happening, because in their mind they're counting by groups of three. So three, six, nine, twelve, but we're also dealing with fourths. So, I think for someone who wants a very detailed basic understanding it's easier to separate those arrays, but for someone who just wants to understand the concept of quickly multiplying or quickly, efficiently going by those groups, they're going to count by groups of three, and clump them together so you understand the relationship of what's being asked and how to find the solution.

When I went to a particular group, they had tried multiplying three-fourths times four, and one of the students had placed twelve down, and then another one of her peers decided to record twelve-fourths. When I asked what is it going to be, twelve-fourths or twelve, she then didn't necessarily understand—she thought she was wrong. She wasn't necessarily wrong, but there is a major difference between twelve as a whole number and twelve-fourths, which is equal to three. So, I needed her to reason through the difference between just placing twelve as our solution versus twelve-fourths, which is actually—when you show the model, you're only shading in three wholes. So, she easily was able to, like, recognize that mistake after the discussion, but if we were just to leave it, she would just write down twelve was her answer, and ultimately be incorrect.

In fifth grade, one of the important things that I really like to kind of stand by is, as I'm monitoring each group, I really like to visit each group and kind of tell myself that I'm going to ask at least, like, four to five questions before giving a statement. They're really eager to know whether they're right or wrong, and we're trying to refocus that and re-train their minds with the growth mindset of, "Just because I ask a question doesn't necessarily mean you're wrong." I want you to think about, "Okay, how could I use this to then spark an interest or the next step in my thinking, or better understand relationships?" So that's really important for me to ask those questions and have them feel comfortable with me asking questions so they understand that I'm not going to give them an answer. I want them to be able to find that solution to the problem and strengthen their problem-solving skills.