

SALLY KEYES: My name is Sally Keyes, and I'm a math coach at Ida Price Middle School in the Cambrian School District in San Jose, California.

CECILIO DIMAS: Hi, I'm Cecilio Dimas. I am a 7th and 8th grade math teacher at Price Middle School in San Jose, California.

KAMALJIT SANGHA: Hello, my name is Kamaljit Sangha, and I teach 7th/8th at Ida Price Middle School, Cambrian School District, in San Jose.

SALLY KEYES: What is a re-engagement lesson, and why are we actually doing the lesson that we're doing today?

KAMALJIT SANGHA: A re-engagement lesson is a little bit different than a re-teach lesson. A re-teach lesson is where you give the students more practice using the same strategy. And sometimes you might give them practice but a little bit different strategy or a new strategy. Whereas in re-engagement, what happens is we analyze student work, and from that we make up prompts to bring out the mathematics, the misconceptions that the students may have, and bring it to the surface. (fade out) Using the questioning techniques, we figure out exactly what are their misconceptions and address those issues.

SALLY KEYES: Can someone tell me a little bit how we began planning this notion of the re-engagement? What was our mathematical purpose for the re-engagement lesson today as well as for our math department here at Ida Price?

KAMALJIT SANGHA: At our school, as a department, we give a MARS test called "Picking Apples." It deals with cost analysis. And it's at the third benchmark near the end of the year. And we as a staff, as a department, decided we wanted to get the students to be able to give multiple representations of that mathematics in that problem and other cost-analysis problems. (fade out) Within that, we know that the students, in each different representation, they have misconceptions. So we want to target each of those different representations and do a re-engagement lesson on that.

SALLY KEYES: The "Picking Apples" problem is a cost-analysis problem that we're giving to all the 7th graders here at Ida Price. And so we know that there are different avenues or strategies in order to determine that cost analysis piece, such as the verbal description, making a table, creating a graph or coming up with an algebraic expression. And so one of the purposes, then, for our re-engagement throughout the year was that we just didn't want kids to feel comfortable with one of those strategies in answering that "Picking Apples," but we wanted them to feel very comfortable with all of those. And so we knew that each of one of those had some particular challenging mathematical issues.

KAMALJIT SANGHA: We basically want them to realize they also are equivalent mathematically.

CECILIO DIMAS: And then that tied in to a MARS task that we gave called "Gym." After we gave the students the task and we analyzed the student work as a team, as a department, we focused on question number 2, which was heavily focused on the idea of presenting their mathematical explanation using a verbal representation. So going along with that being one of the multiple representations, we decided that we would create a re-engagement lesson based off of the "Gym" task but focusing on having the students show their thinking, their mathematical reasoning, using a verbal representation in addition to a tabular representation.

SALLY KEYES: Then we decide to go to the table next. What was our reasoning behind that?

CECILIO DIMAS: Since the "Gym" task was very heavily reliant on verbal representation, we felt that that would be a lead-in to creating a table, so that then in the future we would be able to work with them to go into graphical representation.

KAMALJIT SANGHA: We also noticed that when they were trying to answer the "Gym" problem, they were trying to come up with some sort of table. And there were different tables. So we figured that would be the first step toward it.

CECILIO DIMAS: There was this idea that that was a way to organize information and organize data, but the students weren't quite sure – just like Kamaljit just said – weren't quite sure how to organize it all.

SALLY KEYES: Continuing about the lesson for today?

CECILIO DIMAS: So then, after looking at the "Gym" task and honing in and figuring out that the tabular representation was a representation that we wanted to focus on, we created another task, another problem, called "DVD Plans," where we had three different companies with three different plans for charging their customers to rent DVD's. And we came up with a prompt that focused on at what point in time, if ever, will the three plans match up. When will the plans cost the same amount of money? So we brought in the element of cost analysis, comparing three different plans, representing it in a table, and also using verbal representation.

SALLY KEYES: And that gets back to "Gym," because in "Gym" it was that cost-analysis piece again, but just two plans. And when were they going to be costing the same, and how many visits for one versus the other.

CECILIO DIMAS: We will be working with multiple tabular representations and really focusing on how they were set up, how they were structured. And looking at whether they make mathematical sense, and whether or not they match the original DVD plans. And looking to see how they're structured. Some students may set it up in vertical columns; others might use rows. Just looking at the different ways in which a student could organize their data.

SALLY KEYES: The different kinds of representations and the tables that were going to be used in the re-engagement lesson – where did those come from? How were those developed and in what order did you decide to use them?

KAMALJIT SANGHA: We looked at student work, and we noticed certain misconceptions that they had. Certain students made separate tables, certain students made one table, and certain students have it vertically, others have it horizontally. So those are the examples we used. And also depending on where they're starting – like start at one, start at zero.

SALLY KEYES: So we selected student work that purposely addressed particular mathematical issues that we wanted to make sure kids had a good solid understanding of, in order to understand the use of a table mathematically and the equivalence with other representations.

SALLY KEYES: What do we consider to be then the big mathematical ideas that we are addressing in this particular lesson as well as what we're thinking about overall for the year as far as our lesson study re-engagement?

KAMALJIT SANGHA: Multiple representation and their equivalence. Getting that same mathematical idea from all of them.

SALLY KEYES: We realize how critically important that is because there are certain students who – they don't tend to see the equivalencies of them. They may go just to the table, or they may go just to the verbal, and sometimes they're not really comfortable with all and realize that they can actually find out the math information from a graph.

KAMALJIT SANGHA: And exposing all this to the students, all the representations.