

JIM KARDITZAS: Molly, I know you did a pre-assessment for the Rolling Cups lesson. What -- what observations did you make about either success or misconceptions or struggles that you anticipate from this work?

MOLLY MCNINCH: So in the pre-assessment, a lot of the students were able to see the relation between the wide and narrow diameters -- so, the top and bottom of the cup. And so they knew that there was a relationship there, between the wide diameter specifically and the roll radius.

And they also knew that the relationship -- or, not "they *knew*" -- a lot of them *discovered* that the relationship between the wide and narrow, depending on the difference is, the smaller the difference, the larger the circle. So one of the -- so a lot of the students that were kind of having misconceptions were not necessarily -- a lot of the students who were struggling, were struggling because they only could get so far.

So there was almost a piece that was kind of keeping them from moving forward. So for example, there were -- there was one student in particular who made an argument, and as I stated earlier, made the argument and then provided evidence that didn't support their argument.

So they had the argument that the taller the cup, the greater the radius, and that it also depends on the angle of the slant height. And then proceeded to show angles of the slant height. But then I noted, "Look at Cup E. Does this follow your idea?" Because Cup E talks about -- the taller the cup, the greater the radius. And so Cup E is actually the tallest cup, and it has one of the smaller/middle radii.

And then -- so there were a lot of students who came to ... knew that there had to be some type of relationship. So the brainstorming that they were doing was, they were trying to create ratios, they were trying to multiply the different numbers to make sense of, "How am I using this data?"

Now, I tried to -- I tried to tell my students multiple times that people never give you data that's useless. And they're -- even if it's data you're not going to use, they put it there to either trip you up or to give you a different insight.

There was one student in particular who came to almost the exact conclusion that you and I had when we did this, which was: the longer the slant length, the larger the circle; there must be a difference between the two diameters for it to create a circle. So this student knew that there had to be a long slant height or a small slant height, depending on what size circle you wanted to make. So the larger the slant height, the larger the circle. But they also knew that there must be a difference. So she concluded that they [the two diameters] can't be equivalent. And so if there's a difference between the wide and narrow diameter, it will make a circle.

Now, I really like that -- so with this student in particular, they had a very good explanation, but it's all an explanation. So this student didn't model their mathematics so much as they explained it, which is not a bad thing at all. I'm happy with explanations. But really commenting on the work, saying, "Could you represent this using variables and operations? How would you think about it in a more mathematical way? Or you can represent it with a model, represent it with all different types of images, etc."

And then -- so there were also a couple diagrams -- and a lot of the students, because they knew there was a relationship between the diameters, there were several students who didn't account for the slant height. And so a lot of the comments that I made referred to comparing all of the cups that are given or comparing the three different values versus just comparing the diameters.

And so that goes back to comparing diameter to radius, diameter to diameter. So knowing that even though it's a diameter, that doesn't mean that we can't compare it to a radius.

Yeah. So -- and then, because a lot of them were kind of moving forward but are kind of hitting a wall, one of the modifications, I thought, would be to put them in groups of three or four.

Now, my students in particular have trouble reasoning -- not reasoning. My students have trouble supporting their arguments, so putting them in a little bit of a larger group is a little bit more power to draw from, so more ideas to draw from or more people to express their thought process to. Now, when it's just one other person, I think it can be really intimidating for a student, or it can cause the, "Okay, Jim's going to do all the work. I'm just going to sit here and copy everything he does." Which can happen, but you know.

JIM KARDITZAS: So instead of using pairs, you're going to use threes or fours?

MOLLY MCNINCH: Threes or fours. Yeah. And -- I think that's fine. Also, it'll hopefully shorten the amount of time between transitions because they're already with their group and they will have all their materials. They'll be able to do the task hopefully in a little bit shorter time, but we're not anticipating that.

JIM KARDITZAS: Okay. So what other modifications did you make for the lesson?

MOLLY MCNINCH: So, the other modifications that I made -- so, in addition to creating larger groups, the modifications of not using the post-lesson assessment but rather using a status poster.

And that's really to -- instead of evaluating how they worked, I wanted to focus on them modeling their mathematics. So really focusing on the fourth standard for mathematical practice [Standard for Mathematical Practice 4: "Model with mathematics"] versus the evaluating other students' work, which I think is one of them. Yeah, so -- critique the reasoning of others [Standard for Mathematical Practice 3: "Construct viable arguments and critique the reasoning of others"].

So the third mathematical standard versus the fourth mathematical standard for my class in particular. Oh, I waved. Sorry. So for my class in particular, I wanted them to focus on the "modeling with mathematics" standard versus the "critiquing others' work" [standard].

JIM KARDITZAS: Okay. Thank you.

MOLLY MCNINCH: Cool. All right.