

>> I loved the way you set up the class in terms of, "Here's what we already know about graphing lines, and now we're going to go figure out some stuff." You set it up in a way that the kids just seemed ready to go. What did they figure out about graphing quadratics?

>> I think what they figured out is that they have the bits and pieces that they need in order to make a quick sketch, and they didn't quite get far enough to be able to put it all together and have that aha moment. But that's actually fine with me, because I'd rather have that aha moment happen first thing tomorrow, and then be able to build on that aha then uh, have it happen at the end of class and then the energy dissipate.

Um, coming in, they'd -- they'd had a little bit of exposure to zero-product property, although we didn't call it that, we called it mental math. Um, they had a little bit of exposure to factoring, quite a bit more to multiplying. Um, they had plenty of expo-- exposure finding  $x$ - and  $y$ -intercepts of lines. Um, and we call those three, um, sub-problems, um, "the three-ring circus" that underlies the group tests that they worked on today. Um, so, today was a chance for them to take those three -- three rings, and start to see how they interlock, and we're almost there to look at the middle of the three rings. We're not quite there but we're in a great place.

>> I have to ask, do you have a way tomorrow, of getting them to that aha? About the quadratics?

>> Oh, they'll -- they'll do it.

>> They're just right there. With the warmup, they'll do it?

>> Uh, yeah. I won't have to do anything, I hope. I think I can um, I mean I could reorganize the class by the -- each of the four problems that they worked on. I don't think I need to do that. I think I can give them a sample problem and ask them to use it as a vehicle to show off what they learned the day before and they'll -- they'll know what to do. And that idea of -- of showing off learning, I think, is something that throughout the department we try to build on quite a bit so that students know that we're learning this not just to be able to regurgitate something, but because there is a big picture that I'm trying to get a handle on um, and at routine points I'll be asked to show off what I've learned.

>> It was -- it was so evident at the end when you said, "So we've worked through this activity here, now each one of you take one," and, uh, I had to imagine that they knew -- not only did they have to put together these little bits and pieces for themselves --

>> Yeah.

>> -- but that they kind of owed it to someone sitting next to them just a little bit, that when they come tomorrow, they'd have to be able to show that.

>> Well I think -- normally I -- we don't do curriculum by starting with small pieces and building to big. Usually we start with a big idea and let the small pieces fall out. But in this case, because there is this complexity of pieces, um, we did start small and -- and proceed to big before they were really ready. Like, they don't have mastery of any one of those three -- three-ring circus

pieces, and that meant that the task today was genuinely group-worthy. Because in most teams, there's one person who knows the mental math stuff pretty well and can give justifications, there's somebody who's -- has complete command of generic rectangles and knows how to factor, um, and there is someone else that has command of the -- the third piece, and there's a reason for them to talk to try to put all that together. And a reason to call me over when they reach some points where they're a little bit stuck or they don't realize some shortcuts, like at the end when they were making long T tables to find the vertex instead of taking some shortcuts.

>> So, when you're moving group to group, you're in many ways assessing, you're checking where they are and what pieces they have put together.

>> And that the -- the pedagogical flow of the lesson, um, has been transparent enough to them, that they're, um, they're understanding what they're supposed to be figuring out. So, that's why in three out of the four groups, they, um -- they didn't realize that they could just look exactly in the middle of the x-intercepts to find the vertex, and I -- because I was watching, I knew to go over and intervene and try to, um, steer them in that direction.

>> I loved it at the beginning when you said, um, directly to your facilitators, you -- you said, "What question are you on?" And go ahead and get them started. They heard you, they did it, and it seemed to go the entire period through.

>> Which is not typical, because 90 minutes of solid work together is hard for kids to sustain. Usually something like 75 minutes. But it was, it was perfect because they needed all 90. Um, had they gotten squirrely and off-task, then I would have interrupted them with some kind -- some focusing questions or some summary questions for them.

>> I think today they were motivated because they wanted to do the wave at the end.

>> They did want to do the wave at the end. [laughs]

>> They deserved a celebration.

>> We -- we had to make an arrangement, like, in the last five minutes.

>> [laughs] Thanks.

>> It was fun.