

## Video Transcripts

### Playing with Quadratics: Activity Design

*Laura Epp (Teacher):* Understanding and solving in math can include visualizing a concept, thinking about it in different ways, representing in different ways, playing with ideas and the importance of persevering when solving different kinds of problems and using different kinds of flexible strategies to do so.

So designing with that in mind helps me to not only be explicit about what I am teaching, which I think we have been good at in math with, historically speaking, but also how we're going to teach it and why. Games, movement, drawing, talking, exploring, thinking, all of these different ways to help deepen the understanding.

We wanted to make engaging activities that have a low floor and high ceiling so everyone can participate at different levels. We wanted the activities to be flexible for teachers so that they could use them in various groupings. They could use parts of them, they could use them as an introduction, as a review and even in as formative or summative assessments.

All the activities we did with the Pre-calc 11 class could be easily adapted to different grade levels. You give students some parameters and they create something. And you could do that inside of a grade four multiplication question. Or you can have that be, to design a function in calculus that has specific maximum and minimum points and derivative. Really gives an opportunity for students to think in a different way than when they're just answering the question, when they get to create something.

When I started teaching, many years ago, the focus was on the content in the planning process and shifting this focus to include curricular competencies has allowed me to not only look at the content but also focus on the idea of understanding and what actually helps students understand deeply the content we want them to learn in mathematics.

### Playing with Quadratics: Activity Delivery

*Laura Epp (Teacher):* We're going to start with a little quizlet live, which I know you've done before and it's a great collaborative way of exploring the math concepts. Then we're going to get some exercise with graphing aerobics. Then we're going to work in partners in a Desmos activity you have not done yet. And then end with just a quick checklist

*Michelle Burton (Teacher):* Alright, so those are our teams, so if you guys can move together please, find your group.

Alright, competition starts now!

So what do you think...

Oh, there we go!

*Laura:* It's time for some graphing aerobics. Just a little reminder, we got our beautiful parabola shape where this is the vertex. And if I wanted to move that to the left or right then all I'd have to do is some side steps, if I want to move it up or down, on my toes, bend my knees. I can make this a reflection over the x axis, if you imagine the x axis is right here, we can reflect it down with a negative a.

*Students:* SRT

*Laura:* S is stretch. R is, what do you think? Reflect, and then T is translate which is this, left, right, up, down. So find a spot, let's get ready for some aerobics!

3, 2, 1.

Very good, so I saw you make 2 right steps.

Add one more layer of complexity, here we go, 3, 2, 1.

Yes, I saw you go left two, and up one, very good.

And here we go, 3, 2, 1.

Very nice, reflected, went right 4, up one.

Perfect, you deserve a round of applause!

*Michelle:* And so you're adjusting the equations and you could also adjust the domain or range and if you need a hand with that call one of us over so we can give you a hand with that. Alright, it's time to play, work together as a team to basically successfully get all the stars.

*Laura:* Now the purpose of the self-assessment is for you to think about how you understand something as complicated as working with graphing quadratic functions. So all you have to do here is check what applies to you and fill in a couple of blanks. It's important to think about how we learn.

### **Playing with Quadratics: Deal with U! Delivery**

*Grant Gasser (Teacher):* So just slide this into one of these slipcovers.

It would be nice to have a set of cards for every table, and then you do what I'm doing. So instead, I will ask you to draw one from each of the stack here.

Ok so let's try this, opens up, does not cross the x axis, has a vertex in quadrant 4, and again, there might be the chance that it doesn't work.

Answer is?

*Student:* Not possible.

*Laura Epp (Teacher):* Very good!

*Grant:* Not possible. What could I do to make this work, as opposed to take things away?

*Student:* You could have it open down.

*Grant:* Ok, so let's just do that.

*Laura:* A lot of you have this, how many of you have this solution? Who has something different? Ah yes you have a taller graph.

*Grant:* What did you do to get this?

*Student:* I plotted my y intercept, and I knew that my vertex had to be in quadrant 2 so I just picked a point to see if it would end up going there. And I knew that if I went up five and over and then up 3 and then over and then up 1 and over it would take me to that point.

*Grant:* Wow, that's great!

*Grant:* You have a space at the bottom of your graph page, so now we've got into the quantity of things so now you can start representing your quantities as equation forms. Then I would like you to tell me what's the y intercept?

*Laura:* Don't be afraid to look at what your neighbour has, do you have the same thing as they do, do you have something different? The reason you're in groups like this is so you can talk to each other.

*Grant:* So, does anybody have an answer?

*Student:* I put it into x-intercept form, factored form. And then I factored it out and got the quadratic.

*Grant:* How did you get to the 12 though?

*Student:* I did, like negative 1 times 2 squared which is -4, plus 16 is twelve.

*Grant:* So that's awesome!

*Grant:* This is sort of our assessment, end result activity, something that your teacher or I can take away with us to see how you're doing. It's a collaborative assignment, so you can work together with a person or you can work alone, it's up to you.

*Laura:* What is something else other than the  $a$  value, what else did we play with?

Vertex, yeah we moved the vertex around.

What else, yes?

Yes, so we started the graph in various quadrants.

What else, do you have one?

### **Playing with Quadratics: Activity Reflection**

*Laura Epp (Teacher):* So they really had an opportunity to take what they knew and try things out and play and explore. They were highly engaged, and we know that students who are engaged learn more.

*Jayden (student):* The lesson today was really good. I found it; it was fun. Having the interactive activity helps me because I am a little bit of a visual learner. And after I knew the basics and I knew how the numbers worked together, seeing it helped me wrap it all in together.

*Cara (student):* I found the way that I applied math skills, I don't know. I found it interesting with the different activities that we did because I didn't really know that I could apply math with using aerobics, for example.

*Grant Gasser (Teacher):* In an open-ended activity like this where there's no answer book at the end, it's just let's talk about what happened. I give you a couple of parameters and it's not possible. Okay. Why isn't it possible? So there is a bit of that where it's co-created. It's not so teacher directed. Students can have an opportunity, which is always nice, to correct the teacher and say, "Well, you know what? I think this." Or, "I think that." There was a bit of that as well.

*Melissa (student):* I enjoy group work because I think talking out your questions that you have towards the formulas and stuff really helps you understand it more and have a deeper meaning of what it's like really doing the equations.

*Owen (student):* With math you have sort of the algebra route and the visual route, especially with graphing and in this case I found it pretty normal for me since that's what I find easiest, but I did like the fact that we were forced to look at it both ways and then we were able to learn about using the different ways of visual and the algebraic methods.

*Laura:* One of the *First Peoples Principles of Learning* is that learning is experiential and relational. And in all the activities we did in the last two days with the students, they really got to make observations, interact with the

material in different ways and with each other. And so I think that really is a nice reflection of that principle. And it is a good reminder because when you are learning something with people and experientially it's fun.

*Melissa:* I thought applying my math skills in a game really made it more, it made it more fun and it made me understand more and learn through a different way.

*Grant:* We ask students, "Well, what mistakes did you make and then how did you correct them?" And, so, they'll put that in the thinking. I made this mistake but then I looked at my neighbor and they said this so then I changed it to this and then I realized that I should do that. Those kinds of things that talk about what were the process steps that you went through. I think that's important for the new curriculum side.

*Kai (student):* If someone doesn't understand something, and I know how they- how I could help them, it's really good to communicate them, and they—I don't know the answer to something, they could explain it to me, and communication is really a big part of understanding.

*Cara:* I liked working in my group because it was collaborative, so we could input all of our ideas and share what we thought. And if we got it wrong, we would just cooperate and learn from our mistakes and just move along.

*Melissa:* I thought the self-reflection was a good way to really understand what we learned and how we learned things today and what we know now.

*Owen:* It's very good to be able to look back on what you've done. It really, really helps and it's very important to go back and reflect on your work or else you pretty much just forget about it.

*Kai:* It's really good to have a sheet like that, to reflect on what's going on. So then you'll be like, hey, I did learn about that.

*Laura:* When looking at the self-assessments and I saw how diverse their preferences were and the different things that help each student learn and my takeaway is to do as many different activities as possible so that you can reach the diverse needs of your classroom and help all of them be successful.