

## **Empowering Students in Math Problem-Solving Through Robotics and Coding**

STUDENT: I don't usually do coding 'cause I can't name the learning that's coming out of it, and that's why I don't usually do it, but today I did it because I felt confident and I knew I could do it.

STUDENT: I think it helps because with problem solving and you have to decide what tools and where you want the person to go, and if you programmed him to go somewhere and you didn't know left or right then you would program him to go somewhere else than you wanted him to go.

STUDENT: Dash can help you with your math 'cause you have to problem solve and prove that it's working.

STUDENT: You have to put how fast it would go and the metres and everything, and if we didn't put that information then he wouldn't know where to go or anything.

AMY ZORZETTO: Let's talk about what do you need to do with this so that you have an accurate measurement because you want it to be as accurate as possible, right? Novo?

STUDENT: So start it from the front of our door so that it doesn't move. I keep my finger here and turn it.

AMY ZORZETTO: So what have we learned about when we measure? I think that's what you're talking about. So if I want to measure, and this is my metre stick and I want to measure from here what do I need to make sure I do? Take a look at this and think. When you have this, Cole, let me ask you. So say let's use the wall as a guide okay? So we have it along the wall and I want to start measuring, I want to do another metre. Grab another metre stick and show me how you would do that,

The doing of the math, those math process expectations are so closely aligned with coding and robotics that they go hand in hand.

AMY ZORZETTO: So what do you mean it wouldn't be exactly?

STUDENT: Like it would be a few centimetres off.

AMY ZORZETTO: Okay, and is that important? Does it matter?

STUDENT: Yeah.

AMY ZORZETTO: It does matter? Why does it matter?

STUDENT: Because then we wouldn't measure this.

STUDENT: Yeah, and then we might hit the door when we're going into the office.

AMY ZORZETTO: So this doesn't seem like very much though does it?

STUDENT: No, but it makes a big difference.

AMY ZORZETTO: Why does it make a big difference?

STUDENT: Because if we even get a little bit off in the one wheel it could turn the other way.

AMY ZORZETTO: So the wheel would turn? So what about the straightness of it in terms of the distance? So say we have one there like this--grab me another metre stick up there, right? Grab another metre stick and we're going to do the same thing. Thanks, Zachariah, and we'll add it down here. If I do similar to what you did like that, and if we did that all the way down the hall do you think our measurements would be accurate?

STUDENT: No.

AMY ZORZETTO: So what's really important that we need to do?

STUDENT: Make sure they're straight, and together.

AMY ZORZETTO: And together right? So let's think of that. SO what kind of math have we been doing when we've been doing this?

STUDENT: Measuring?

AMY ZORZETTO: We're measuring, what else? You're gonna be programming into the coding. Now you're gonna be measuring in metres but this in the Blockly here, it doesn't measure in metres. It measures in?

STUDENT: Centimetres.

AMY ZORZETTO: So what do you have to do?

STUDENT: Put it on 100.

AMY ZORZETTO: Do you guys want to go measure it?

STUDENT: Yeah.

AMY ZORZETTO: And do you want to--are you starting to program everything else and then they're gonna bring back the measurements for you?

AMY ZORZETTO: They were really interested in bringing the attendance or a note down to the office and so it was really important for me to understand if they had the knowledge around the measurement pieces that they needed to be able to do that and to question that around there. So a lot of the questioning was open ended so that they could share with me what their thinking was but also really important is to gain knowledge about what they already had knowledge and maybe what I needed to scaffold in terms of the thinking.

AMY ZORZETTO: You used the trundle wheel, what did you get?

STUDENT: I got 28 and then--

AMY ZORZETTO: 28 what? Do you remember what the unit is?

STUDENT: Metres.

AMY ZORZETTO: Metres, okay 28 metres.

STUDENT: And Cole what did you get with the metre stick again?

STUDENT: I got 37 metres and 18--

STUDENT: And then we kept doing it so it seems like 36 is the middle so we're gonna go with that.

AMY ZORZETTO: You're gonna try 36?

STUDENT: Yeah.

AMY ZORZETTO: Okay, so did you program that in?

STUDENT: Yeah.

AMY ZORZETTO: Did you figure out how many times? You're doing the repeat button, right?

STUDENT: Yeah.

AMY ZORZETTO: And so how many times did you do the repeat?

STUDENT: You can only do 20.

STUDENT: 36.

AMY ZORZETTO: Okay, so you decomposed the number 36 into?

STUDENT: So we did 20 and then we did 16.

AMY ZORZETTO: 16, okay.

STUDENT: Wait, but then we're repeating 16 20 times, you know, right? Because look [INAUDIBLE]

AMY ZORZETTO: So you've put the repeat button inside the repeat button. So tell me again, Cole, what you think might happen.

STUDENT: It's gonna repeat 16 20 times. And that's gonna repeat this lots of time.

AMY ZORZETTO: So See if you guys agree. Let me turn it so you can see it. So right now it says when start repeat 20 times. What's being repeated 20 times?

STUDENT: This, 'cause it's in there.

AMY ZORZETTO: So Which is forward 100 fast. It doesn't say what unit it is, right?

STUDENT: Yes.

AMY ZORZETTO: But what unit is that when you go to program it actually?

STUDENT: Centimetres.

AMY ZORZETTO: Then it says there right? Thanks, perfect Novo.

AMY ZORZETTO: I discovered that they know a lot about measurement, that even they did some conversion that is not necessarily connected--for some of them wasn't within their grade level. It was actually higher than their grade level but it was an authentic reason to have that understanding and that they share their knowledge with each other around that too. So I also noticed that they understood about how when you measure items you have to have the items connected to each other so that there's not spaces or gaps in between which is a huge, big idea for our students to understand.

AMY ZORZETTO: Today what you saw is an example for coding or robotics they focused a lot on measurement. And measurement always tends to fall into the aspects, but we actually focus a lot on the math process expectations and how

they're connected. So as the students we just recently reflected on that. So throughout the year I know they've always been connected, and so as a teacher I've always known that part of the curriculum is a piece that I want to focus on and spent time with the students talking about those pieces but I've never actually named them for them. And I realised pretty recently that, that was something that I needed to do with them. I needed for them to make that connection back. So we focused on the math process expectations and actually as the students, as I explained them they actually spent some time collaborating to decide how it was connected to coding and they blew my socks off is a term that we use in our class but they did because they went way deeper than I even did right? Because they're the ones that are doing that learning.