

Article 5 Ways to Do Robotics Remotely

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Distance Learning & STEM

5 Ways to Do Robotics Remotely

This robotics teacher has found creative ways to continue STEAM lessons with her students virtually, even when they don't have robots.

- By Dian Schaffhauser
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Think about how many uses besides the obvious ones you can come up with for these objects: a sheet of paper, a marble and a straw. How about these applications? Using the straw to suck air out of a food bag before freezing, or converting marbles into wheels and a sheet of paper into a paper boat. During a recent **ISTE 20 Live session**, Colleen Larionoff explained that she likes to give students divergent thinking exercises like this one, sharing responses via **Padlet**, to show them how there are many different ways they can answer a question and solve a problem.

Larionoff is an innovation coordinator and robotics coach for **Dwight-Englewood School** in New Jersey. During a brief ISTE "snapshot" session, she shared what she has learned about helping her students develop critical thinking skills and develop their social-emotional skills with the remote robotics classes she teaches.

Stay Flexible

Remote instruction is still fairly new for most teachers. While you may have a set curriculum you want to go through, Larionoff noted, you also have to be "willing to completely change it." As an example, while she'd normally give students access to LEGO, VEX and Arduino robots, that's not always possible in a remote setting. So she's turned to the use of "found materials." She offers challenges to her students, such as, what Rube Goldberg-like contraption can you build using these components? And if you

don't have these components, what can you use in their place? Students have concocted robotic arms, gear systems and catapults out of little more than cardboard, string, straws and small robot parts that she was able to send home with them.

Flexibility also requires Larionoff to acknowledge that she's learning too and to solicit feedback from her students to find out what they think about what they're doing.

"Being willing and showing that you are also willing to grow with your students really helps them feel empowered to do STEAM," she said.

Similarly, stay sensitive to limitations students might face in their home environment, whether that might affect their access to the materials they might need for your projects or the space in which to do building and construction.

"Be mindful of that," Larionoff advised.

Reconsider How (or Whether) to Provide Examples

Larionoff said she struggles to decide whether or not to provide an example. On one hand, beyond providing verbal or written instructions, an example can help make clear what your expectations are, "especially for those with limited language ability."

On the other hand, students may just copy the example, thereby limiting their creative thinking and student agency. Also, she suggested, teacher examples can "promote frustration" when the student tries to recreate it but can't make their version look like the teacher's version.

As an antidote, Larionoff offered a few ideas:

- Show a student example;
- Share an example she's made that's "flawed or unfinished in some way" and then point out what she'd do differently the next time, "to make them think critically and realize that what I'm doing isn't necessarily perfect"; or
- Model the engineering process, by making an example in front of the students and then disassembling it again "so they can't copy it."

Use Scaffolding to Balance Student Agency with Support for All

Larionoff considers student voice and choice "really important." Giving them free rein "can really help them be creative," she pointed out. However, that can also be "nerve-racking" for other students, such as those who don't speak English well and don't understand what you're asking them to do or those who have other learning differences that make it tough for them to work with so much autonomy.

To address both quandaries, she likes to keep her basic instructions to the "bare minimum" and then provide a statement to this effect: "You can stop here Below are additional resources if you need help." As she noted, the step-by-step is available to those who want it, but it won't hinder those who don't.

She added that when working with English learners, teachers need to remember not "to confuse language ability with intellectual ability." They're not to be babied, but empowered.

Also, Larionoff reminds her students "to start with what you know and grow from there." Allowing students to set their own goals is especially useful in activities where some students have a lot of programming experience, as an example, and others have none.

Promote Growth Mindset through Feedback

The feedback Larionoff gives to students pushes them to think about what they've done. She likes to ask reflective questions such as:

- Can you make it better?
- What if we didn't have one of those materials? What could you have used instead?

When students finish their projects early, she'll ask, "Is there a totally different way you could have solved this problems?"

The goal with these questions is to encourage them "to persevere" and to understand that the work can be hard, "and that's fine."

Try Self-Study for Self-Paced Choices

To provide students with cross-curricular resources that allow them to do self-study, Larionoff has turned to hyper-linked documents, slides, choiceboards and Bitmoji classrooms (which can become "huge time consumers," she warned). The idea is to

create clickable parts that lead students to daily challenges, articles, videos, art and building projects -- resources that they can go through at their own pace.

These self-paced concoctions are where Larionoff has been able to explore aspects of robotics that don't fit always into the maker mold, including career explorations and ethical concerns. She poses questions to students, such as, "Do robots take jobs or are they doing jobs people don't want to do or couldn't do safely?" and then asks them to share their responses.

What's important is to make sure that diversity is reflected in the choices offered.

Collaboration also comes into play. For instance, coding is a part of the content for Larionoff's classes. But when students get stuck, she likes them to take it to the group by sharing their screens -- though she doesn't force it. She also uses pair programming, places students into breakout rooms and asks them to show their progress and leave comments in various tools, including Padlet and [Flipgrid](#).

"It's Hard, It's Different"

When school moved online a lot of people asked Larionoff how she could continue doing robotics.

"Honestly," she said, "It's hard, it's different."

But even so, robotics encompasses plenty of skills development that has nothing to do with the hardware itself, and that's what she emphasized in her ISTE session. "If you think about the purpose of robots and how they help people and then think about the problems that robots are helping to solve, you can really promote empathy in your students by having them think about the diverse users and what their needs are."

To pick up more advice, ISTE registrants [can watch Larionoff's complete session online](#).

About the Author

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