



BRYAN MILLER

Constructing Coders Who Create in ALL K-12 Classrooms

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A little bit about Bryan

- ❑ A former educator of 15 years. He began teaching kindergarten and became a K-5 computer science teacher.
- ❑ Currently the co-founder and CTO (chief toy officer) for Top Tech Toys.
- ❑ Director of education outreach for Wonder Workshop
- ❑ International keynote speaker

Why teach computer science?

- “In the new economy, computer science isn't an optional skill – it's a basic skill, right along with the three “Rs.” - Barack Obama

Why do we want computer science in every class?

- **Computer science should fit in every subject that we teach. It should be integrated into the curriculum.**
- We need to get past the idea that computer science is just a 45-minute stand-alone class.
- Computer science is motivating and engaging for students and we can harness that energy in every content areas.
- **The benefit of teaching computer science is empowering students to become problem solvers, creative thinkers, and creators for their world that does not yet exist.**
 - Students use analytical thinking, problem solving and creativity when programming and those skills are used in every subject area.
 - Grit and resiliency are built in when students are working through their programs and trying to debug their code. Working through challenges helps students to learn how to fail forward.

Low technology or no technology ideas for teaching computer science.

- **If then computerless challenge**

- A challenge that is very similar to the game Simon Says but instead use the programming language of “if-then”.
- Say to students “if I do this ___ then you do this”. Ask for a student volunteer to be the programmer that gives directions to the computers (other students).
- This activity can be bumped up with deeper vocabulary such as “if then else”. For example “if I do this then raise your right foot, else raise your left hand”. A speed round can be added to gamify this activity.
- You can pull in any vocabulary from any curricular area for this activity.
- **Coding the planets activity**
 - Students cut out the planets and place them on a giant grid. Students then need to write the program for getting the planets from one place to their correct place on the grid.
- Lots of free resources for teachers to access these unplugged activities for students.
 - [Code.org](https://code.org) has TONS of free unplugged activities on their site
 - [Makewonder.com](https://www.makewonder.com)

Computer science isn't JUST programming. We don't expect students to become programmers. We are teaching essential skills.

Debunking fears around teaching computer science.

- What if WE as teachers don't understand programming? How can we teach it to our students?
 - The students are the best teachers. They are engaged and interested in computer science and will take the opportunity to learn on their own and teach one another.
 - **You don't have to be an expert. You can dig into free content available to you to learn computer science.**
 - If a student, or students, show particular interest in learning computer science allow them the opportunity to show what they know using programming.
 - Get connected with others who are exploring computer science with their students.
 - There are tons of resources available to us for teaching and learning computer science. Free online conferences such as Ditch Summit.
 - Webinars from edweb.com on computer science and robotics.
 - Courses for teachers and students
 - [Code.org](https://code.org) has free resources available that you can access anytime.
 - Online learning course from Wonder Workshop called [Teach Wonder](https://teach.wonder.workshop.com).
 - [Code Academy](https://codeacademy.com) and [Tynker](https://tynker.com) both have lots of free resources.
 - Get social on Twitter and follow the hashtags to learn from and with others.
 - #Coding

- #CompSci
- #Robotics
- #CSforAll
- Books available for teachers who are interested in integrating computer science.
 - [Hello Ruby](#) by Linda Liukas
- Websites
 - [CSforAll](#)

Integrate computer science into all subject areas.

- If you understand some of the basic foundational skills needed for computer science then you can begin to integrate these skills into other subjects areas.
 - For example, if you have some understanding of conditional logic then you can apply that concept to choose your own adventure activities in Google Forms or Slides.
- **Try [Scratch](#) with your students. A totally free programming language with tons of free resources available for teaching with it.**
 - Use Scratch to teach math by using the coordinate grid when creating your programs and moving the sprite along the coordinate plane.
 - Can integrate a lesson on degrees when programming your sprite to turn or by programming a shape.
 - Use decimals to show how the sprite is moving in smaller increments.
 - Understanding positive and negative numbers when moving your sprite forward or backward along the coordinate plane.
- **Use affordable items to bring physical computing into the classrooms.**
 - Dash, Dot, and CUE from Wonder Workshop
 - Allows students to explore computer science in the physical world.
 - Uses a digital device to navigate the physical world.
 - Simple enough for kindergarteners to use but challenging enough for older kids with the different apps available.
 - Free lessons and activities on [MakeWonder.com](#).
 - Lessons for ELA examples.
 - Create a biography timeline and program Dash to drive to each point on the timeline. Have students use the voice recording feature to explain the important events on the timeline.
 - [MakeyMakey](#)
 - Allows you to turn anything (that connects electricity) into a keyboard or touchpad.
 - Educators section on their website with tons of free resources that integrate MakeyMakey projects into your curriculum.
 - Use MakeyMakey to recreate the game operation and put and adapt it for other subject areas.
 - Parts of a flower

- Human body

Ways to raise funding for bringing these items into the classroom.

- State and federal grants are available, you just need to look.
- DonorsChoose is a great option for getting items, especially for projects under \$300, funded.
- Become a BETA tester. Companies will send you products to try with your students in exchange for your review and feedback.
- Local businesses will sometimes fund items you will use in the classroom. Best time to ask is the end of the fiscal year.
- Many companies have forms you can fill out on the websites to ask for free products.
 - Tips: Don't ask for dollar donations, ask for the product itself.

Resources:

- [Star Wars Coding Projects for Scratch](#)
- [Scratch for Educators](#)

Related posts on the Ditch That Textbook blog:

- [20+ FREE lessons for teaching computer science](#) by Owen Peery
- [25 ways to get kids coding across the curriculum](#)
- [20 ways to celebrate the Hour of Code in ANY class](#)
- [6 reasons why I want my students to code](#)