



This article is a part of a yearlong series on technology and innovation.

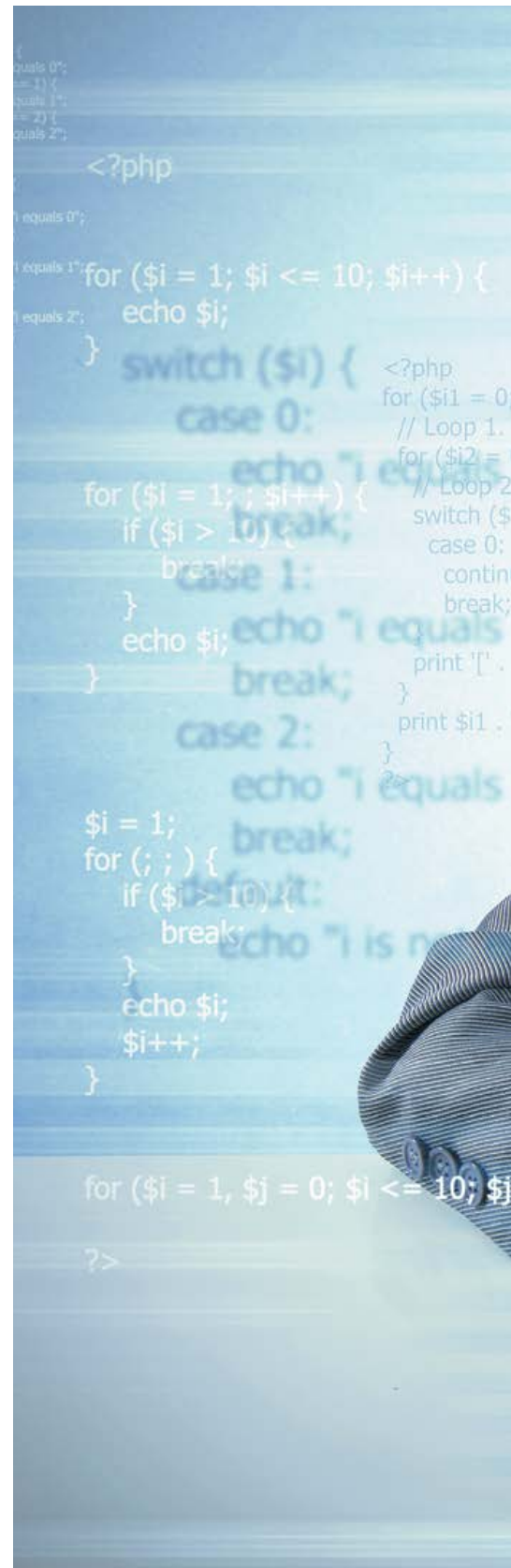
{crack the code}

Creativity, problem-solving, and teamwork abound when students are introduced to coding.

By Adam Welcome

Coding is the language this generation speaks, and educators should understand that language and support kids in their discovery of it. You can think of coding as the “back end” of virtually everything we do and experience online and with mobile technology. There are algorithms, characters, mathematical equations, and a lot of creativity that goes into all the code that makes our digital lives tick. When a website or app doesn’t work, there’s something wrong with the code. When you experience something amazing online or with your smartphone, that’s code someone wrote and put into action. Every sector of our life is infiltrated with code and every company in the world needs employees who can write code and solve problems.

It’s curious that so many people think coding is an abstract, inaccessible idea. Not so; it’s mainstream and very relevant in 2015. Coding incorporates problem-solving, math, 21st century skills such as collaboration, and Common Core standards. It’s our responsibility to create coding experiences for kids and to push them in new directions that will challenge them in fun and innovative ways. We must prepare and expose our students to this work, and here’s how you can get started.







DO THIS

Bring computer science to your school by committing to an Hour of Code. The Hour of Code initiative is a one-hour introduction to computer science, designed to demystify code and show that anybody can learn the basics. Schools should sign up to host an Hour of Code during Computer Science Education Week: Dec. 7-13, 2015. www.hourofcode.com

Cross-Curricular Focus

Schools across the country have been adding coding to their curriculum because they see the relevance it holds and how it crosses over into various curricular areas. We started coding at Montair Elementary School in Danville, California, because I saw how relevant it was to our students' daily lives. It's also relevant to the adoption of Common Core—it's college and career readiness to the fullest.

Coding is a mindset that can ignite a wildfire of innovation and creativity on your campus. If you're coding with kids, you're relevant, you're looking ahead, you're showing your community that getting kids ready for the world is important, and you're having fun.

Many leaders ask: "How do I get started?" "What should I buy?" Or they say, "I don't know how to code" or "We don't have time." Chances are you already have the pieces—here's how you can put the puzzle together. You don't need to know how to code to teach coding to kids. You do, however, need to be open-minded and ready to solve problems.

First, do some basic research on coding with websites such as **Code.org** and **codeacademy.com**. Learn some of the coding lingo so you'll be able to support students in their problem-solving. Another great resource is other educators. Your colleagues might have already done much of this research—take advantage and collaborate with them. Also depending on where you live, many technology companies will come and teach coding at your school as a community service project. Reach out to your parent groups and inquire, then have the experts help you in the journey.

Next, identify the device(s) on which students will learn to code. Students can use any type of device on your campus to code: iPads/tablets, any Chromebook or MacBook, or even an iPhone. My new foray this year is writing code with a Sphero droid and making the robotic droid do really awesome things. We're also hoping to offer an Apple Developer Program class to write for iOS.

Start small, pick a platform, play around with it, and then go explore with your students. My style is to loosely plan the rollout, show kids the coding resource we're going to use, pair them with a partner so they can solve problems together, and then let them go. You need to guide them and check in, but so much of coding is discovery and collaboration.

The final step is rallying the troops and getting the word out. Use the **Code.org** video on YouTube titled, "What Most Schools Don't Teach." Embed it on your school blog or website, Tweet it out, show it to parents and students, and build excitement for coding.

Coding Schoolwide

At my school we've integrated coding directly into the classroom for "genius hour," math extension activities, problem-solving units, and collaboration time.

Genius hours and math periods are excellent times to integrate coding into class time. You can simply buy a Sphero for \$99, and download one of the many recommended apps. Have students set up an obstacle course and drive the Sphero around the room. They'll need to adjust their code based on how the Sphero interacts with the code they write in the Tickle app.

Buddy coding is a practical way to introduce the language to kindergarten and first-grade kids. Pair up a fourth- and fifth-grade class with the younger group, and have them code together as they learn the ropes. This allows the older kids to teach the concepts, which is a great skill to learn. The teacher doesn't have to be the expert; the kids are.

Minnesota elementary principal Brad Gustafson's school has also been teaching coding to students. "When our school first started participating in the Hour of Code, it sparked a curiosity and passion in our students. Fast forward to today and the energy around coding and connectivity has ignited an epidemic of innovation," Gustafson said. "Our students are begging their parents for access to Sphero robotic droids and other tools they have access to in school. This is an amazing reversal from the traditional paradigm in which kids come to school wishing school was more like their 'real, actual lives.'"

Coding With the Principal

Three years ago, I taught a coding class at my school for students in grades 2-5. The kids were excited to code with the principal. We put out a call for expert coders, and a few parents who work in the technology sector were more than happy to help. **Codecademy.com** was also a helpful resource because it walks you through each lesson and students can choose from multiple coding languages to learn.

{coding ideas to inspire}

Here are a few more clever ideas for coding projects. Contact the principal for more details and information about implementation.

Beginning Code for Preschool: We used Bee-Bots—programmable robots—in our preschool to teach beginning coding. Students used arrow cards to plan a sequence. They first programmed a friend to get from point A to point B. Then they used the Bee-Bots on grid mats to do the same. *Dana Mulay, Ventana Vista Elementary School, Tucson, Arizona, @DanaMulay*

Math Rodeo: Our grade 3 team uses a model known as the “Math Rodeo,” which is designed to make learning fun while fitting in all of the Common Core standards. Every Tuesday, the grade level rounds up for a day of action-packed learning of specific standards involving math and coding/computers. Each class lasts 45 minutes, at the end of which students remain in their classrooms while the teachers move on to the next group. Each teacher focuses on one topic, ranging from measurement, fractions, and coding. The third grade is all 1:1 devices, which makes incorporating technology easy. *Jeff Kubiak, Cordelia Hills Elementary School, Fairfield, California, @princpalkubiak*

Mini-Lessons: Students play a game developed by the school’s computer teacher called “The Amazing Clockbody,” in which partners work together to write code, sequence directions, and conditional loops and statements to maneuver around a life-size game board. Students then use the Tynker visual programming platform to apply those ideas. *Kimberly B. Lewis, Cordova Elementary School, Cordova, Tennessee, @k2blewis*


We held the class on Monday mornings before school started at 7 a.m. You know kids are dedicated to code when they show up that early in the morning. Twenty-five students signed up and the entire group finished the six-week course. What’s really profound is that so many of those students are still coding in middle school and high school. They even started a coding club at their next school—if you just start the fire, they’ll continue to feed their passion. Here are some tips from my experience:

- Meet at least twice per week for 30-minute sessions. You need the consistency of meeting times, and one hour was too long for each session.
- Use a few different platforms and different devices. This allows for differentiation among the students and they’ll get to explore and discuss the differences, which will broaden their exposure.
- Pair up the kids so they have a coding partner. Coding is fun, but also challenging at times. It’s really nice to have a problem-solving partner when working on a difficult string of code.

- Set the ground rules: Have fun, relax, it’s not a competition, and stick with it.

It’s our responsibility to create these experiences for kids and challenge them in fun and innovative ways.

“Coding has breathed new life into math, technology, and even language arts by providing additional ways for kids to interact with the curriculum and state standards,” explained Gustafson. “Our students are creating codable mini-golf courses during the school day and sharing them with others across the country. Our after-school coding club numbers ballooned to the point we needed to hire additional staff so we didn’t have to turn kids away. Our students have spoken. This is their education and this is something they want to learn.”

The question is not should our students be coding? Students deserve the opportunity and it would be educational malpractice to limit them based on our unwillingness to adapt and learn something new. Make it happen and empower students with a new and relevant language. 

Adam Welcome is principal of Montair Elementary School in Danville, California.