HOW TO SPEAK CODE

As computer programming skills become a new frontier in digital literacy, public libraries are forging ahead with partnerships, meet-ups, and advanced courses

By Matt Enis

Last summer, *Bloomberg BusinessWeek* devoted an entire issue to "What Is Code?" a single article by Brooklyn-based writer and programmer Paul Ford. It quickly generated more traffic on the business magazine's website than any other article since the site's launch in 2010, editors told the *Huffington Post* a few weeks after the story's publication. The detailed-but-accessible essay discusses key concepts in computer programming, programming languages, and the software development process at businesses. Yet perhaps one theme that grabbed readers from the business community and kept them engaged throughout the 38,000-word piece was the idea that "you," a successful VP at a large company, are working with "The Man in the Taupe Blazer," a project leader who has been hired for a major overhaul of your company's website. And during your initial meeting, "you" can barely understand what he's talking about.

"For your entire working memory, some Internet thing has come along every two years and suddenly hundreds of thousands of dollars (inevitably millions) must be poured into amorphous projects with variable deadlines," Ford writes in the intro. "Content management projects, customer relationship management integration projects, mobile apps, paperless office things, global enterprise resource planning initiatives—no matter how tightly you clutch the purse strings, software finds a way to pry open your fingers."

The article doesn't argue that business executives could solve this problem by dropping everything and learning C. There is a reason that they hire experts for their multimillion-dollar projects. Instead, Ford's breakdown of key concepts pulls back the curtain on the fundamentals of computer programming and makes a compelling argument that any smart person can learn the basics—and that the basics are worth learning even for those who aren't planning to become professional coders. It is, in part, a case for coding as a new frontier in digital literacy. As technology becomes an ever more ubiquitous facet of modern work and entertainment, speaking a bit of the language is one of the best ways to facilitate communication with those experts.

"Once you understand the basics of coding—or anything, really—as you get older, you can see where it goes," says Alex Giannini, manager of digital experience for the Westport Public Library, CT. "Kids today are growing up with an iPad in their hands. They don't have to learn the digital language; they're born with it. The more that we can integrate even basic coding younger and younger, it just makes it easier to grasp the true concepts as they get older."

There's a growing interest in this type of education among kids, teens, businesspeople, career changers, and the generally curious. And a growing number of public libraries are already responding to this need within their communities. Here's a look at ways in which a few libraries have made their programs a success. (For more on the library's role in teaching coding for kids both in a school and public library setting, see "Coding Skills Empower Us All," *School Library Journal* 5/15 Maker issue, and look for more in *SLJ* 4/16.)

Constant communication

Florida's Orange County Library System (OCLS), Orlando, offers an example of how a technology curriculum can grow when a library system responds to local demand and seeks regular feedback regarding its community's needs. Fourteen years ago, like most libraries, OCLS offered classes on computer basics. Patrons began requesting computer classes taught in Spanish and Haitian Creole, so the library set up high-demand classes in those languages. Multipart courses on software such as Excel and Photoshop were added owing to demand. Surveys revealed that there were many patrons who were interested in the classes but couldn't fit travel to the library into their schedule, so a series of live, online web courses was launched eight years ago, notes Ormilla Vengersammy, Melrose Center manager and Technology and Education Department head for OCLS.

Due in part to the growth of Orlando's technology sector, demand has been increasing for courses in topics from HTML 5 and mobile app development to networking concepts and electronics prototyping. With its current slate of about 250 in-person and online tech courses, OCLS has one of the most comprehensive computer course selections in the library field.

"We do a lot of analysis prior to developing a course," explains Vanya Walker, instructional technology specialist for OCLS. "We look at trends to determine the needs of our audience. We also ask our patrons, in regular surveys, 'What do you need?'"

Once demand is determined, Walker says that OCLS then examines the topic to decide whether that need should be addressed with an individual class or a multipart course.

"We look at the scope of the class, and what we want to cover, and then we find natural breaks," she says. For ex-

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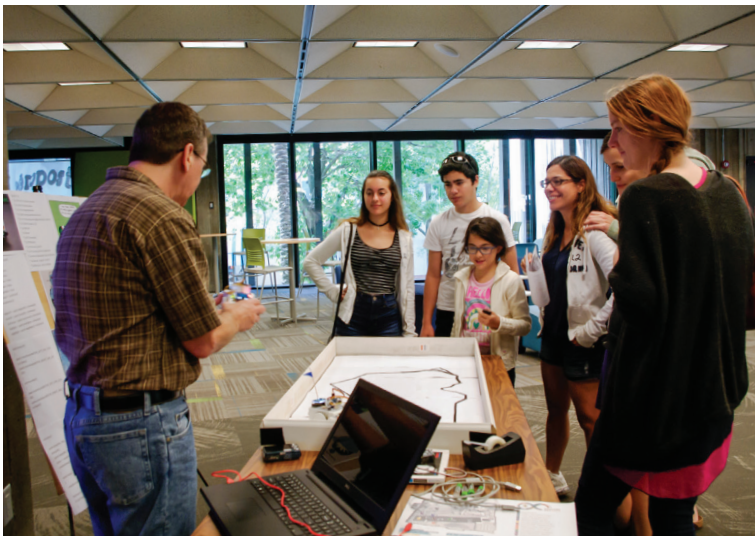

CRACKING THE CODE (l.–r.): Florida's Orange County Library System offers about 250 distinct classes on topics ranging from computer basics to electronic prototyping. (Far r.): Hackathons have become popular events at California's Santa Clara County Library District in Silicon Valley

ample, with the library's HTML 5 class, which consists of four 90-minute sessions, "we know we want to cover the basics of HTML and the basics of web design. We know that [we must] cover CSS or Cascading Style Sheets, because that's an integral part of HTML 5. And we're also going to include JavaScript.... It takes you through the complete, basic process of designing a website from scratch."

The library also supplements its classes with an institutional subscription to Lynda.com, but Vengersammy notes that OCLS still considers in-person instruction to be a priority, enabling attendees to ask a teacher questions in real time and work with other patrons.

Learn as you go

The Denver Public Library (DPL) has followed a similar trajectory at its Community Technology Center, which began as a traditional computer lab offering one-on-one assistance and classes in computer basics and has expanded in recent years as patrons began requesting more advanced instruction. Program coordinator Nate Stone organized staff-taught classes on the open source content management system Wordpress and subsequently four-part courses on HTML and CSS. Later, a separate four-part course on JavaScript provided patrons with a comprehensive web development track. Then, people started asking about the programming language Python.

"None of us on the staff here felt like we had the skills set to teach that as a structured class," says Cody Yantis, librarian at DPL's Community Technology Center and ideaLAB. So, Yantis simply dove into the programming language alongside interested students. "We ended up doing an eight-week [course in which] we met once a week and worked through an online resource together. So I learned as well. I would just work ahead and come up with some exercises, but then we would also just tackle stuff together. And it worked out really well."

DPL is planning to offer a similar Python course this spring. It's a great example of how a library might use online resources such as Codecademy, Code.org, Lynda.com, Treehouse, or a curated selection of free web resources to develop courses on advanced topics in-house even without a preexisting expert on staff.

Denver's tech sector is on the rise, and locals have the option of enrolling in for-profit coding "boot camps" for advanced instruction and job training. But as Yantis notes, those types of courses are generally an expensive investment, often costing individuals $10,000 or more.

"For the Community Technology Center, we see our place as kind of a bridge," he says. "We're never going to offer a high enough level of [instruction] to get someone a professional programmer job as soon as they finish. But it may get them into a program that will lead to that.... This allows people to try it out, see if it speaks to them, without any kind of financial obligation."

Make friends

As programs grow, however, opportunities to provide more advanced instruction can grow as well. DPL's Community Technology Center and ideaLAB Maker space has begun attracting attention from local tech companies, some of which have expressed interest in teaching classes or offering mentorship. The Melrose Center at OCLS has become a regular meet-up spot for IndieNomicon, a local group of game developers and entrepreneurs. Last summer, Intel hosted a six-week "Innovator Lab" to help programmers work with the company's RealSense 3-D camera and gesture-based human-computer interaction technology. Afterward, it donated equipment to OCLS.

A proactive search for instructors can also produce help from quarters that many libraries might not expect. At California's Santa Clara County Library District (SCCL), in the heart of Silicon Valley, teen services librarian Matt Lorenzo developed coding courses with help from members of academic clubs at local high schools. Advanced teens now teach coding courses for middle school students at the library.

"I wasn't really sure how much attendance we would have, but, right off the bat, a class filled up," Lorenzo says.

Whether it's a teen instructor or a guest speaker from a local tech company, Lorenzo says that part of the challenge is helping these instructors explain complex concepts in ways that their audience can easily grasp.

"They have to have sound knowledge, and they have to

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be able to express that to other learners in a way that can be retained by students," he says. "I spend a good amount of time working with presenters to make sure that everything is lined up in an easily understandable, flowing manner.... With the older kids able to help the younger ones…it takes that classroom feel where 'you need to know this or you're going to get a bad grade' off the table. It relieves a lot of pressure for younger learners when they're being taught by their peers."

With young people accustomed to teaching one another and working with mentors from the local tech industry, the library's Cupertino branch has become a great spot for hackathon events. Last summer, more than 100 local teens participated in a 12-hour, all-night event where they worked in groups to create apps and games, then presented their creations to a panel of judges.

Get them hooked

Thanks to a generous private donation, Westport PL was able to take its coding curriculum to the next level in 2014, acquiring two small humanoid NAO Evolution robots by Paris-based Aldebaran Robotics. At about $8,000 each, these walking, talking, dancing robots are currently priced out of reach for many library systems, but the program engagement that Westport managed to generate during the past two years could indicate that inexpensive programmable robots, such as Sphero or Ollie, could be a good way to capture attention, introduce basic concepts, and then take a deeper dive for patrons who become interested in more advanced coding.

The robots, named Vincent and Nancy, instantly captured the community's imagination. Giannini says that shortly after acquiring the robots, Westport announced a series of classes on its website, six days per week with a demonstration on Sundays, with the classes capped at ten attendees each. "It was a Friday afternoon," he says. "By Sunday morning, two months' worth of classes were full."

The robots can be programmed by novices using proprietary software called Choreograph, which Giannini describes as similar to Scratch, a visual programming language for kids developed by the Massachusetts Institute of Technology. Offering introductory classes in which everyone could use Choreograph and see instant results from their work kept attendees engrossed, while identifying patrons who might be curious to learn more.

"You can take a class with us, and by the end of the class you can have the robot wave and say something, and there's instant gratification," Giannini says. "Once you go deeper into that software, Python is underneath. By the end of the year, we trained over 2,000 patrons on [Choreograph]. I'd say 90 percent were happy taking the [basic] courses we provided, creating a 30- to 60-second program on the robot, using existing movements.... But there was that ten percent who wanted to go deeper. And for them, we did an Hour of Code [course], and we taught Python."

Progress report

Vengersammy and Walker agree that breaking a course down into manageable segments and demonstrating visible results help to keep learners involved. "One key to capturing an audience's attention is to show them the end product first," Vengersammy says. "This is what you're going to create."

In the OCLS two-part Arduino course, one of the very first things attendees do is set up the device and issue a command to make an LED light blink. "You have to tell it where the power is coming from, what ports you are using, how fast the light should blink. And people see it right away, and they're so excited," Walker says. "Then you can challenge them—make it blink faster, make it blink slower…. People think 'code' and 'programming' and 'microcontrollers' and they think 'that's going to be too much for me.' When you present it the way that we do, which is fun and easy and exciting, people build their skills without even realizing it."

Once the library helps patrons get past any initial trepidation and instills the confidence that they, too, can learn to code, it may just be the spark they need to seek out more knowledge or start their own projects. At Westport, Giannini says that he has reached a bit of a saturation point with large public demos of the robots, but that's not a bad thing. Going forward, Vincent and Nancy will continue to be in demand for advanced students, including a programming group from a local community college that recently booked a weekly session.

"It's one thing to give people the tool and show them the tool, but once they see the tool and understand [it], they want to take it and use it for their own purposes," Giannini explains. "That's the goal of any of the stuff that we teach. Actually, that's why we teach." ■