CRACKING THE CODE

Learning the literacy of new media

Students aren't just playing computer games, they're learning to make them

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Somewhere on a distant galaxy, far, far away, BB-8 has a problem.

BB-8, the robot who's taken over from where R2D2 left off back in the mists of time before the release of the latest "Star Wars" movie, needs to move clumps of scrap metal from one place to another, without tripping over obstacles or running into any bad guys.

Michael Alfano, a sixth-grader at The Dorset School in Vermont, is among those coming to help, by writing the needed computer code to assist the friendly robot perform his tasks. This effort was part of the international "Hour of Code" campaign held back in December in classrooms of this region and around the globe. The program asks individuals or classes to take an hour to try a tutorial designed to demystify and teach coding basics. Even President Barack Obama endorses the initiative and the concept of coding, considered by some to be as necessary a knowledge to develop, alongside literacy and numeracy.

Under the hood of all the devices that have become part and parcel of everyday life — from smartphones to GPS, cars to credit card machines — are millions of lines of computer code, and the number of people who know how to write it are less numerous than the technology firms who make the hardware and software would like.

To encourage youngsters to consider thinking about possibly becoming a software application developer or computer programmer, rather than simply being users of technology, the Hour of Code aims to be that catalyst to spark that curiosity.

Sponsored by Code.org, a nonprofit organization based in Seattle, Wash., the now three-year-old initiative aims to spark interest in computer science and programming on the part of today's students of all ages. More than 9.4 million students are enrolled in Code.org courses alone, according to its website.

Phyllis Tate, the computer lab teacher at The Dorset School, has used the Hour of Code approach in her classes since its beginning. A former computer programmer herself before getting into teaching technology, she finds the Hour of Code to be a great way to introduce elementary and middle school students to what makes all the devices many of them use daily actually work, she said.

A natural fit

"Kids are great users of technology, but they're consuming, not creating," she said. "Even if they don't become computer programmers, in any job, they're going to have to work with programmers and understand how computers think and work. Everything you do on a computer, somebody had to go through and do this stuff."

Code.org banks on popular video games and characters from franchises like "Star Wars," "Minecraft" and "Frozen," to attract younger students to use its programs.

Alfano and his fellow Dorset sixth-graders can either sequence blocks of code pre-written with directions like "move forward" or "turn left" or "pick up" to move characters through obstacles or have them complete tasks. If they are adventurous, students can try writing codes from scratch in JavaScript — the main programming language in use today — to get their characters to work through a series of puzzles, which deepen in complexity as they advance along.

"We have to pick this all up before he does something," Alfano said as he punches in coded commands, much like a real programmer would, to make BB-8 move left and right a field to collect scrap metal, bad guys looming by. He uses both the pre-coded blocks and his own script to orchestrate the robot's path. That's the fun part, he said, "learning how to do things and make them happen."

After a few puzzles are successfully solved, an instructional video pops up on the screen to set the stage for the next round and so on, until all 20 are solved with the necessary code written.

ANDREW MCKEEVER — MANCHESTER JOURNAL

Phyllis Tate, the technology teacher at The Dorset School in Vermont, helps one of her students navigate her way through one of the coding problems during December's national "Hour of Code" campaign.

Robyn Lawson, a third-grade teacher at Brayton Elementary School in North Adams, Mass., introduced the Hour of Code to her students for the first time back in December.

"They loved it. They were so into it," she said.

Brayton third-grader Christopher Dupre Harris said he's been interested in video games most of his life, and first heard of code when he was about 5 years old, he said. But this year, prior to Hour of Code, he

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returned to the idea and looked it up on his own.

"I think it's interesting to learn because some day you might want to do stuff with it and actually make stuff that works," said Dupre Harris. He said he might aspire to make a game as big as the ones he plays, like "The Legend of Zelda" and "Super Mario Bros."

Coding for all

According to various studies, boys like Alfano and Dupre Harris are more likely to stick with their attitudes and aptitudes for computer science, but their female counterparts may not.

According to the results of a 40-year study on the gender gaps in computer science release last April, a person's confidence in math and science has a lot to do with it. Women tend to rate their math skills lower than men. In 2011, women represented only about 15 percent of computer science majors.

Which is why educators and agencies like Code.org are developing programs and initiatives to particularly engage girls and students of color in coding, demographics that are underrepresented in these study and career fields.

JENN SMITH — THE BERKSHIRE EAGLE

Williams College senior computer science major Emily Roach shows Brayton Elementary School third-grader Ja'liene Tudor how to program Disney character Elsa from "Frozen" to ice skate in a geometric pattern using a program at Code.org.

Having solved the 20 puzzles she needed to do, Dorset sixth-grader Tatum Sands got to print her own certificate authenticating her success at the Hour of Code.

Does she want to be a programmer when she grows up?

"Maybe," she told a reporter.

Making it relevant

Tate explains to her students that learning code is like learning another language. Using the interactive coding programs, kids can work at their own speed, and at their own level, solving the puzzles one at a time as Tate moves from terminal to terminal, guiding students through writing and sequencing scripts of code.

"With the young students, I see a lot of thinking and development of patterning skills," said Sue Candiloro, dean of students for Greylock Elementary School in North Adams.

Diane Ryczek, technology coordinator for North Adams Public Schools, said coding is now being used from kindergarten through high school in some capacity. "This year we decided with better access to technology and more people able to support the teachers we were going to try to reach as many students as possible," she said, noting that all seventh-graders participated in Hour of Code this school year.

In addition to being an obvious workforce skill, Ryczek said coding can also help students developing their sense of reasoning. "It requires students to be very serious thinkers and it also intrinsically causes students to collaborate to solve problems in ways that teachers have not been able to make happen," she said.

The technology director added that having teacher training partnerships and the use of free apps and websites to teach coding are a huge benefit for schools wishing to teach the subject, as technology and staff training can be quite costly.

Accessible code

Lawson's class is now participating in a 10-week coding instruction series led by students trained in computer science from the Williams College Elementary Outreach iTeam and the Center for Learning in Action. The program will not only teach kids what code is, but the college students will work with Lawson and other Brayton Elementary teachers to come up with ways to integrate coding and computer science into their lesson plans.

"They're not only teaching students, they're teaching me as well," said Lawson, lauding the partnership.

The Williams College students include computer science majors Emily Roach, a senior, and

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Stephanie Liu, a sophomore, as well as statistics sophomore Austin Vo and freshmen Miranda Chaiken and YJ Huang. Most of them began taking coding classes in either high school or their first year in college.

Vo said he's eager to pass the skills he's learned on to a younger generation, which include perseverance.

He and Roach spent almost an entire class period co-coaching third-grader Ja'liene Tudor through the task of writing and repeating a code that would make the character of Elsa from Disney's "Frozen," ice skate in specific directions that would reveal a beautiful but complex geometric design. The process involved manipulating math formulas, understanding and computing spatial relationships and utilizing writing and computer skills. When Tudor's code sent Elsa twirling through a perfect snowflake pattern, she and Vo exchange happy high-fives.

"I hope they learn to love the problem-solving aspect of computer science," said Liu, noting that most modern career fields utilizes software and digital devices, and require data entry, collection and application.

In the Bennington-Rutland Supervisory Union, where coding is not required to be taught, but is used by some teachers for certain classes and lessons, Superintendent Daniel French lauded the real-world applications initiatives like Hour of Code and other tutorials offer. "[Students] work online and share code — it's precisely that sort of networked way of working that we try to replicate in other areas of our curriculum as well."

JENN SMITH — THE BERKSHIRE EAGLE

Brayton Elementary School third-grader Christopher Dupre Harris explains how he's writing codes that will prompt a character to move through a level of the popular game "Minecraft." He hopes to develop an equally popular computer game some day.

CODING: 101

Learn how to code here:

Code.org
Codecademy.com
CodeSchool.com
edx.org
Khan Academy: khanacademy.org/hourofcode
MIT's Scratch project: scratch.mit.edu

Computer science jobs that use coding:

Software development
Hardware engineering
Web development
Network design and administration
Data analysis

Median pay in 2014 for jobs that use coding:

Computer hardware engineers earned $108,430 per year or $52.13 per hour.
Software developers earned $97,990 per year or $47.11 per hour.
Computer programmers earned $77,550 per year or $37.28 per hour.
Multimedia artists and animators earned $63,630 per year or $30.59 per hour.
Web developers earned $63,490 per year or $30.52 per hour.

Source: Federal Bureau of Labor Statistics