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Business

Volunteers teaching algebra through computer coding

Help students learn algebra functions in real-life applications

By George Levines | GLOBE CORRESPONDENT DECEMBER 02, 2013

GEORGE LEVINES FOR THE GLOBE

"How do we expect kids to succeed in a global economy when we don't prioritize what's basically 21st-century literacy?" said Bill Stitson, a software engineer at Trip Advisor, with student Ngan Ly.

A software engineer at Trip Advisor, Bill Stitson finds himself every Tuesday at the McCormack Middle School in Dorchester helping sixth-graders learn algebra by making video games.

No, it's not a pushover class.

Stitson is among a number of tech industry professionals who have volunteered to help teach an innovative math curriculum called Bootstrap, which uses computer coding to help students learn algebra functions in real-life applications, rather than in abstract problem-solving. It's being used in classrooms around Boston with the help of Citizen Schools, which places volunteers and aspiring educators in schools in low-income neighborhoods.

"I had students who were amazed that when they played Call of Duty that shooting the enemy required a programmer to use the Pythagorean theorem in the programming," said Peter Isham, a teacher at the McKinley Middle School in Boston who has used Bootstrap in a summer program.

"The number one reason for using Bootstrap is that it answers the question all students ask, 'When am I ever going to use this?' " Isham added.

And now Bootstrap has become a rallying point for the tech industry, which has long complained of a shortage of skilled computer scientists and is lobbying Beacon Hill to increase the amount of coding taught in Massachusetts schools.

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"There's this push of, 'Programming, programming, programming. If you're not teaching programming then you're behind the times. China's going to eat our lunch,' " said Emmanuel Schanzer, a former coder for Microsoft Corp. and educator who founded the Bootstrap project and is studying for a doctorate in algebra teaching at Harvard University.

This year a group of executives from leading technology firms, including Google, and other business and education organizations formed a lobbying group, the Massachusetts Computing Attainment Network, to pressure Beacon Hill into requiring computer science in public schools. But state education leaders have pushed back, saying they prefer not to impose mandates on classroom courses.

So Bootstrap, with its goal of teaching a basic math curriculum — algebra — while students also learn about computer coding, would seem to offer a happy middle ground.

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Emmanuel Schanzer, Bootstrap founder and a former coder for Microsoft Corp., taught algebra to students in Boston.

"We view Bootstrap as absolutely compatible with the goals of MassCAN," said the group's executive director, Jim Stanton.

Indeed, a who's who of the tech industry, including Apple Inc., Cisco Systems, and Facebook, have become financial supporters of Bootstrap, and the curriculum has been used by more than 400 educators since 2005, and not just in the United States. Schools in Canada, India, Indonesia, and Saudi Arabia have brought Bootstrap into their classrooms.

The computer language that forms the basis of Bootstrap's instruction was developed by Northeastern computer science professor Matthias Felleisen. He and Schanzer met by chance on a train from Providence to Boston when Schanzer recognized the computer language on Felleisen's screen and the two hit it off.

While Felleisen calls himself the "grandfather" of the project, he said Schanzer's evangelism cannot be overstated.

"He's somebody who knows how to reach students and middle school teachers," Felleisen said.

Seven Massachusetts schools use Bootstrap. Five of those classes are taught by volunteers from businesses such as Trip Advisor, while the other two are taught by full-time teachers. The curriculum is also available online for free, and Bootstrap said it has received more than 1,000 requests for materials.

Among the most enthusiastic business boosters of Bootstrap is Trip Advisor, the Newton-based travel advisory site. Through its charitable foundation, Trip Advisor donated $300,000 to Bootstrap and lends the program 15 employees, who take time out of their workday to help close the achievement gap in classrooms in Boston.

“We were looking for a way that we could support organizations that helped disadvantaged children learn more about tech,” said Jenny Rushmore, director of responsible travel at Trip Advisor.

One recent school day, Stitson worked with a group of sixth-graders at the McCormack Middle School.

As 12-year-old Ngan Ly punched through the coding process for her video game, “Alien vs. Girl,” one of the stars in the galaxy rested out of place, half off the screen. She opened a file full of numbers and other data, changed some numerical values, and clicked through a few commands. The star snapped into place.

Meanwhile, Stitson asked a group of students about phrasing an algebraic function that would show an animated rocket’s height as time passed.

“Can you write this so the computer understands?” Stitson inquired.

Sharing laptops, the students got busy editing code, and after updating the files, showed how they learned to represent height at different points in time: pressing the spacebar on their laptops launched the cartoon rocket upward across the screen.

Stitson feels he is helping launch the students into a world where technology is everywhere.

“How do we expect kids to succeed in a global economy when we don’t prioritize what’s basically 21st-century literacy?” he said.

Beyond the anecdotal enthusiasm from participants, Bootstrap said it has evidence that its curriculum is working: Students who have taken the course scored an average of 14 percentage points higher in composing functions, and 27 percentage points higher when tackling word-based math problems.

However, finding enough teachers capable of understanding the curriculum might pose a challenge.

“At the end of the day my head was spinning,” Adam Newall, a teacher at Pembroke Community Middle School, admitted after his first day of a Bootstrap training.

But by the end Bootstrap finally clicked for him — and his students. Newall said he has no doubt the curriculum belongs in his classroom.

“For me as a teacher to see kids — looking at something that they’d normally shut down with — raise their hand, is just fun to see,” Newall said.