

EDUCATION DISRUPTED

How Silicon Valley Pushed Coding Into American Classrooms

By Natasha Singer

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At a White House gathering of tech titans last week, Timothy D. Cook, the chief executive of Apple, delivered a blunt message to President Trump on how public schools could better serve the nation's needs. To help solve a "huge deficit in the skills that we need today," Mr. Cook said, the government should do its part to make sure students learn computer programming.

"Coding," Mr. Cook told the president, "should be a requirement in every public school."

The Apple chief's education mandate was just the latest tech company push for coding courses in schools. But even without Mr. Trump's support, Silicon Valley is already advancing that agenda — thanks largely to the marketing prowess of Code.org, an industry-backed nonprofit group.

Timothy D. Cook, chief executive of Apple, at an Apple store in New York where third graders participated in one of Code.org's introductory coding lessons. Andrew Burton/Getty Images

Code.org was founded in 2012 by Hadi Partovi, an early investor in Facebook and Airbnb, and his twin brother, Ali Partovi, himself an early investor in Zappos and Dropbox. The group first gained renown by using a viral video to stir up mass demand for coding lessons. Now Code.org's goal is to get every public school in the United States to teach computer science.

In our tech-driven world, Hadi Partovi argues, computer science has become as essential for students as reading, writing and math. "Encryption is at least as foundational as photosynthesis," he said.

Computer science is also essential to American tech companies, which have become heavily reliant on foreign engineers. Mr. Trump's efforts to limit immigration make Code.org's teach-Americans-to-code agenda even more attractive to the industry.

In a few short years, Code.org has raised more than \$60 million from Microsoft, Facebook, Google and Salesforce, along with individual tech executives and foundations. It has helped to persuade two dozen states to change their education policies and laws, Mr. Partovi said, while creating free introductory coding lessons, called Hour of Code, which more than 100 million students worldwide have tried.

Along the way, Code.org has emerged as a new prototype for Silicon Valley education reform: a social-media-savvy entity that pushes for education policy changes, develops curriculums, offers online coding lessons and trains teachers — touching nearly every facet of the education supply chain.

Mr. Partovi standing behind President Barack Obama and a group of middle school students at an Hour of Code event marking Computer Science Education Week in 2014. Jabin Botsford/The New York Times

"They have got this multipronged approach," said Amy Klement, a partner at Omidyar Network, a philanthropic investment organization started by the eBay founder Pierre Omidyar and his wife, Pam, which has given \$5.5 million to Code.org. "It's unique and a model I would love to see replicated."

But Code.org's multilevel influence machine also raises the question of whether Silicon Valley is swaying public schools to serve its own interests — in this case, its need for software engineers — with little scrutiny. "If I were a state legislator, I would certainly be wondering about motives," said Sarah Reckhow, an assistant professor of political science at Michigan State University. "You want to see public investment in a skill set that is the skill set you need for your business?"

Mr. Partovi, 44, said he simply wanted to give students the opportunity to develop the same skills that helped him and his backers succeed. He immigrated as a child to the United States from Iran with his family, went on to study computer science at Harvard, and later sold a voice-recognition start-up he had co-founded to Microsoft for a reported \$800 million.

"That dream is much less accessible if you are in one of America's schools where they don't even tell you you could go into that field," Mr. Partovi said.

Even so, he acknowledged some industry self-interest. "If you are running a tech company," he said, "it's extremely hard to hire and retain engineers."

Code.org is now one of the largest providers of free online coding lessons and more comprehensive computer science curriculums. It has also provided training workshops to more than 57,000 teachers, Mr. Partovi said.

The rise of Code.org coincides with a larger tech-industry push to remake American primary and secondary schools with computers and learning apps, a market estimated to reach \$21 billion by 2020.

Last year, Apple rolled out a free app, called Swift Playgrounds, to teach basic coding in Swift, a programming language the company unveiled in 2014.

Swift Playgrounds, an educational app that Apple created to teach young people how to code. Apple

Last month, Apple introduced a yearlong curriculum for high schools and community colleges to teach app design in Swift. Apple has also supported Code.org by hosting the group's popular Hour of Code events in its stores.

Before Code.org emerged, the National Science Foundation, industry, and education experts worked for years to develop and spread computer science instruction in schools. In 2009, for instance, an engineer at Microsoft started a program called Teals (for Technology Education and Literacy in Schools) that places tech company volunteers in schools to help teach the subject.

Then Mr. Partovi came along with the idea of using a viral video to spark mass demand for the courses.

He began by persuading Bill Gates, the co-founder of Microsoft, and Mark Zuckerberg, the Facebook chief executive, to appear in a short film promoting coding to students. In its first week on YouTube, the video, called "What Most Schools Don't Teach," racked up roughly nine million views. Within two weeks, Mr. Partovi said, about 20,000 teachers contacted him.

Mr. Partovi compared Code.org's approach to those of start-ups like Airbnb and Uber. "Airbnb is disrupting the travel space, but they don't own the hotels," he said, adding: "We are in a similar model, disrupting education. But we are not running the school and we don't hire the teachers."

Mr. Partovi's elite connections didn't hurt.

One day in early 2013, he bumped into his neighbor, Bradford L. Smith, then a senior Microsoft executive, in a driveway outside their homes in Bellevue, Wash. Mr. Smith had recently published a Microsoft report calling for a federal plan to better prepare students for careers in computer science and engineering.

Mr. Partovi, for his part, was hoping to go viral with a message that coding could improve students' job prospects. Teaching skills that may lead to higher-paying jobs "seems like the kind of idea that everyone in the country can get behind," he said.

Mr. Partovi promptly invited Mr. Smith over to preview his celebrity coders video.

Microsoft soon became Code.org's largest donor. Mr. Smith, now the president of Microsoft, compared their efforts to an educational initiative in the late 1950s. Back then, the Soviet Union had just won the space race by launching Sputnik, and the United States, in an effort to catch up, passed a law to finance physics and other science courses.

"We think computer science is to the 21st century what physics was to the 20th century," Mr. Smith said.

Together with local groups, Mr. Partovi said, Code.org and Microsoft have helped persuade 24 states to allow computer science to count toward math or science credits required for high school graduation. Along with groups like Black Girls Code, Girls Who Code and Latina Girls Code, Code.org has worked to make the subject accessible to a diverse group of students.

But the movement has also supported legislation that could give companies enormous sway in public schools, starting with kindergarten, with little public awareness.

Last year, Microsoft and Code.org helped push for a career-education bill in Idaho that, education researchers warned, could prioritize industry demands over students' interests. Among other things, they said, it could sway schools to teach specific computer programming languages that certain companies needed, rather than broader problem-solving approaches that students might use throughout their lives.

"It gets very problematic when industry is deciding the content and direction of public education," said Jane Margolis, a senior researcher at the Graduate School of Education and Information Studies at the University of California, Los Angeles.

The Idaho bill read, in part, "It is essential that efforts to increase computer science instruction, kindergarten through career, be driven by the needs of industry and be developed in partnership with industry."

"We think computer science is to the 21st century what physics was to the 20th century," said Bradford L. Smith, president of Microsoft. The company is among Code.org's largest

When a reporter apprised him of the bill's language, Mr. Smith of Microsoft seemed taken aback, saying he had not endorsed it. "Broad public education should not be grounded first and foremost in the needs of any particular industry — or in the needs of industry as a whole," he said.

Mr. Partovi noted that Code.org had opposed a "more extreme" coding bill in Florida that would have required students to obtain industry certification. It has also opposed bills that would allow coding courses to count toward foreign-language credits in high schools, he said. Still, Mr. Partovi added, "We do think that tech companies have a role to play."

The Idaho law took effect last year. One of its first results was a new program, developed with Oracle, to train public-school teachers how to teach students Java, Oracle's popular coding language. Other companies, including the chip maker Micron Technology, were invited to help develop computer science standards for Idaho schools.

"Some people will believe that industry is going to be driving our education system forward, and that is absolutely not the case," said Angela Hemingway, executive director of the Idaho STEM Action Center, which oversees the state's computer science education initiative. "They are collaborative partners."

More than 100 million students around the world have tried Code.org's Hour of Code lessons. Jason Henry for The New York Times

Certainly, many students across the country, and their parents, are clamoring for computer science. But what if some other subject — say, data science (which involves computing) — turns out to be more important and broadly applicable for students' lives, careers and communities?

The clout behind computer science has all but obviated a wider debate about whether, to better prepare students, schools might introduce an array of new subjects. It has also overshadowed discussion about whether students would be better off if schools modified traditional math classes to increase the emphasis on fields like statistics.

Mr. Smith of Microsoft said that tech companies and philanthropists were simply trying to give voice to an overlooked subject. "What we really need is a national conversation about the broad array of intellectual disciplines that will be fundamental to the future of American students," Mr. Smith said. "It's a broad array, not a single subject."

Mr. Partovi concurred. "We have a lot of debate in this country about how to teach," he said, "and not enough debate about what to teach."

Doris Burke contributed research.

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