How Silicon Valley Pushed Coding Into American Classrooms

https://www.nytimes.com/2017/06/27/technology/education-partovi-computer-science-coding-apple-microsoft.html

Hadi Partovi, co-founder of Code.org.Credit...Koren Shadmi for The New York

By Natasha Singer

- June 27, 2017

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.

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

“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.

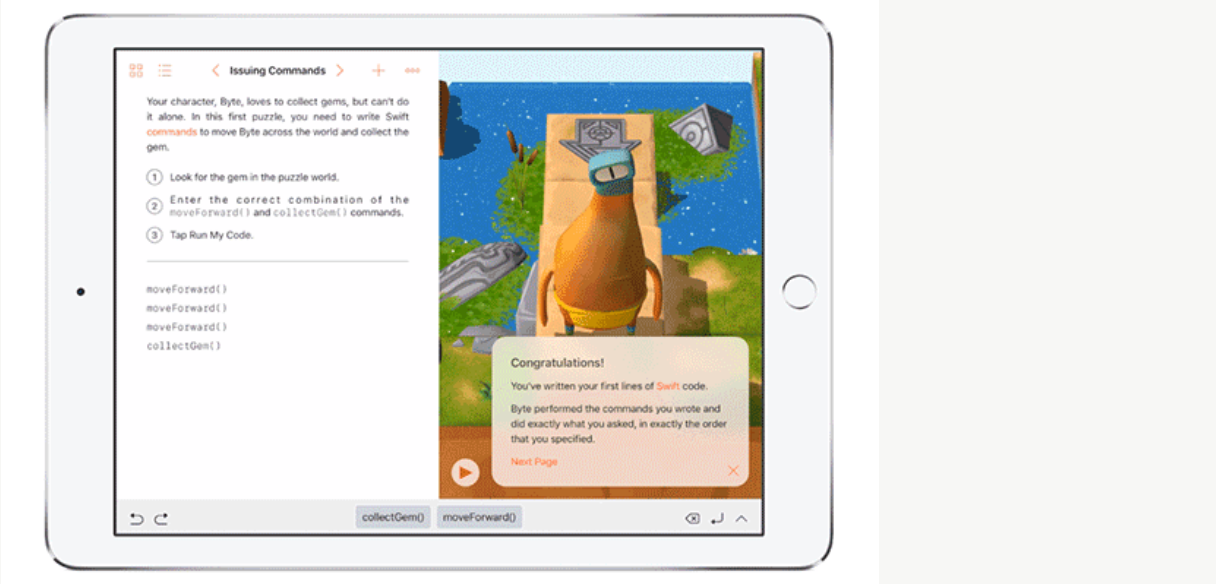
“That dream is much less accessible if you are in one of America’s schools where they don’t even tell you you could go into that field,” Mr. Partovi said.

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.

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.
What Most Schools Don't TeachCredit...CreditVideo by Code.org

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."

Image

“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 donors.

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.”

Image

More than 100 million students around the world have tried Code.org's Hour of Code lessons.

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."

70 Comments

Expatico

Apparently it's impossible for a kid with an Internet connection to find this software online, download it, and learn it. We have to wait for the Internet to be developed first, because it doesn't exist.

Prospective coders should also look up "H1B" visa to find out what the future competition from abroad will look like, and how low they will drive salaries. Even the best-educated coder can have his career destroyed by a stroke of the legilslative pen.

Global Charm

Coding is like writing. What one learns as a small child is different from what one learns as a teenager or a young adult. The child learns to arrange symbols into a form that governs the behavior of a machine. The older child learns that the formal language of computation yields insight into what can be abstracted, and that programming can sometimes be the intelligent statement of constraints, as opposed to a step by step algorithmic description.

There are also forms of computation, such as the Antikythera Mechanism, that are milestones in human intellectual accomplishment, and better understood by the child that has pieced together a cardboard orrery and calculated where the moon will next rise. Coding does not have to take place entirely at the keyboard.

We somehow manage to grasp that reading and writing are not simply job readiness programs for legal work, and that home economics is not some insidious plot by the restaurant industry. But there's something about code that just drives some people wild.

Horace

Does "coding" have something to do with the Enigma machine? Or is it a sexier name for computer programming? I hope it's more fun and easier to do than when I took a "Data Processing" course in college, using Fortran and Cobol, to try to get a taste of what computing was about. Naturally I flunked and didn't go near a computer again until the PC came out.

Werner Liepolt

Apple had a great decade long program in HyperCard that had thousands enthusiastically engaged then abandoned it. Education can't function when it depends on corporate whims.

M. V.

I am astounded by the tone and content of both the article and the comments.

We live in an era when our daily lives are dominated and, to a large extent, controlled by code. Algorithms are used to get us to buy, sell, tell us how/where to eat, drive, fly, or walk, who and how we date/mate. Increasingly, they impact what we think, and (need I remind you) – how we vote.

The application I am using to read this article and write this comment right now are products of coding – and the coding dramatically effects how the content is viewed and interpreted.

Under these circumstances, learning to code is not a 'job skill' – it is an essential life skill to understand how we are being manipulated, seduced and coerced.

Trivializing teaching code as mere career education misses the staggering impact that programming has on every aspect of our lives. The cynical tone and nattering about different languages misdirects attention from the core need to understand how programming machines is different from human interaction.

Failing to understand the impact of coding on human culture makes everyone more vulnerable to the potentially catastrophic side-effects of the technology revolution. For this reason, and this reason alone, all children should be taught to code. It is education for freedom.

Is code as important as reading/math/writing?

I would say that learning to code is as important as learning to duck when a bullet is coming at your head.

ed davis

"Coding," has to be a requirement in every public school. In our tech-driven world, I would argue computer science is just as important as reading, writing, & math...if not more so. That's where the jobs of the future are. It certainly won't be in the political science field. I find it unbelievable & at some level revolting that main opposition to this initiative is coming from academia. We routinely graduate students who after 12 years of a liberal education can't read or write on a college level. And this is where they have decided to take a stand...coding...how idiotic. Who cares if Silicon Valley is swaying public schools to serve its own interests...is it better to give those jobs to foreigners or send them overseas? We teach biology, chemistry, & physics to students who want to work in the sciences why not teach computer programming too? What makes this really galling is these same people have complained for years about the lack of minorities and women in Silicon Valley. The industry comes up with a viable solution & they are the first to question it....wow. Pompous progressive academics should focus on what they do best. Generating an endless cacophony of white papers on intersectionality and other subjects no one cares about. More Ph.D. thesis that none will ever read or see. Please do what you do best. For God's Sake stay out of education. You don't know what you're talking about and no parent with a brain cares what you have to say. Really, mind your own business.

Parent

I am a parent of children in public schools with a science degree that I use every day in my job. And I have concerns about the way coding is making its way into public schools and what it is displacing. I think there is a role for teaching coding in public schools. However, I think other skills are also important as well. We have to be thinking about everything that matters for children. I think this article raises important points that should not be so condescendingly dismissed.

ed davis

I was a parent of children in public schools but they didn't offer coding. I had to send my kids elsewhere for that. But what my son learned in coding camp has blossomed into an extra-ordinary opportunity in Silicon Valley. I'm sorry it's not even a close call....whatever coding will displace...gender studies???....they can do without. The far left complains & whines about the lack of women & minority representation in the computer industry & then when they try to fix the problem they swing the other way. For all of their talk about helping the working class and POC they put up road blocks when a good solution presents itself that they didn't come up with first. To them this isn't about how Silicon Valley is pushing coding into American classrooms....that's a lie....it's about how Silicon Valley will push out the pointless classes that offer no real value to students. It's about Power....them losing power over a system that they have brought to their knees. If Bill Gates, Jeff Bezos and Tim Cook want to bring their technology, expertise, & money to our public school classrooms we should let them. There's no way they could make the situation worse and more than likely they will make it significantly better. My condescension towards so called well meaning progressive academics is well earned; they have no solutions....they are intellectually bankrupt. Honestly the overwhelming majority of parents are with Silicon Valley not academia. It's high time we try something different.

Armand Mintanciyan

Agree with Ed Davis 100%.

I am in the trenches so to speak working on enterprise IT systems for Fortune 100 companies and am one of the few US born in the groups I work with.

Further, not every high school offers AP Computer Science. This is what is concerning.

Counter Measures

Call me an old fogey, but I still prefer Al Hirt's, Java, over Oracle's one! And I read alot

OSS Architect

One thing you discover when writing code for a progrm is "the computer is always right". I had course material on logic as part of math courses and no teacher was as strict as a code compiler, or a program that had to work.

If Silicon Valley wants more coders, fine, but anyone that takes one or two classes in

programming languages has their world turned upside down.It literally transforms how you think.

Piaget studied how a child's mind developed and he found it stopped, for the majority, in any understanding of random events (probability). Programming introduces an even more complex world view: not what is, but what man or machine can create

This is about a whole new form of human existance. In the future man will have to coexist or master machine. Silicon Valley is pushing survival skills.

Steve S

I have been trying to contact the authors of the IPad App: Logo_3D!
and plead for an update so this fantastic educational coding tool, which has so far been ignored, does not die. Having taught programming to kids in the early 1980's I was amazed when I bumped in to this 20 command programming language, which costs $2, but now crashes on IOS 10. Take a look at their website, maybe email them:

SP

Micron is helping to develop computer science standards in Idaho?! Micron is a non-entity in the field of software. Besides who learns Java.

Glenn

In my first year as a full-time HS English teacher, I learned of a summer program for the "Gifted and Talented." I approached the chief administrator of the program and asked if he thought there might be some interest in a course in Assembly Language, a very complicated programming language. I did not know the language, but I assured him I could teach it to myself and provide a course outline for the class.

At first, there were no takers, so he visited Math and Computer Science classes to educate the students on what a rare opportunity this class provided for them. I taught the class that summer.

At the end of the program, parents came by and explained that, although they had no idea of what I had taught their child, their child expressed great satisfaction with the class. But one parent, a Physics professor at a state university, actually understood the value of my class and said that it was probably the only such course offered in the country at a HS level.

We should be more daring in what types of classes we offer HS students and my experience proves it. Children are capable of more than we might think.

Bey Melamed

From my own experience, coding as part of everyone's curriculum could be really helpful in developing conceptualization and abstraction skills as well as establishing a common language between technology and the general population.

David H. Eisenberg

Makes sense to me.

Bob Aceti

My undergrad degree was in Economics and I took a few computer science courses in 1974-1990. The programming language to learn in the 1970s was a structural program called COBOL that was used for commercial applications - like payroll calculations and W2 slip recording and printing, payables, receivables, etc.

To keep a long interesting story short, and (hopefully) debate at minimum, let me summarize some observations over the last four decades:

1) few code professionals actually 'do well' enough to pick and choose engagements; some are SAP programmers and 'systems architects',
2) the IT market is flooded with "computer" graduates;
3) Google, Apple, MS, etc., need to flood their HR pipeline with technology grads to sustain their businesses - they are the Biggest Winners;
4) billionaires who 'made it' in the IT industry are a.k.a. lottery winners: the odds of having a long-term successful career in IT declines as new software and tools come to market and younger more literate programmers versed in the new tools become in demand; and
5) don't deny yourself a classical education - arts, history, language, philosophy and social sciences - you may not become rich but you should find jobs that will pay the bills, afford a home and raise a family - without looking over your shoulders waiting for the next 20 y.o 'Mark Zuckerberg' to disrupt the market in a few years, while your skills slowly become outdated.

Frank

'don't deny yourself a classical education - arts, history, language, philosophy and social sciences'

agreed - as an Arts Graduate who later became a Computer Programmer/Analyst and finally Computer Teacher in a community college, I have had a rich and satisfying life on many levels and continue to engage daily with all kinds of people around me.

I remember the single-focus uni engineers - could you hold a conversation with them - um - nah - unless it was about mathematics or their project - nothing to talk about - talk about a narrow focus missing the important things in a wider life.

My observations about coding in college computer courses were - only about one in ten students was interested in learning the technical details to be a computer professional.

Of those (students enrolled in our college computer courses), only about one in ten was actually interested in learning coding

That suggests about 1 in 100 students are actually interested in learning coding.

Most of our students preferred hands-on 'I just want to fix computers' and women in particular mostly preferred the idea of a job with some social contact - not staring alone at a computer all day like I did as a programmer.

Gun programmers tend to be good at maths - most of our students had a poor grounding and even aversion to maths - and the logic of sequence, selection and iteration in programming seemed either too difficult or too mind-numbingly boring for students who preferred to be physically active.

Yoda

As an ex-college professor I would like to point out that many students do not know when the first and second world wars occurred. That about four-fifths of Americans cannot find Iraq on the map (despite the fact that it has been in continuously in the news for over a decade). That about half of Americans believe evolution is not true. That about 40% of college undergrads need remedial classes in math and English coming into college. That a large number cannot even write a coherent essay.

Perhaps these can be solved first. They are of greater much importance than providing a specific industry with workers it "needs" (ironic considering that high tech industry throws out employees over the age of 40 [or less], when the become obsolete).

Ruthmarie

In the dark ages of the late 1980s (when I graduated from college) college was for learning. It was not a job creation program. As to preparing students with specific skills such as coding, there was this thing called "on-the-job training". Remember that?

Expatico

College was for partying, at least if you were a Liberal Arts or Business major. But guess what? The salad days of the American economy are over: nearly half of college graduates have jobs that don't require a university degree.

If you want to bankroll your kid while he pursues a $250,000 degree in communications or gender studies, have at it. For other parents or pupils unlucky enough to be born without a trust fund, job preparation matters, as does return on investment.

Hadi Partovi

As the founder of Code.org, I'd like to add that the true credit for our impact belongs to the 600,000 teachers who have introduced our computer science courses to their students. Teachers are the unsung heroes of this story. Code.org and Silicon Valley are only here to support this teacher-led movement.
America's teachers are among the hardest working people in the world, and they're on the frontlines of a global movement to modernize education and prepare students for the skills needed in the 21st century. Computer science encompasses not only coding

but also computational thinking, digital literacy, data science, cybersecurity, networking, machine learning, and more. We owe teachers a lifetimeof gratitude for the work theyve done to change education to incorporate CS, to prepare our children for the future.

Expatico

Lovely sentiments, but you need to pay them for this work. With cash.

Edward D. Weinberger

As a long time programmer, math tutor and occasional college professor, I heartily support any and all efforts to teach coding skills (If only I had been able to persuade my own kids to learn such things!).

I have several reasons for doing so. First, the obvious: In a time when it is so hard for young people to get started with good jobs, programming is an obvious win. Industry is clearly in a position to identify which computer languages are the most in demand, so they should be allowed to make that choice. In general, the languages that are most in demand represent the latest thinking on how to solve the very difficult problem of providing detailed instructions to what, after all, are lifeless pieces of silicon and metal. Therefore, any subsequent programming languages are likely to build on the best of that thinking, much as Java has built on the best of earlier languages, such as COBOL, FORTRAN, and C.

However, computer programming teaches a wide variety of core skills. For one thing, computer programs are, effectively, the solution to algebra word problems; it is therefore impossible to master computer programming without mastering algebraic thinking. Skilled programmers must, in fact, master even higher level "algorithmic thinking," the ability to break a logical problem down into a series of small steps, much as is required by a multi-step algebra word problem.

But the most important skill that programming teaches is patience.

HugsAllAround

And humility.

Bart Grossman

Thew tech industry seems bound and determined to take us to a digital future that seems increasingly dismal and anti-human.

Lisa

As a teacher, I've actually really appreciated the effort that the tech industry has made to create all of these resources for us. The article makes it sound like they are making kids learn specific coding languages to create an army of workers, but I've loved the lesson plans that Code.org has put out. Their Hour of Code stuff is a little more focused on

programming, but in a kid-friendly way, but their actual courses are really well-rounded. They cover things that all of my students should know about computing. Most of my kids use computers, but have no idea how they actually work, and it's been fun to see them wrap their minds around how we can actually get computers to do what we need to do.

I agree that the public education system should be doing more of this, and maybe if the government would step up, then we wouldn't need the tech industry to fill in the gaps. The truth is, though, that these people are meeting a very real need in our schools, and without government funding, the free lessons, training, and online systems have been a Godsend.

Terry King

As several people have pointed out, experience with coding, includes many different "What you see is NOT what you Get" languages, even HTML. It's important for most people to "Get It" about the concepts of sequential actions, decision making, symbolic definitions and the structures of data.
This benefits people in many different jobs and professions. As quoted above, many productive people are not Coders, but they have used the experience and perspective of coding in their jobs and lives. My daughter learned BASIC and PASCAL in High school, and did her own graphics design for scientific writing. Fast forward 27 years and she is a Biochemistry Professor at Yale with 4 kids. She learned FORTRAN fast about 8 years ago when she found the best DNA data processing algorithms were still in FORTRAN. She did her own graphics for a paper published in NATURE. She has hired one of my daughters-in-law (who was a mathematician at NASA) to code for her research. My 3 other sons who were writing Hangman in BASIC on our home-made computer in 1975 have high-tech design jobs they like.
Coding is just a tool to make things work, and make US able to think about How Things Might Work.

Annie

Like most things in life, this trend has pros and cons. On the positive side, I think that even for kids who have no real interest in coding and who will never pursue it once out of school, there is value in deepening their understanding of how those machines that have become so intertwined with and essential to our lives (for most of us) work--learning coding can help to do that. It certainly could have a largely positive impact on dealing with the problem of jobs for the future. Right now, there are actually more jobs available than all the doomsayers wish to acknowledge, but there are also two big mis-matches, one between the skills people have (which is not limited to technology) and one between where the jobs are and where the people who need them are.
Programming jobs could be done from anywhere, home or small dispersed tech hubs.
IMO, another big pro is that the more people who know coding, the new pathways will be explored by people whose primary interest is not technology per se. To me, what defines human beings is creativity--our ability and willingness to adapt and make use of what we find around us as well as our ability and willingness to follow all different paths to find solutions for the problems we encounter. What came out of the original use of computers is far beyond what was expected.

There are, of course, dangers also--loss of time for other subjects and approaches in the classroom, too much influence by corporations--and running out of characters!

Sean

Actually, the industry is responding to a need. Just as other industries need people in their respective fields. My question to my fellow readers, when has getting an education become a bad thing. I want students to have a strong background across multiple disciplines. It's the 21st century, STEM education is needed in today's economy. This is the world we live in now.

Cloudy

While the idea of teaching children to write code is good, it's not unfair to be a bit cynical about the execution. Given that high school students who take French usually can't speak French afterwards, one has to wonder if instruction in coding will be more successful. That aside, the free market provides a plethora of ways to learn coding, from bootcamps costing thousands of dollars to free online courses. All that's needed is a computer and an internet connection, or even just access to a public library. But all of these methods require time, determination, and the self-discipline to learn a skill that for many is intensely boring and difficult. And when it comes to employment, are there really that many jobs for mediocre coders? Or is it a race to the bottom for ever lower piecework rates?

Todd Goglia

Most jobs are for "mediocre coders". Only a tiny percentage of programming jobs entail a real understanding of advanced computer science concepts such as machine learning. Most jobs consist of getting data from a database and outputting it to a web page or getting user input from a webpage and saving it to a database.

Kristin

When the schools and the venture philanthropists sell "coding" to the public, it's not what the public thinks of when they think computer programming so the public supports it. In our elementary schools they are using Kodu and in our high schools they are using Python in the computer science classes. These aren't teaching our kids anything that they can't learn from the internet or by playing video games. My son took a Computer class and it was so easy that he wrote his own code to write the code that was his assignment; these classes are a joke for our kids. Our students would benefit from learning real coding, C , but the schools can't afford to teach this nor do they have the skill set to teach it.

I think that this latest fad to push pseudo coding into our schools is nothing more than a way to open the door for the public purchase of infrastructure to facilitate the creep of EdTech and Competency Based Education programs in our classrooms.

Lisa

Python is not "pseudo coding"! It's one of the most in demand languages right now. I'm not sure what you're expecting, classes in "C" in kindergarten? Kids are learning programming in a developmentally appropriate way, and kids who have no experience need to have classes that are at their level. Sure, everyone could learn from the Internet, but we have schools to teach all kids, so they all have a chance at a basic education.

Kids don't learn linear algebra or read James Joyce in kindergarten. We teach them things that prepare them to master the core concepts of different discipline, and they build on that as they continue through their education. All kids should have the chance to build these basic skills, regardless of your views on Competency Based Education.

Parent

Yes, Kodu for us also. Disappointing, and focused on video games.

Matt

Are you joking? C was invented in the 1970s and thus lacks over thirty years of programming language innovations, like object oriented programming and exceptions. Python is used for almost every "real" programming task you can think of. Google's machine learning library Tensorflow was written partially in Python, and Django (a Python web framework) is one of the most popular tools to make websites (according to a quick Google search Instagram, Pinterest, and the Washington Post run on Django).

Python is a wonderful choice for people learning because you don't have to worry about types, it has a robust standard library that can do things like HTTP, and there's no compilation to worry about.

LB

I've seen coding referred to as the next blue collar work, and thus we must train children and workers to code. But what happens when the computers can, themselves, code?

Yoda

by that time Mr. Cook will already have retired and be on his own private island playing golf and counting his hundreds of millions. It will be those students you mention that will be shafted. Don't worry though, the high tech industry will get more programmers until the date they become obsolete. This reminds me of how IT "skills" were in demand by the industry and what happened to so many who majored in that field.
14 Recommend

63 and counting

when the computers are coding (in some respects, they can do this now), it might be helpful if a few of us can understand what they are coding

SAO

I think coding should be taught in schools. It's ridiculous that so many Americans are struggling to find jobs that pay a living wage when tech firm are crying out for more H1Bs to fill their high-paying jobs.

That said, the real issue here sounds like we need a discussion on how curricula are formulated. It is certainly easier to convince school boards and education departments to add something if it comes with a ready-made curriculum.

Yoda

"It's ridiculous that so many Americans are struggling to find jobs that pay a living wage when tech firm are crying out for more H1Bs to fill their high-paying jobs. "

SAO, high tech companies like Google, APple, etc. are primarily interested in the upper crust. They are rarely if ever interested in those who do not graduate from a top school like Stanford, CMU or the like. Zackerburg of facebook for example had programming contests, from which he hired programmers, only from a few top notch schools. Google and Apple themselves only interview potential programmers at a few schools.

There will always be a shortage of these type of employees. And few of those taught coding will ever make it into schools like Stanford or CMU.

Frank

reminds me of a cartoon about a homeless guy in San Francisco or somesuch - holding a sign 'will code for food' ...

_W_

I'm always amazed when a Silicon Valley boss sounds the alarm about a dearth of programmers in the United States. To those of us in the profession, it smacks as a way to flood the job market, and lower wages. There are lots and lots of older software engineers who can't find work in their profession. Why doesn't Mr. Cook try hiring some of them, even at the same wages they would pay these younger people coming out of the trade schools, or at the same rate as the big outsourcing companies in India? Get real, Cook!

Yoda

There are lots and lots of older software engineers who can't find work in their profession.

Exactly! As soon as programmers reach 40, if not sooner, they are thrown in the trash can. Then people like Cook and Steven Jobs complain about the "shortage" of programmers.

The educational system in the US needs to solve many more skills problems such as lack of math, writing and English skills, history, basic science before trying to tackle this nut.

Frank

yep - my understanding is coders are cheap in India

quality ? not so good ...

newyorkerva

To all this talk of teaching computer programming in schools to fill tech jobs, why won' the tech companies create their own apprentice programs? Why won't tech companies use some of their millions/billions and open up learning centers in communities where they don't have business centers if they are truly altruistic, and not self-serving? Logical thinking can be developed through any scholarly pursuit.

Yoda

To all this talk of teaching computer programming in schools to fill tech jobs, why won' the tech companies create their own apprentice programs?

they would have to pay for that. On the other hand schools can supply these skills, at least for a few students, at taxpayer expense. Typical business mentality that is so prevalent in the US.

Matt J.

Overall I think that this is a very positive change. If you look at the jobs of the future there is often a technology component. Whether you want to work in a shop where there is CNC machines or whether you want to work at a tech company it is going to be helpful to know and be comfortable working with computers. The fact that this is increasing opportunities for groups outside the typical white male stereotype is also extremely important.

Having said that, like any good thing, you do have to worry about it being taken too far. I don't want my daughter being forced to learn Swift because Apple has donated computers to the school, but that is about the execution of the concept, and not a flaw in the concept of bringing programming to schools.

If I think back on some of the classes I took in high school (chemistry and biology), I can't really say that I got much use out of them. Why not let students have more say in their education. I care more that the learning is rigorous, than what exactly is being learned. Create a passion for lifelong learning, and I will show you a successful school.

Interested Observer

My son, now almost 40, took programming in high school. He is an executive today, not a programmer, but he has told me that learning how to code in high school was an opportunity to develop skills in defining a problem, defining the desired outcomes, breaking the problem into manageable pieces, and achieving the desired results. It is fine to debate the relative value of coding compared to other subjects, but educators and others would be well advised to be content with implementing whatever actions they can identify that take them to better educational outcomes instead of speculating on yet another perfect world that educators then have little success in implementing.

Raymond

Programming is a useful skill and is likely to be an essential skill in the near future. It opens many doors. While it is often viewed as mostly useful for doing computer science and the hard sciences (e.g. physics and math), programming unlocks doors in biology and even the classics. For example, there are people who look at how language has changed by looking at data from large collections of books and this can't be done by looking at individual books.

Angela

Here are some facts for Idaho:
1) Idaho's collaboratively created standards have NO mention of a specific platform or program. It is about computational thinking to guide instruction on the local level.
2) CS is optional in Idaho schools, not required. Schools have complete control over if/how they implement CS.
3) There is no accountability for schools, teacher, or students. CS is optional for all. Yes, it can be used as a math or science credit on the state level, but even this decision is locally determined. K-5 primarily integrate this into other subject areas. More secondary math and science teachers are also taking this approach.
4) Idaho has always believed in public-private partnerships and there are many examples of successful partnerships which do not include financial support - internships, mentorships, and apprenticeships.
5) CS education provides 21st century skills such as problem solving, critical thinking, and innovation.
6) Idaho’s tech sector is the second fastest-growing in the nation at 6.3%. It is anticipated that 80 percent of all jobs will require technology skills within the next 20 years.
7) CS is one of the fastest-growing fields in Idaho, and we expect it to grow 14 percent by 2024.
8) Nearly 3,800 STEM jobs went unfilled in Idaho in 2015. These jobs pay a median wage of more than $30 per hour -- double the pay for non-STEM jobs -- which means the state fails to recognize $240 million dollars in personal income and tax revenue each and every year.

Lee

More states could learn from Idaho's example. I'm glad that you took the time to clarify this for the rest of us.

Yoda

Nearly 3,800 STEM jobs went unfilled in Idaho in 2015. These jobs pay a median wage of more than $30 per hour -- double the pay for non-STEM jobs -- which means the state fails to recognize $240 million dollars in personal income and tax revenue each and every year.

you do know that about a quarter of all STEM graduates in the US are unable to find work in their fields?

Parent

We need to think carefully about allowing any industry to have this type of influence on public schools, with little oversight. Furthermore, the tech industry has an additional conflict of interest, on top of public funding of training their future workforce. Requiring learning to code is yet one more reason that every child age K-12 "needs" their own 1:1 device - with public school budgets footing the bill. There are opportunity costs in education. Any dollar spent on learning to code and having a device on which to do it is a dollar not spent on smaller class sizes, supportive adults for struggling students (social workers for example), arts, music or more books that capture children's imaginations. Similarly, the time spent learning to code must come from somewhere - what should be given up? This is another opportunity cost.

I believe learning the principles of coding does have a place in public schools, but it should be age appropriate, and in balance with everything else children need, and not influenced so heavily by the tech industry. Educators should decide what children should be taught.

I also am uncomfortable with the degree that learning to code is heavily gamified especially in the software made available for the early years in our district. There are coding tools for kids that are hands on and require critical thinking skills that are not just increasing focus on and interest in video games, but they are not always what is chosen or pushed.

Old Yeller

As a retired engineer that teaches java and python to kids, I have a different take on coding.

I agree that knowledge of coding is so important for a continuing education and for future income, that every student should be taught the basics at least.

But in a not-so-distant future where everyone can do simple coding, coders will become the sweatshop workers of the times. Only those who go beyond coding, deep into the mathematics and science of computing will thrive.

Yoda

Only those who go beyond coding, deep into the mathematics and science of computing will thrive.

that is currently the case. Why do you think the top high tech companies like apple and google only hire computer science majors and programmers from schools like Stanford and CMU?

RM

There is a lot more to "computer science" than writing a program that does what it is intended to do. It is important that students learn something of the mathematical part of computer science to the extent their teachers understand the subject.
As to the programs themselves; students must learn to write programs that not only work but are easy to read, understand, and modify should the need arise.
Finally, any teacher who can teach these things could probably earn a great deal more as a computer programmer or software engineer herself. That, too, is a potential challenge.

aimlowjoe

I went to HS in the mid 1980's. Back then we were able to take a BASIC programming course. We used Commodore 64's with cassette tapes to store our programs. We learned that we could make and manipulate programs ourselves. Somewhere in between then and now schools decided to stop teaching programming and start using the computers to write papers and research articles. They give out Chromebooks to every kid in my school district. They use them to write and research. The kids are missing out on all the fun and 99% of the under the hood power of computing. I hope this trend catches on. I have spent my career in IT because of one course I took in 1984.

Dan Lufkin

Compare the fractured US education "system" with models in other countries where the necessity of leaning programming was recognized a generation ago. In the UK, for instance, every seventh-grader is given, free of charge, a tiny but fully operational computer and a year of practical coding instruction. Google ¨Raspberry Pi" and "BBC Micro:bit" to see what's involved. Better yet, buy one (<$35) and follow one of the on-line courses. You don't need to be a mathematical genius to have a lot of fun learning how to think like a programmer. Keep in mind that British teens are not noted for their sophisticated sense of humor, so some of the programs they post on the blogs may be jarring. Be assured that there's plenty of genuinely interesting work there, too.

hen3ry

While we're at it why not teach students how to read and write grammatically correct sentences? I wince when I read some of the comments on this paper and on Facebook. People seem to have lost the ability to write sentences that are clear, use apostrophes correctly, and use a dictionary.

One question here: what gives CEOs the right to walk into any school and dictate the

curriculum, especially when some of these CEOs head up companies that don't like to pay taxes? If they want a well educated workforce I suggest that they have their companies pay taxes rather than walking into a school and pushing a particular curriculum on the students.

Yoda

While we're at it why not teach students how to read and write grammatically correct sentences?

maybe some geography classes too. more than half of all Americans cannot find Iraq on a map. A sizeable number need remedial classes in math and English upon entering college. A large percentage of students do not even know when the first and second world wars or the Napoleonic wars occurred. We have a lot to work on.

Alan Foo

As a teacher, I already resent the implications that my practice (instruction and pedagogy) is mandated and dictated by people who have never been in a classroom (i.e. legislators) or have no background in education (i.e. Gates, Walton, Broad, etc.) Now, private industries are injecting themselves into education, tilting content in a direction that's favorable towards their interests. If we are indeed tilting education towards a more "producing worker"-centric model rather than a more "producing citizen"-centric vision, then why should the tech industry have a foothold? Why isn't the retail or agricultural or pharmaceutical industry get in on the action? Am I training future workers for private industries? If so, won't I be narrowing my students' options by focusing on the needs of a SPECIFIC industry?

Perhaps the bigger questions should be: What is the role of universal public education? Does public education still have a role in our society? How should the private sector COLLABORATE (not DOMINATE) with public education?

Hadi Partovi

Alan, i agree, and i believe what's actually happening in schools is exactly what you recommend. There's not a single school where Code.org has forced curriculum on the classroom. In fact, our success is only due to the 600,000 teachers like yourself who love our curriculum (which was created by K-12 public school teachers like yourself). Teachers are the unsung heroes of this movement. Code.org is powered by teachers. And Silicon Valley is supporting, not leading, their work. I agree with your sentiment, and i believe if you ask any Code.org teacher (or read their comments in this article) you'd see that our work is not only aligned with the interests of teachers and students, its literally driven by teachers first.

Katy

Technology is the way of the future, there's no putting that genie back in the bottle. Each generation of employee needs to be more advanced than the previous one in technology,

without that knowledge they're going to be hamstrung and behind the curve.

Side note: There's no reason that technology classes can't be linked with the Arts, especially music!

Todd Goglia

Your side note is important. Offering programming courses is mostly going to attract kids who're already interested in computers. Digital arts classes- both music and visual- can provide an understanding of how computers work while piquing the interest of students who might not otherwise consider computer programming.

Yoda

Katy, many programming languages become obsolete pretty quick. Perhaps emphasis should be on skills that help build future skills or skills that serve as a basis of technology (i.e., mathematics, logic, etc.). These should be emphasized more than coding.

NJG

I first learned how to program in FORTRAN when I was in graduate school in Biophysics. However, both my children were introduced to computers when they were very young. The principal of their elementary school introduced computers in their classes and the children were all taught a beginning programming language called logo. When I started working in a laboratory that did not have access to computers I convinced the director of the lab to buy an Apple II to analyze our data. I eventually bought one for my home use and my kids started to program in BASIC. They loved the computer, both for playing games and designing their own games. Using the computer also improved their writing and computational skills. Both of them now work in very high tech, well paid jobs. I am strongly in favor of teaching computer skills to children in school and I fail to see any downside at all. Teaching children computer skills is not the same as teaching them to use computers to play video games.

NJB

This trend can only be a good thing. Scores of thousands of programming and other tech jobs go unfilled by Americans every year because we fail to produce enough computer and software engineers. Meanwhile, in the recent world championship of programming, Russian and Chinese university teams left American teams (including from the likes of MIT) in the dust. Why? Because in these countries programming instruction for students starts much earlier in high school and continues throughout their education.

No wonder Russian (and Chinese no doubt) hackers can wreak havoc with our data systems so easily. Cyber security alone produces and will produce thousands of new jobs. We need to fill them with Americans and we need to start that process as early as practicable in our education system.

Frank Gaik

Wow, a three-point shot, which can blame teachers for H1-B1 excesses, unemployment, and national insecurity (including our threatened election integrity). What schools don't teach is the ultimate uncaused cause!

Andrew Biemiller

I hope that the including computer skills will involve both an understanding of computers and programming, AND some application of computer skills. In my opinion, one of the problems in teaching math is a failure to move between new mathematical skills and the application of those skills. The same applies to computer skill education.
Andrew Biemiller