



# CODING NATION

The Kapor Center Coding Landscape  
2013 Report & Database

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The U.S. high tech economy is barreling forward, growing three times faster than the private sector as a whole (Bay Area Council Economic Institute, 2012). As tech becomes more ubiquitous in our lives, we're simultaneously witnessing a boom in efforts across the nation that teach coding and computer programming; at least 100 programs have launched in the past three years.

At the Kapor Center for Social Impact, we wanted to create a central resource to help us better understand this landscape: who/what/where ARE all of these programs working to expand our nation's computer programming skills?

After gathering information on over 300 coding and computer science education programs, we decided to share this information through a publicly-available spreadsheet database and this accompanying overview report, *Coding Nation*.

Our goal in compiling what is the most comprehensive list available is to encourage others to use this information, both to make connections (including volunteering!) and to share resources and successful strategies among programs, helping our nation to build and sustain momentum heading into the increasingly tech-driven future.

### WHAT WE SEE AT A GLANCE

Based on the information we were able to gather thus far, we've drawn a few preliminary conclusions about the national coding landscape:

- Most programs are focused on teaching youth (24 and under) the basics of coding or computer science; a smattering of programs target adult participants as workforce development or retraining opportunities.
- Participation fees range from free to \$18,000; the majority of programs are either free or cost less than \$250.
- Python, Ruby, and Javascript are the most popularly-taught coding languages.
- Of the programs that shared their founding dates, only 45 were started prior to 2010. 108 have started in the last three years!
- 63 programs focus on women and/or girls.
- 32 have a stated mission to work with historically underrepresented populations.
- 33 are US-based bootcamps; 1 of these is specific to women.

### OUR MISSION

At the Kapor Center for Social Impact, we relentlessly pursue creative ways to leverage information technology for positive, progressive change. We're particularly interested in diversifying the tech sector, mobilizing the tech sector for greater social impact, and expanding tech-driven educational opportunities. The Kapor Center is based in Oakland, California.

## OUR COMMITMENT TO CODING & COMPUTER SCIENCE EDUCATION

It is no secret that African Americans, Latin@s, and women, regardless of racial/ethnic backgrounds, are vastly underrepresented in the high tech sector. We recognize the critical importance of broadening the too-narrow funnel of youth who enter the tech sector as technologists and entrepreneurs. We want to ensure that the nation taps into our broad swath of demographic groups and communities that are all-too-often overlooked and undervalued as potential contributors. If our nation successfully invests in and nurtures our domestic talent, we can well meet the economic opportunities (and challenges) that the increasingly tech-driven future presents. The Kapor Center is committed to that vision of greater access and inclusion.

In order to accomplish this, we know that widespread teaching of coding and broader computer science skills is necessary. We know that exposure and encouragement are necessary. We know that connections between schools and industry are necessary. (Some of these things we learned from the [2013 White House Tech Inclusion Champions of Change](#).) We are committed to investing in this pipeline, and have started with four programs mentioned later in this report.

It's important to note that the database is not an endorsement of the programs therein; we've primarily aimed to collect, compile, and circulate the findings. True to our founders' early commitment to open source principles, we want to keep these data accessible and available to the public at large. In fact, we're depending on a spirit of crowdsourcing to help us update, refine, and expand the database. **So please tell us: What groups did we miss? What other features should we have? Please send any information to [codingdata@kaporcenter.org](mailto:codingdata@kaporcenter.org).**

## IN THIS REPORT

This brief report contains opinion pieces by two of our well-respected advisers that underscore the importance of computer science education. We've also shared our definitions of the difference between "coding" and "computer science," descriptions of four Kapor Center partner organizations making headway in this coding education field, an overview of what is (and isn't) included in the database, and instructions on how to access the database itself.

We certainly hope that this information is a useful first step to field-building and ensuring greater tech diversity. We look forward to working with our community members to uncover new programs and update current information. **Please help us with this effort! You can make comments directly on the database spreadsheet, or send them to [codingdata@kaporcenter.org](mailto:codingdata@kaporcenter.org).**

## CODING VS. COMPUTER SCIENCE: WHAT ARE WE TALKING ABOUT?

**Computer Science** is a field of study concerned with the theory and practice of processing digital information. Computer scientists conduct research which results in the creation of the operating systems, programming languages, and tools which are the building blocks of information technology.

**Coding**—which is also called "software development," "programming," or informally, "hacking"—involves the use of these building blocks to solve a problem or to build a platform or application.

**Content creation** is arguably a third, related means to engage people with information technology. One could say that it is at the beginner's end of the coding spectrum, where one creates material for viewing and consumption through an existing app or portal.

As an example of the interplay between these three areas, we'll use Facebook: Mark Zuckerberg used an already-existing programming language, PHP (which had been developed by software engineers drawing on the field of COMPUTER SCIENCE). He created an application (CODING) that became Facebook. Facebook users upload information, photos, and other media into their accounts (CONTENT CREATION). As an added full-circle bonus, Facebook software engineers were able to create systems—originally intended to handle Facebook's enormous traffic—that have become building blocks for other app development (COMPUTER SCIENCE).

# Finding Kids' Inner Geek == Building 21st Century Skills

Jennifer Argüello



On a chilly March morning in Austin, Texas, I met a friend to visit a classroom at East Austin College Prep, located in a low-income neighborhood. The purpose of the visit was to see a class using [Globaloria](#), a social learning network where students use game design to develop digital literacy, STEM and computing knowledge, and global citizenship. Globaloria is a required class for all EA Prep sixth through eighth graders. Imagine an hour of this a day for three years?! I was blown away by this program and how effective it was in the classroom. These middle schoolers were writing code in a real, commercially-used programming language, as well as creating their own animation and graphics. They even talked like mini-game development professionals. These students were not just building educational games for a grade, but also for improving their community by creating educational games for local non-profit organizations like Mothers Against Drunk Driving. The most inspiring part of this class was that it was 80% Latino and 50% female—demographics that are completely unheard of in the real world of computing professionals. In the almost 20 years I've been working on STEM advocacy for underrepresented minorities, I had never encountered such a program.

This life-changing experience cemented my interest (well, obsession) with how to bring K-12 computer science education programs to every child, especially those children from historically underrepresented groups. This is not just an obsession from an outsider looking in. I am a computer scientist by education and profession. I taught myself to code when I was six years old. Computer science was a way to enhance my already-growing problem-solving and “maker” skills. I was very lucky to have started so young; it was completely accidental. My mother was a newly-arrived immigrant and spoke little English. She would have my brother and me do puzzles and math problems before we were in kindergarten. This did not require much English. Similarly, learning a computer programming language is not English-intensive either, which is why a child at a very young age can pick it up conceptually and start programming very young. Eventually, I earned a Bachelor of Science in Computer Science and worked for several startups and large corporations as an engineer.

But my childhood story was 30 years ago. Surely computer science education is a core part of K-12 curriculum today, where almost every industry is becoming computing-enabled, and the growth of future jobs

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in computing is surging. Right? NOPE! **Computer science education has actually decreased in schools.** The number of high schools offering computer science has fallen 35% since 2005. Only 5% of high schools today offer AP Computer Science. The number of K-8 schools which offer computer science is too low to even count. This dynamic is setting us up for an employment pipeline crisis, which will be especially hard-hitting for underrepresented minorities, the fastest growing segments of the US population. Already in California, 50% of K-12 students are Latino. This is tomorrow's workforce, and they are being left behind when it comes to learning the skills for tomorrow's jobs! This is already evident today, where just 1% of the computing workforce in the US in 2012 was Latina. *Yes, I am the 1%!*

**But all hope is not lost.** Back to the school visit. Once you take a wider look at the learn-to-code organizations aimed at K-12, it's like uncovering a hidden ant mound—more and more programs are popping up every day. Some programs are school-based, but most are extracurricular. Even youth enrichment programs are starting to integrate more technology education. For instance, the Girls Scouts of America now has a badge for computer game design. New York City has an initiative, The New York City Foundation for Computer Science Education, to bring computer science education to all 1.1 million K-12 public school students. And then there are even larger, overarching organizations such as [code.org](http://code.org), aiming to bring computer science to all schools in the nation.

**We need to continue to increase K-12 access to computer science and coding education.** Now that we're building a sense of the education programs that exist across the nation, the next step is to build sector-wide metrics and standards. All of these disparate education efforts present a challenge for a student, school, or parent to know what makes a program good. The problem I find is that there is no common language to speak about these programs or to compare them. More academically-based computer science programs use terms such as "CS0," "CS1," "algorithms," "data structures," etc. Coding programs use the nomenclature of the computing profession: "hacking," "frameworks," "apps," "mobile," "robotics," "front-end programming," etc. It can all get very confusing very fast.

I am on a mission to understand the greater K-12 computer science education movement. I care deeply about the **computational concepts, algorithmic thinking, and problem-solving skills which a student can learn from computer science—21st century skills for 21st century jobs.** The larger goal of building these skills is not about turning every child into a software engineer; it is aimed at making every child computer literate and proficient at solving problems. I want to help every child find his or her inner geek, which will enable them to develop these critical 21st century skills. Learning to code is one way to do both.



# Winning with Both Sides of the Coin

Omoju Miller

As an industry, coding and computer science education are at an interesting junction. On one hand, we have entertainers, basketball players, and billionaires telling everyone that they need to learn to code, while on the other hand, computer science classes are not widely or uniformly integrated into our nation's K-12 science curriculum. The computing community in the U.S. faces three significant and interrelated challenges in its workforce development: the underproduction of degrees, the under-representation of women and ethnic minorities, and a lack of presence in K-12 education. As a result, one of the major challenges facing the United States today is how we train and retrain an entire population to become computer science literate.

According to Bureau of Labor Statistics projections, 51% of the 9.2 million STEM (Science, Technology, Engineering, & Mathematics) jobs between the years 2010 and 2020 will be in computing. Furthermore, computing is one of the fastest growing job markets through 2018. When you realize that 70% of the U.S. population (women, ethnic minorities, and persons with disabilities) is underrepresented in computing, the picture becomes bleak. As of 2007, fewer than 20% of computer science degrees were obtained by women; to achieve parity, this should be 50%. Similarly, less than 20% of computer science degrees are obtained by underrepresented minorities; to achieve parity, this should be 28%<sup>1</sup>.

Also disheartening is the fact that the Advanced Placement exam in Computer Science (APCS) has the lowest student participation rate of any STEM-related subject, and that rate is decreasing yearly. Fewer than 25,000 students nationwide took the 2011 APCS exam, compared to 300,000+ who took the AP Calculus exam. Of that small APCS exam number, only 3% were African American, 6% were Latino, and 15% were female<sup>2</sup>. To bring this issue home, only one high school in the Oakland Unified School District offers AP computer science. This, in a school district that is scarcely a 40-minute drive to Silicon Valley.

As a result of these gaps, a new space has emerged in the computer science ecosystem that focuses on increasing representation in coding and computer science. The players in this space are often nonprofits that run programs that introduce computer science to youth. Notable among this list are organizations like Black Girls CODE, Girl Develop It, Iridescent Learning's Technovation Challenge, and the Level Playing Field Institute's Summer Math and Science Honors Academy (SMASH),



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<sup>1</sup> SOURCE: Commission on Professionals in Science and Technology.

<sup>2</sup> SOURCES: College Board Data, CSTA Data

to name a few. Entrepreneurs have also stepped into the space and are creating compelling businesses that address the coding education gaps, training their clients to become proficient at writing code. While we certainly need more programmers, we also need more people with the foundational knowledge of computer science, which makes new innovations possible.

Broadly defined, computer science is a two-sided coin. On one side, we have the knowledge of computational thinking, and on the other side is the skill of programming. Computational thinking—essentially learning to think like a computer scientist—can be loosely described as the thought processes involved in formulating problems so their solutions can be represented as computational steps and algorithms. This is the part of computer science that takes a long time to acquire. When most people think of computer science, they are thinking of the skill that is programming. Learning to program is not trivial, but acquiring the cognitive knowledge of how computer scientists see the world is another ballgame, like the difference between AA baseball and the major leagues.

A cursory survey of the computer science ecosystem yields a paucity of programs addressing the knowledge of computational thinking. While it is

not impossible for a programmer to invent new technology, the skill of programming, by itself, is not enough to take you there. What we need are inventors, people with the computational building blocks *and* programming skill who can use the tools to create new startups, new apps, new industries, and spin a new, more inclusive technological age!

We have a long way to go in creating a more inclusive computer science community that generates both computer scientists and programmers. While there has been a proliferation of both non-profits and for-profit organizations to help solve this problem, we also need to undertake sweeping educational reforms in K-12 computer science education. Nevertheless, I am excited about the opportunity this staggering need has created for us to reinvent a better computing future.

What we need are inventors, people with the computational building blocks and programming skill who can use the tools to create new startups, new apps, new industries, and spin a new, more inclusive technological age!

# Coding Nation in Action

The Kapor Center is dedicated to ensuring that more people from communities historically underrepresented in the broader tech industry develop competitive skills for careers in coding and computer science. We recognize the need for representation in both of those skill bases. Just as with other fields of study, better demographic representation in coding and computer science can yield wider, more diverse perspectives on problem-solving, producing a more creative range of solutions.

To that end, we're proud to collaborate with the following four youth-serving organizations, our initial partners in this area of work. Together we hope to contribute to building a better-connected sector of coding and computer science education programs.

[Black Girls CODE](#) (BGC), launched in 2011, is devoted to “showing the world that black girls can code and do so much more.” By reaching out to the community through workshops, hackathons, and after-school programs, Black Girls CODE introduces computer programming and technology to girls from underrepresented communities in technology areas such as web design, robotics, gaming, mobile app development, and more. By cultivating the next generation of developers, BGC hopes to grow the number of women of color in technology, and give underrepresented girls a chance to become the future leaders in technology and the masters of their technological worlds. BGC aims to educate 10,000+ girls in computer science by the year 2020.

BGC offers an innovative annual Summer of Code series of workshops—serving seven cities in 2012 and 10 cities in 2013, involving more than 2,000 girls ages 7-17. Black Girls CODE provides its participants an opportunity to explore basic programming concepts in a “hands on learning” and coaching environment. The program includes six weeks of after-school classes focused on allowing the participants to explore various technology concepts, and encouraging exploratory learning and discovery using tools such as Scratch, Alice, Python, and KidsRuby. Trained course instructors and teaching assistants/mentors are available to support students’ engagement in learning activities throughout each workshop.

Founded in 2011, [CodeNow](#) teaches computer programming to underserved high school students, 95% of whom receive free or reduced lunch, and 40% of whom are female. Through free weekend trainings hosted at local tech companies and online homework, participants learn to code in the programming language of Ruby. In phase one of the program, students receive more than 50 hours of training and have an opportunity to earn a laptop. CodeNow currently operates in New York City and Washington, D.C., and has recently launched a program in the San Francisco Bay Area.

This past summer, CodeNow piloted its first summer fellowship program in NYC. During the fellowship, 20 high school students who had already completed CodeNow’s regular programming gained an additional 250+



*Black Girls CODE*



*CodeNow*



hours of training in six programming languages, including Ruby, Rails, JQuery, Javascript, CSS, and HTML. Top programmers in the coding community led the trainings, and each week students were hosted by a different tech company, including Google, Microsoft, Etsy, and MeetUp. During the last week, students paired up to complete projects of their own. In its two years of existence, CodeNow has served over 100 students, with a goal of doubling that number by the end of the year.

The [Hidden Genius Project](#) provides a two-year computer science and technology entrepreneurship program to African American high school youth from Oakland. With the goal of helping these young men enter career paths in software engineering, technology entrepreneurship, and user experience design, Hidden Genius is structured around an intensive, annual eight-week summer program, and includes weekly supplemental sessions, mentorship, and site visits to tech firms. In addition to computer science and entrepreneurship training, the program teaches critical thinking, creativity, long-term planning, and communication, among other skill sets. Hidden Genius is unique in that it has a multi-year cohort model and provides support for its students year-round. Four tech entrepreneurs founded Hidden Genius in 2012, with the intention of creating a replicable model for other demographics and communities.

[Level Playing Field Institute](#) (LPFI) is committed to eliminating the barriers faced by underrepresented people of color in science, technology, engineering, and math, fostering their untapped talent for the advancement of our nation. LPFI was founded in 2001, and its flagship program is the Summer Math and Science Honors Academy (SMASH), in operation since 2004. SMASH scholars spend five weeks each of three summers at a SMASH site on a college campus (currently located at UC Berkeley, Stanford, UCLA and USC) immersed in rigorous STEM classes with other high potential, underrepresented high school students. As part of their STEM curriculum, SMASH scholars receive computer science instruction throughout the summer program. There are currently 240 SMASH scholars and approximately 180 alumni.

In 2013, LPFI launched SMASH Prep, which serves middle school African American males who have demonstrated both an aptitude and interest in math and science. SMASH Prep scholars attended every-other Saturday sessions throughout the school year, and took math, computer science, and communications technology courses. Additionally, LPFI piloted Camp Code, a two-week computer science initiative in collaboration with the YMCA. Camp Code exposed a group of West Oakland Middle School students to computer science for the very first time, introducing them to algorithm development, problem solving, and programming skills, with an overt social justice lens.



*Hidden Genius Project*



*Level Playing Field Institute*

## THE KAPOR CENTER CODING LANDSCAPE DATABASE

The Kapor Center has collected information on 300+ programs or software that teach youth and adults elements of computer science and coding. This is not an exhaustive list, as this field is rapidly growing. As stated in the introduction, we're hoping that the larger community will help us to frequently update this list as programs continue to launch.

The primary objective of this Coding Landscape Database was to catalogue organizations that provide some type of coding training. We've generally categorized the range of programs into these clusters:

- **Bootcamps:** Intensives that prepare participants for at least entry-level developer positions.
- **Certifications:** Trainings that result in a certification/credential, badge, or belt to identify skill development progress.
- **Corporation-focused:** Courses that provide training to corporations or on behalf of a specific corporation.
- **Hackathons:** Event in which individuals collaborate in a short and intense time period (typically 24 to 72 hours) to build a mobile or web application.

There are many valuable networks and support organizations that help convene and/or advocate for people who work in the tech and coding space. These organizations were not a focus of this data collection effort, and many are not captured in this database. General STEM-oriented programs were also not a focus of this effort and are largely not included. For an organization to be categorized as a bootcamp, it had to have an intensive program over a set period of time that prepares a participant for at least an entry-level coding job.

Many programs operate within schools or universities or do not have websites, which makes it difficult to find out what programs exist. For this database, non-school-based programs were the focus.

We've also included a few programs that are based outside of the U.S., mostly for two reasons: if a program/bootcamp is online, location doesn't matter, and international programs also provide great models for replication here in the United States.

The majority of the data in this database was garnered by web searches. Some websites, such as [bootcamper.io](https://bootcamper.io), [The Computer Science Collaboration Project](https://www.computer-science-collaboration.org/), and [code.org](https://code.org) had databases of programs which provided information for this data collection effort. We would like to thank the staff of CodeNow and the [National Center for Women & Information Technology](https://www.ncwit.org/) (NCWIT) for providing data sets as well.

[Please click  
here to view  
the database.](https://kaporcenter.org/coding-nation)

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