

Written Testimony of Erin Siefring, Chair of Computer Science Education Coalition, for
U.S. House Appropriations subcommittee on Labor, Health and Human Services, Education, and Related
Agencies

“The Impact of Computer Science Education on the National Security and Economic Competitiveness of
the United States in the 21st Century”

March 8, 2017

Chairman Cole, Ranking Member DeLauro, I am Erin Siefring, chair of the Computer Science Education Coalition—a broad-based coalition with over 100 members representing a cross section of businesses, non-profits and educational organizations.

Thank you for the opportunity to testify before you and all the members of the Subcommittee on Labor, Health and Human Services, and Education today on a critical issue that greatly impacts the economic competitiveness and national security of the United States: K-12 computer science education. Our country is falling far behind in this area with real impacts to the homeland and our economic base. A prioritization by the subcommittee can address this problem, and give Americans the tools they need to protect our country and grow the economy.

Computer science is a foundational skill for 21st century jobs. This skill is in high demand in our military and throughout the private sector. However, the United States is failing to take the necessary steps to equip our current and future workforce with the computer science skills needed to fill these positions. Critical jobs throughout our economy are going unfilled due to a lack of Americans qualified in computer science. The result is a weakened homeland and an economy not reaching its potential.

Today, cybersecurity threats and espionage are on the rise, but the ability of the United States to defend itself against these kinds of attacks is on the wane due to a shortage of qualified workers in computer science.

As the Center for Strategic and International Studies explained, “There are only about 1,000 security specialists in the United States who have the specialized skills to operate effectively in cyberspace; however, the United States needs about 10,000 to 30,000 such individuals.” This dearth of talent decreases our country’s ability to defend itself in a time where a single actor with advanced knowledge of computers, networks and cyber security can do immense damage to the nation just by hitting the enter key on their laptop.

For example, in June 2015, the Office of Personnel Management reported that an intrusion into its systems compromised personnel records of about 4 million current and former federal employees. Records obtained by USA Today revealed that hackers infiltrated the Department of Energy’s computer system over 150 times between 2010 and 2014.ⁱ

Cyber threats to our nation go well beyond our electric grid and strike at the heart of our economy. In fact, just in one day, a “glitch” was blamed for causing the suspension of trading on the New York Stock Exchange for nearly four hours, the grounding of all United Airlines flights, and the malfunction of the Wall Street Journal’s web site. The damaging effects of these asymmetrical attacks can be mitigated if

we give our cyber warriors the education in computer science that they need. Failure to deal with this issue now will only compound the problems going forward and increase America's national security risk.

Today, less than half of K-12 classrooms across America teach computer science,ⁱⁱ yet it is projected that computing jobs will grow at double the rate of all other jobs over the next few years.ⁱⁱⁱ According to Code.org, computer science based employment will make up two-thirds of all projected new jobs in the science, technology, engineering and mathematics, or STEM fields.

The United States simply doesn't have enough home grown talent equipped with the computer science skills needed to meet the current or growing demand for computer science jobs. There are currently over 500,000 good paying computing jobs unfilled across the country.^{iv} For example, New Jersey currently has 22,593 open computing jobs.^v The average salary for a computing occupation in the state is \$100,529, almost double the average salary of \$54,950^{vi}. This is a trend that is happening throughout the country.

Computing jobs are the number one source of new wages in the United States. Unfortunately, our nation's failure to adequately invest in computer science has resulted in many of these jobs being lost overseas. To fill these job openings in recent years, companies have often had to import talent from across the globe. In fact, the majority of high-skilled immigration is for computer scientists^{vii} and almost 60% of "skilled worker" visas granted were for computer science occupations.^{viii} If we are to reverse this trend and empower our citizens to create an economy where people buy and hire in the United States, Congress must invest in K-12 computer science education now.

To compete for the jobs of this century, our students need to be learning about algorithms, how to make an app, code, or do robotics. These are the critical thinking skills today's students need to become the innovators and cyber warriors of tomorrow. And, basic computer science literacy will make them better cyber citizens.

Absent a robust pipeline of American workers trained in computer science, our economy will fall behind our competitors who have already taken significant steps to prioritize the teaching of computer science in their countries. For example, the United Kingdom and Australia have made computer science a compulsory part of their primary school curriculum, and Germany has gone as far as to make computer science mandatory at all grade levels.

American students have not been afforded the same opportunity, which limits their creative potential and employment opportunities. The jobs are there for them here at home, but our lack of investment in computer science education has put these jobs out of their reach. At the same time, our competitors are on the move, making the investments to prepare their student for computer science jobs.

Computer science skills are needed in white collar jobs and blue collar jobs. Wired Magazine highlighted the lengths to which computer science has permeated our economy in the December column, [The Next Blue Collar Job is Coding](#).^{ix}

These jobs are in areas such as machine maintenance, agriculture, and auto mechanics. For example, there are more lines of code in a modern car than the space shuttle. Without Americans to do these jobs our transportation infrastructure will be at greater risk. In order for the United States to have a robust manufacturing base, we need the roads, tunnels, and ports to bring our goods to market. We need computer science education to keep this infrastructure up to date. We need workers trained to run the

robots, and program the computers that will keep commerce humming.

While there is currently no federal funding dedicated to this critical challenge, many across the United States understand that this needs to change and have been proactive in their efforts to facilitate that change.

Virtually all parents see computer science education as a good use of resources at their child's school^x and states and districts have been leading the charge when it comes to expanding access to computer science education in K-12 classrooms. For example, in Arkansas, Gov. Asa Hutchinson put in place a [Computer Science Initiative](#), which calls for offering computer coding classes at every high school in the state. After he signed this bill in 2015, Gov. Hutchinson said, "Of all the big-ticket items we've dealt with this legislative session, this relatively small-ticket item may have the greatest long-term impact."^{xi}

Last year, America's leading CEOs, educators, and non-profit leaders united with 28 Republican and Democratic governors to send an open letter^{xii} to Congress, asking for funding to provide every student in every school the opportunity to learn computer science. The signatories included now-Vice President Mike Pence, Fortune 100 CEOs across multiple industries, such as the nation's largest technology companies, retailers, telecom firms, airlines, investment companies, entertainment companies, hotels, and manufacturers, which further illustrates how many industries are impacted by the current skills gap in computer science and have a vested interest in their being a robust pipeline of individuals with computer science skills going forward.

Industry has stepped up to the plate, as well. But, state and private efforts are not enough to move this critical subject forward. We are behind and a federal investment is necessary to amplify and accelerate the work already being done around this issue. An initial federal investment will help us to catch up and move forward on a positive trajectory.

Since the Computer Science Education Coalition launched a year ago today, bi-partisan support for computer science education has gained traction in both the House and the Senate. That bipartisan support can even be seen on this committee, where members from both sides of the aisle have been actively engaged on this issue.

On behalf of the Computer Science Education Coalition, I would like to take a moment to thank those on the committee for the time and energy they have invested in this critical issue. Specifically, Chairman Cole (R-OK) and Rep. Fleischmann (R-TN), who have been champions of this issue. Both have taken time to visit classrooms in their districts to understand first-hand what teachers, parents, and students are saying about computer science. In addition, Rep. Barbara Lee has been actively working to advance this critical subject, and introduced a Congressional resolution^{xiii} last year calling for greater transparency and access to computer science education for all students to ensure greater diversity in the tech sector.

Many others in Congress have signed onto letters in support of funding K-12 computer science education. A reasonably sized redirection of existing federal funds to computer science education for our country's students will help to reverse our current trajectory. A small step from this subcommittee in support of computer science education can help secure our place as the leaders in computer innovation now and in the future.

Even with increased investment in this critical issue, we won't suddenly produce the homegrown talent we need to keep pace with future demands. It takes time to change the course of a ship the size of America. That is why focusing on K-12 computer science education is so important.

Studies show that students who are exposed at an early age are significantly more likely to pursue computer science in college. Girls who take AP computer science in high school are 10 ten times more likely to major in computer science in college. African-American and Latino students who take this course in high school are over seven times more likely to major in this field.^{xiv}

In addition to the economic and national security benefits integrating the teaching of computer science into our elementary, middle, and high schools could have, exposure to computer science at a young age has the potential to address the diversity and gender gap in computer science fields.

America's shortage of qualified workers in computer science threatens America's role as an innovation leader in a globally competitive world and undermines our national security. Until computer science education is a national priority we will continue to lose jobs overseas and become less safe here at home. That's the reality of the situation.

An investment in computer science is an investment in the future of this country. The Computer Science Education Coalition urges the members of this committee and Congress to prioritize this critical subject as the development of Labor, Health and Human Services, and Education spending bill moves forward. Even with tight budgets, an investment in computer science must be prioritized as it will equip American's with the skills needed to compete for and fill computing jobs, bolster America's economic competitiveness, and help America remain safe and secure in the decades ahead.

Thank you for your time and attention to this critical matter.

ⁱ Cory Bennett, Energy Dept. Hacked 150 Times in 4 Years. The Hill, September 9, 2015. <http://thehill.com/policy/cybersecurity/253130-hackers-cracked-energy-department-150-times-over-four-years>

ⁱⁱ Google Inc. & Gallup Inc. (2016). Trends in the State of Computer Science in U.S. K-12 Schools. Retrieved from <http://goo.gl/j291E0>

ⁱⁱⁱ Bureau of Labor Statistics Employment Projections. <https://www.bls.gov/emp/tables.htm>

^{iv} Code.org, Promote Computer Science. <https://code.org/promote>

^v Code.org, Support K-12 Computer Science Education in New Jersey. <https://code.org/advocacy/state-facts/NJ.pdf>

^{vi} Bureau of Labor Statistics May 2015 State Occupational Employment and Wage Estimates. <https://www.bls.gov/oes/current/oesrcst.htm>

^{vii} Office of Foreign Labor Certification, US Department of Labor. <http://blog.code.org/post/116568172243/with-all-the-national-debate-on-immigration-i>

^{viii} Office of Foreign Labor Certification, US Department of Labor. <http://blog.code.org/post/116568172243/with-all-the-national-debate-on-immigration-i>

^{ix} Clive Thompson, The Next Big Blue-Collar Job Is Coding. Wired Magazine, February 8, 2017. <https://www.wired.com/2017/02/programming-is-the-new-blue-collar-job/>

^x Google Inc. & Gallup Inc. (2016). Trends in the State of Computer Science in U.S. K-12 Schools. Retrieved from <http://goo.gl/j291E0>

^{xi} Brian McNicoll, Not Enough American Kids Trained in Computer Sciences. The Hill, April 22, 2016. <http://thehill.com/blogs/congress-blog/education/277290-not-enough-american-kids-trained-in-computer-sciences>

^{xii} CS Education Coalition, in partnership with Code.org. Offer Computer Science in Our Public Schools. <https://www.change.org/p/offer-computer-science-in-our-public-schools-csforall>

^{xiii} Congresswoman Barbara Lee. Congressional Leaders Call for Greater Diversity in Tech. <https://lee.house.gov/news/press-releases/congressional-leaders-call-for-greater-diversity-in-tech>

^{xiv} College Board, AP Students in College: Analysis of Five-Year Academic Careers, 2007. <http://research.collegeboard.org/sites/default/files/publications/2012/7/researchreport-2007-4-ap-students-college-analysis-five-year-academic-careers.pdf>