**Testimony of Hadi Partovi**
**Co-founder and CEO, Code.org**

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*Hearing: Driving Innovation through Federal Investments*
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For decades, lawmakers, educators, industry and students and parents have been talking about a "STEM"crisis and the need to support policies and programs that make the country more innovative. At Code.org, we argue that when we talk about the "STEM" crisis in our economy and schools, we are really talking about a computing crisis. In fact, according to the Conference Board, demand for computing professionals is roughly four times higher than the average demand for all other occupations, with more than 560,000 jobs in computing open as of March 2014.[1] Furthermore, more than half of all jobs in STEM fields will be in computing.[2] These are generally understood facts, but what is less well known is that almost every job -- medicine, law, business, and banking -- increasingly requires foundational familiarity with computer science. A 21st-century doctor, lawyer, or banker may not need to know how to write complex code, but they increasingly need to understand the inner workings of an app, a website, cookies, software security, and other technology basics.

Despite these facts, most K-12 schools do not offer computer science, and students are not expected to be exposed to it at any level. In fact, last year, only 1 percent of Advanced Placement (AP) students studied computer science. And only a tiny fraction of that 1 percent are women and underrepresented minorities.[3] Cohort after cohort of students are being denied the knowledge and skills they need in our increasingly digital world. Our K-12 schools teach students how to dissect a frog, how electricity works -- it's time they also taught how to "dissect an app", or how the Internet works.

It's not easy to add a new, rapidly-evolving field to the K-12 curriculum, but it's a challenge we must meet. The UK already has a plan to bring computer science to every school, starting in September. But in the US, when we talk about STEM, when STEM policies are translated to action, "STEM" is translated to mean the same fields we've taught for decades: biology, chemistry, physics, and calculus. These are important, foundational topics. But we need to focus the STEM conversation on a new field, a field that is driving 50% of new STEM jobs, a field that is increasingly foundational across all careers in science, business, government and law, a field that is not being taught in the majority of our schools. Today when we say "STEM", computer science is ignored. We need to change that conversation.

**Introducing Code.org**
Code.org is a non-profit dedicated to expanding participation in computer science education by making it available in more schools, and increasing participation by women and underrepresented students of color. Our vision is that every student in every school has the opportunity to learn computer programming.

I started Code.org in 2012 as a personal mission with my twin brother, Ali Partovi, setting out to make a video that would inspire students to take an interest in computer science. That video, "What Most

Schools Don't Teach", starring Bill Gates, Mark Zuckerberg, and other tech heroes and celebrities, struck a chord with Americans. Within one week it reached 10 million views and 10,000 school districts asked Code.org how they could get coding into schools. At the same time, a partnership of the Association for Computing Machinery, the National Science Foundation, the Computer Science Teachers Association (CSTA), the National Center for Women and Information Technology, Microsoft and Google joined with Code.org in a new strategy that leverages our consumer awareness while building off years of effort from the computing community to bring computer science into schools.

**The Hour of Code**
When Code.org announced the Hour of Code in October of last year, the goal to teach 10 million students computer science and coding for 1 hour was ambitious. In December, 20 million students participated in computer science, including 1 in 4 students in kindergarten through 12th grade in the US. Perhaps even more astonishing was that half of these students were girls. The results of just this one week blew us away. In U.S. schools, more students participated in computer science during Computer Science Education Week 2013 than had ever taken computer science in the history of our K-12 system. We hope we can get 100 million students to try the Hour of Code by the end of 2014. (You can help by spreading the word in your states, particularly with teachers, administrators and district and state education leaders.)

Teachers, principals and superintendents in every part of America took the initiative to bring this educational experience to their students. Over 12,000 U.S. schools signed up to host an Hour of Code event for the *entire* student body. We heard stories from teachers about students "working together for the first time to solve problems," or that they "didn't even know coding was something you could teach students", but that "it turned out to be one of the smoothest class periods we've ever had." Most importantly, teachers reported that students want more. Over 10,000 teachers have signed up more than 500,000 students for our follow-on 20-hour, online Introduction to Computer Science course. This is a complete 20-hour curriculum that is in 10,000 classrooms today.

**Bringing Computer Science to ALL Students**
Code.org believes computer science should be part of the core curriculum in education, starting as early as elementary school. Our goals include: (1) Bringing Computer Science classes to every K-12 school in the United States, especially in urban and rural neighborhoods, (2) Demonstrating the successful use of online curriculum in public school classrooms, (3) Changing policies at the federal and state level to either remove barriers to K-12 computer science education or bolster its instruction, (4) Harnessing the collective power of the tech community to celebrate and grow computer science education worldwide, and (5) Increasing the representation of women and students of color in the field of computer science.

**Code.org's Three Pillars: Educate, Celebrate and Advocate**
*Educate:* Code.org's education pillar aims to create modern, engaging computer science curriculum for all levels of K-12 students and to partner with school districts to deliver instruction. We are bringing two high school computer science courses to scale -- Exploring Computer Science and AP Computer Science Principles. Both of these courses are designed to broaden participation in secondary computer science and prepare students for post-secondary experiences related to computing or college majors in computer science. Our district partnerships encompass curriculum for elementary, middle and high schools and professional development for teachers. To date, we have struck agreements with thirty school districts, including Chicago Public Schools, New York City and Broward County (FL), which are among the country's largest.

***Celebrate:*** Our celebrate pillar works to neutralize negative stereotypes of the field, inform students of the benefits of studying computer science, and inspire them to do so. The focus of this area has been the Hour of Code effort and our video "What Most Schools Don't Teach." Today, the stereotype is that computer science is for genius nerds, often portrayed in the media as Asian or white teenage boys. Thanks to the Hour of Code campaign, more than 10 million girls learned an Hour of Code. We hope our continued efforts will break the stereotype permanently.

***Advocate:*** Our advocacy pillar works on policy issues at the federal and state level, through our sister organization, Computing in the Core. Our main goal is removing barriers that hinder computer science instruction or passing policies that will bolster its instruction. At the state level, our headline goal has been to "make computer science count," which means allowing courses to satisfy an existing core math or science graduation requirement. Making computer science courses "count" would not *require* schools to offer computer science or students to study it; it would simply *allow* existing computer science courses to satisfy a requirement that already exists. Today, only 19 states allow computer science to satisfy a core high school graduation requirement.

**Federal Policy Reform to Strengthen Computer Science Education**
When I started to educate myself on the reasons computer science isn't taught in our schools, I found that there are countless federal, state and local policies that determine what is ultimately taught in our schools. I have learned much about the No Child Left Behind Act, the Higher Education Act, Career and Technical Education programs, the Labor Department's workforce supports, the National Science Foundation's investments, America COMPETES, Race to the Top, public investments in afterschool programs and other federal initiatives, policies and investments. Knowing that the goal of our public education system is to prepare our young people for success in college and/or the workforce, it is confounding that most schools don't teach computer science. This must change.

Computer science is not treated as a "core academic subject" in the Elementary and Secondary Education Act. Computer science teachers are not eligible for the same professional development supports as their math and science teacher colleagues. Getting certified to teach computer science is an ambiguous and confusing process in most states, and almost impossible in a few. Modest changes to existing programs could make it easier to give students the opportunity to learn computer science. Senators Bob Casey (D-PA) and Marco Rubio (R-FL) have proposed legislation—the Computer Science Education and Jobs Act (S 1407)—that would amend the Elementary and Secondary Education Act to make it easier for computer science to be taught and for educators to get the supports they need to teach it well. Congresswoman Susan Brooks (R-IN) and Congressman Jared Polis (D-CO) have introduced a bill (HR 2536) with the same goals in the House, making the issue both bipartisan and bicameral.

More directly related to the purview of this Committee, I urge you to ensure that computer science is explicitly included as a focus of public investments and policy goals. The President's budget request for FY 2015 includes an ambitious "ConnectEDucators" program to be administered by the Department of Education. In considering this proposal, I urge you to integrate the teaching and learning of computer science into the initiative. As our schools continue to strive to transition to the digital age, it is imperative that educators have the skills and expertise to not only effectively integrate these new tools and resources into the classroom, but also to teach students the skills and content they need to understand how the tools work and to become interested in creating the technology tools of the future. That means that professional development needs of computer science teachers must be considered as the details of the program are developed and that the teaching and learning of computer science is an important component of the new effort. As educators know all too well, a device by itself is not enough

to improve student outcomes. Without dedicated and sustained professional learning opportunities and an understanding of what computer science is versus education technology or technology education, schools will not be able to leverage other investments in broadband connectivity, devices and materials to their full advantage, let alone give students the knowledge and skills they will need to understand and manage the devices they will use in college and the workforce.

The confusion between education technology, technology education and computer science illustrates the importance of definitions in federal policy. Amazingly, the definition of "STEM" in existing statutes marginalizes public investments in computer science. "Science, technology, engineering and mathematics" doesn't explicitly include computer science, which is problematic in the regulatory process at certain agencies and in the award process at others. I hope that revisions to any laws that include a definition of STEM will explicitly include computer science, or that report language from appropriators might provide further clarification. When it is not explicitly included, it is quite often implicitly excluded, because it is easier for agencies to adhere to explicit guidance and for school systems and focus only on the topics they already teach. In addition, there are a number of federal programs that support math and science teachers that should do the same for computer science teachers. Guidance from this Committee to clarify that intention would be appreciated.

The palpable interest in giving the country's young people access to computer science has buoyed the policy efforts of Code.org, Computing in the Core and our members and supporters. We will work on a number of policies to broaden access to computer science. For example, in America COMPETES, we will work to make sure that computer science teachers--prospective and practicing--are supported in the same way that math and science teachers are. In addition, we are hopeful that the National Science Foundation can help the field develop standards-based assessments for K-12 computer science. Congress is reauthorizing the Higher Education Act, and that statute addresses federal investments in teacher preparation programs. There are few colleges that offer teacher education programs for computer science teachers. Changes to the Higher Education Act could catalyze reform in this area. Cybersecurity legislation, federal investments in research, efforts to nurture interest and success in the STEM fields, comprehensive immigration reform efforts that tie H-1B visa fees to a new STEM education fund and revisions to the E-Rate program are among the policies that can be changed to support the teaching and learning of more computer science.

**Conclusion**

With over 33 million students participating in the Hour of Code to date, I claim that our students have voted with their actions: that learning computer science is this generation's Sputnik moment, that it's part of the new American Dream, and that it should be available to every student, in every school, as part of the standard curriculum.

*More information about Code.org, Computing in the Core and our partners, the Hour of Code tutorial, the inspirational videos that highlight the need for more computer science and the work of our talented team of engineers and education professionals is available on our website at www.code.org.*

Hadi Partovi
Code.org
1511 Third Avenue, Suite 301
Seattle, WA 98101
hadi@code.org
p: 206.420.1376 f: 866.241.8505

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[1] Source -- US Conference Board Help Wanted Online Service
[2] Source -- Code.org analysis of BLS 2010-2020 employment projections (we have not yet analyzed the BLS 2012-2022 projections released at the end of December).
[3] Source: College Board