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Bridging the Computer Science Education Gap:

Five Actions States Can Take

November 2016

Southern
Regional
Education
Board

SREB.org

Executive Summary

In the global labor market, computational thinking skills and knowledge of computer science are required in nearly all career fields. What's more, jobs in computer science, information technology (IT) and related fields represent a large and growing sector of the economy. By 2020, as many as 4.6 million out of 9.2 million jobs in science, technology, engineering and math (STEM) fields will be computer-related, according to the Association for Computing Machinery. Labor market economists at the Georgetown University Center on Education and the Workforce estimate that over 70 percent of these jobs will require a bachelor's degree or higher. And most will pay well. The average median salary of jobs in computer science and IT was $81,430 in 2015, according to the U.S. Bureau of Labor Statistics.

However, the nation is not on track to meet labor market demand in computing fields. Code.org projects that, by 2020, the United States may have 1 million more computing jobs than qualified individuals to fill them. Meeting demand in these innovation-intensive fields will require states to greatly expand and diversify their college-degreed computing workforce.

The Southern Regional Education Board's Commission on Computer Science and Information Technology met in 2015 and 2016 to determine how states can help more young people — especially girls, black and Hispanic students, and students from low-income families — learn computer science, explore exciting computing careers, and for some, start journeys toward those careers while in high school.

By taking the five actions outlined in this report, states can help more youth learn computer science and develop computational thinking skills, not just those students considering STEM careers. Computer science offers students much more than the knowledge of how computers work or the skills needed to build a device, write code or manage data. Computer science builds high-level literacy, math, problem-solving and technological skills and advances productivity in every discipline, industry and profession.

The full report expands on the abbreviated action steps laid out below.

Action 1: Develop state computer science standards for K-12.

- Work in partnership with secondary and postsecondary educators, experts and industry leaders to develop K-12 computer science standards that include the essential concepts and practices students should master in the elementary and middle grades and high school.

- Develop or adopt standards-based, developmentally appropriate computer science curricula that appeal to diverse learners in the elementary and middle grades.

- Require all high schools to offer students access to rigorous, standards-based computer science courses, such as Exploring Computer Science and Advanced Placement Computer Science Principles.

- Provide funding at the state, district and school levels to support expanded computer science learning opportunities in schools.

- Extend early and frequent opportunities for K-12 students and their families — especially girls, black and Hispanic students, and students from low-income families — to explore computer science and computer science-related careers.

Action 2: Lay the groundwork for learning computer science.

- Throughout K-12, integrate and teach the essential literacy skills that students need to master grade-appropriate computer science standards.

- Throughout K-12, integrate and teach the essential math concepts and skills that students need to master grade-appropriate computer science standards.

- Provide targeted interventions and readiness courses to students who need extra help mastering the grade-level literacy and math skills needed for success in computing fields.

- Require students to take four years of math aligned with their career and college goals.
- Support K-12 academic and computer science teachers in designing interdisciplinary, project-based instruction and assignments that engage students in applying literacy, math and computational thinking skills to solve problems.

Action 3: Create clear pathways to computing careers.

- Charge a state career pathway advisory council with developing pathways that meet identified workforce needs in computing fields.
- Build career pathways consisting of four or more courses that connect seamlessly to postsecondary programs in high-demand career fields, such as cybersecurity, informatics and software development.
- Redesign the high school senior year to allow students who meet college-readiness benchmarks to earn college credits that transfer to associate and bachelor's degrees and to help struggling students prepare for college.
- Include computer science and computer science-related career pathways in state accountability and funding systems.

Action 4: Prepare great computer science teachers.

- Recruit teachers with the content knowledge, interest, passion and willingness to learn and explore computer science alongside their K-12 students.
- Offer teaching endorsements to new computer science teachers who complete a two- to four-week, full-day summer institute, led by a master teacher, in which they learn their curriculum by completing the same projects and assignments as their students.
- Create clear pathways to teacher certification and licensure to ensure that all teachers, regardless of their backgrounds, have the appropriate content knowledge and pedagogical skills needed to teach standards-based computer science and IT curricula.
- Leverage federal, state, foundation and private sector funds to support intensive, ongoing professional development on computer science and IT content knowledge and the pedagogical skills needed to manage diverse learners, create assessments and embed literacy and math in student-driven, project-based instruction and assignments.
- Partner with other states, national and regional organizations, the Educational Testing Service or other licensing exam providers to design a new computer science Praxis or other standardized assessment that measures teachers' mastery of the most current content knowledge and pedagogical knowledge required to teach computer science.

Action 5: Educate communities about computer science and computing careers.

- Embed career advisement and exploration across K-12 as a means of educating students, parents and communities about computer science and computing careers.
- Encourage employer partners to invest in the computing and IT workforce of the future.
- Enact legislation to recognize communities that improve computer science education and meet workforce needs in computing fields.

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