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States Move toward Computer Science Standards

By Eve Tilley-Coulson

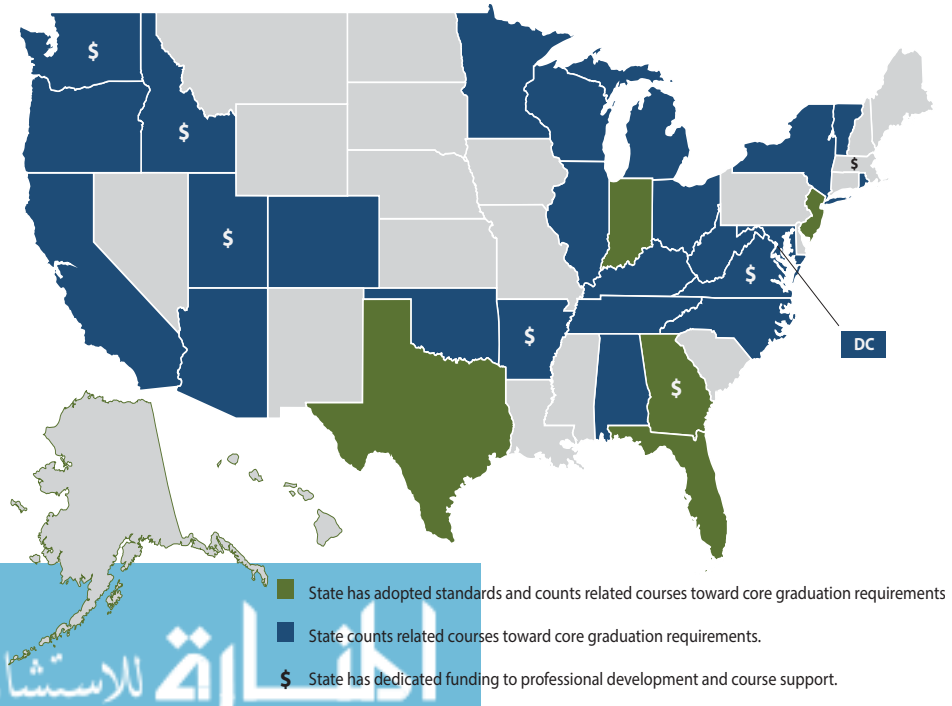
There are over half a million unfilled computing jobs in the United States, and these jobs are projected to grow at double the rate of all other jobs over the next decade.[1] And while educators and parents recognize computer science as a key skill for career readiness,[2] few states have adopted learning standards in this area, and only one in four schools teach computer science at all.

States recognize that computer science standards and aligned teacher preparation are critical to eliminating the shortage of US students capable of entering the computer science field. As 45 state boards of education have authority over academic standards, they are well poised to close this gap between industry needs and current instruction. They are also poised to deliver on the call in the Every Student Succeeds Act to provide quality computer science instruction as part of a "well-rounded education."

STANDARDS

As technology has only recently been integrated into classrooms, states are playing catchup in computer science instruction. Whereas states have revised their English language and math standards over many years, computer science standards are a recent field. Five states have computer science standards (as of June 1),[3] while 25 have set certification pathways for computer science teachers. Yet 30 states count computer science toward graduation requirements, more than double the number in 2013. This growth reflects state education stakeholders' view of the importance of computer science, even as they lack standards to guide instruction (see map).

Growing Number of States Count Computer Science toward Graduation



Two multistate efforts are helping states over the hump. One effort led by Code.org and others offers a framework to help state education agencies develop such standards.[4] The framework lays out concepts and practices for states to consider but does not outline standards themselves (see box). Thirteen states are actively participating in developing the framework, whose goal is to define a baseline literacy for computer science students.[5] A final comment period on the draft framework ends June 29.[6] The final version of the framework will be released in September 2016.

States are also sharing their policies and practices through the Southern Regional Education Board (SREB). Member states offer recommendations on how to increase the number of students interested in careers in computer science and share multidisciplinary curricula to transition students to these studies. The SREB Commission on Computer Science and Information Technology will complete a final report in the coming months that recommends actions SREB states can take to meet current workforce needs.

State education agencies share resources on their own draft computer science standards both to help other states create standards and as options for revision to existing state standards. The Maryland State Department of Education is using early drafts of the K-12 Computer Science Framework to inform decisions regarding computer science education, and guide standards development, policy alignment, professional learning experiences, and instructional resource creation.

Georgia began working on computer science standards comparatively early, in December

FRAMEWORK CONCEPTS AND PRACTICES*

Concepts
1. computing systems
2. networks and the internet
3. data and analysis
4. algorithms and programming
5. impacts of computing

Practices
1. fostering an inclusive and diverse computing culture
2. collaborating
3. recognizing and defining computational problems
4. developing and using abstractions
5. creating computational artifacts
6. testing and refining
7. communicating around computing

*These suggested concepts and practices are not exhaustive.

2014, following the governor's August 25, 2014, proclamation that every student in the state needed to study computer science and that the Georgia State Board of Education should amend state policy accordingly.[7] Educators in Georgia then analyzed existing courses and determined where new courses could be added, also subsequently adding three new courses on game design, web development, and embedded computing. Georgia's computer science task force then created a committee to write standards, over half of whose members are from business and industry.

TEACHER CERTIFICATION

State stakeholders are also working on teaching certification, professional development, and increased school resources for computer science.

In Georgia, computer science educators attend day-long trainings on teaching computer science aligned to their standards, but no formal track toward certification exists. Some Georgia universities offer a content-intensive Computer Science Endorsement 6-12 Program for those with teaching skills who seek added technical skills in the subject. This endorsement does not entitle teachers to a salary increase, and neither schools nor districts subsidize or cover the tuition to acquire it. This hesitance stems partly from the fear of teacher turnover in computer science: It would be possible for a state to pay to develop teachers' knowledge of coding and programming and then lose them to industry jobs where they can earn the higher pay such professions offer.[8]

According to Code.org's Katie Hendrickson, Utah is combating teacher turnover in a different manner. By using state funds to help teachers become certified with multilevel certifications, Hendrickson says teachers may be persuaded to remain in the classroom. Multilevel certifications allow for stepwise professional growth that creates a career ladder.

Maryland has also taken steps to combat this perceived problem, developing a toolkit with free instructional resources to support implementation of their standards and allowing school leaders to apply for Reserve Fund Grants. These grants supplement equipment and teacher professional development.[9]

Coalitions of states have enabled states to pool resources. For example, governors from Arkansas, Washington, and Rhode Island have formed The Governors' Partnership for K-12 Computer Science, which aims to enable high schools in their states to offer at least one advanced computer science course, along with licensed teachers, standards, and curriculum.[10]

The partnership's members then learn from each other's efforts. For example, Washington passed a bill in 2015 that dedicated $2 million every two years for professional development and technology upgrades for computer science instruction. Idaho mimicked this bill with its own legislation in 2016 to include funding, standards development, and curriculum implementation.[11]

There is no single solution for addressing the dearth of students ready to enter the computer science industry. State actors are nonetheless taking steps to close these gaps and will continue to do so, and state boards of education should have a strong hand in standards adoption and teacher certification.

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NOTES

1. Southern Regional Education Board, "Charge to the Commission on Computer Science, Information Technology and Related Career Fields," http://www.sreb.org/sites/main/files/file-attachments/cs_commission_charge_final.pdf.

2. In a recent Gallup survey, 90 percent of parents state they want computer standards (May 9, 2016, interview with Anna Edwards, senior vice president, Whiteboard Advisors).

3. Georgia, New Jersey, and Texas. Georgia recently adopted computer science standards; only 97 schools in the state offered AP computer science courses in 2014–15. Seventeen percent of Texas schools with AP programs offered AP computer science in 2014–15, even though there are currently 41,173 open computing jobs, which is 3.7 times the average demand rate in Texas.

4. Code.org also runs a program called Hour of Code, in which millions of students have gained basic programming skills. Other members of the coalition developing the framework are the Association for Computing Machinery (ACM), Computer Science Teachers Association (CSTA), National Math and Science Initiative (NMSI), and Cyber Innovation Center (CIC) are also involved in the coalition.

5. Those involved in the framework have convened twice, with 13 states and 3 districts sharing status updates on their computer science standards and professional development.

6. See K12cs.org, "A Framework for K-12 Computer Science Education," https://k12cs.org/review/. Comments from state board of education members are welcome.

7. Georgia Office of the Governor, "Deal Recommends Computer Programming Satisfy Core Requirement," press release, August 25, 2014, https://gov.georgia.gov/press-releases/2014-08-27/deal-recommends-computer-programming-satisfy-core-requirement.

8. Interview on April 22, 2016, with Delda Hagin, program specialist at the Georgia Department of Education. North Carolina likewise faces concerns about teachers abandoning computer science teaching.

9. Interview on April 21, 2016, with Heather Lageman, director of curriculum teacher induction programs, Maryland State Department of Education.

10. Courtney Tanenbaum and Melissa Rasberry, "Make Room for C-S in S-T-E-M," InformED blog, April 5, 2016, American Institutes for Research, http://educationpolicy.air.org/blog/make-room-cs-stem.

11. Interview on May 9, 2016, with Amy Hirotaka from Code.org.

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