

National Association of State Boards of Education

⊕ Preparing Computer Science Teachers in Maryland and Arkansas

By Eve Tilley-Coulson

Identifying teachers who can reach a base level of competency in computer science instruction and funding their professional development are the biggest hurdles to making computer science a part of every student's education—something industry leaders and parents agree is critical to a student's future career readiness.¹ Without a sufficient number of competent teachers and the resources to support them, implementation of computer science standards will fail, according to some state education agency staff. For this reason, Maryland and Arkansas have prioritized teacher preparation.

Among the 26 states that are creating teacher preparation pathways specifically for computer science, Maryland and Arkansas are leaders. Their actions include adopting licensure tracks in computer science, offering aspiring teachers computer science courses and professional development based on basic computer science concepts, and presenting monetary incentives for teachers to engage in this professional development.

These states and others are addressing a critical gap. Nationally, only 44 percent of high school seniors have access to computer science courses.² One study of California high schools suggests the problem is even more acute in schools with the highest percentages of low-income and minority students.³

MARYLAND LAYS GROUNDWORK

As part of its focus on teacher preparation, Maryland is setting certification require-

ments for teaching computer science, offering its schools stipends for educating preservice teachers, and creating dedicated computer science teaching positions.

In particular, Maryland will have designated computer science teachers to teach computer science courses rather than using math or science teachers for this purpose. At the local level, there are also computer science supervisors, who oversee computer science instruction for schools within their district. At the state level, an education program specialist is responsible for collaborating with district leaders on computer science initiatives.

While the Maryland State Board of Education has not yet adopted computer science standards, state education agency staff are already developing engaging instructional materials, including a toolkit with resources that address related skills for children as young as pre-K. Use of the toolkit does not require particular devices, so it can be used in facilities without computers or internet access.

The state board has deliberately chosen not to adopt computer science standards yet, although they have the authority and may do so in the near future. In considering lessons learned from earlier standards efforts, the Maryland State Department of Education is involving teachers in the process much earlier and collaborating with districts to ensure that teachers have the necessary preparation time and support. Maryland hopes to “do it the right way, not the rushed way,” said Tiara Booker-Dwyer, the department's ombudsman.

ARKANSAS'S FOCUS ON PROFESSIONAL DEVELOPMENT

Arkansas has been focused on access to high-quality computer science instruction for the past few years, adopting K-8 computer science standards in June 2015, as well as instituting the same teacher preparation pathways as Maryland. Additionally, Arkansas provides funding directly to teachers for professional development.

The biggest road block to improving computer science instruction is not the lack of standards, according to Anthony Owen, coordinator of computer science at the Arkansas Department of Education (ASDE), but rather the lack of teacher capacity. By the end of 2016, the department will have distributed \$770,000 in grants for professional development and to ensure teachers have the resources and tools to teach the skills successfully, Owen said.

Owen envisions teachers being trained in basic competencies and knowledge that will enable teachers to continue teaching as technology changes rather than being trained to meet specific content standards. He added that Arkansas will be able to retain its teachers if they receive the professional development they need.

By the start of the 2019–2020 school year, Owen said, ASDE projects that 95 percent of Arkansas districts will have at least one teacher certified to teach computer science. Officials hope to build current and aspiring teachers' interest in teaching computer science by showcasing career opportunities in the field and by making instructional ma-

materials available to all students and teachers in the state.⁴

Until recently, many states, Maryland and Arkansas included, counted computer science courses in high school as technical education credits. Arkansas, like Maryland, now counts these same courses as fulfilling graduation requirements, giving students more flexibility in course selections.

STATE BOARDS' AUTHORITY

State boards of education have authority over teacher certification in 32 states and have primary responsibility for standards adoption in 44 (see table). Of the 32 state boards with authority to set teacher certifications standards, all but one also have primary authority to adopt computer science standards and to decide how and when to do so. Even though the majority of state boards have these authorities, not all exercise them fully.

Some states with authority over teacher certification and professional development may hesitate to follow Maryland and Arkansas's example out of fear that increasing teachers' knowledge of computer science will enable them to leave teaching for more lucrative industry jobs. Arkansas does not share this fear, Owen said, because its leaders believe the roots of teacher turnover are understaffing and lack of classroom resources. By preparing teachers first and investing in their development, Arkansas and Maryland

are banking on their ability to keep quality teachers.

In states in which state boards do not have authority over standards or certification, board members still can ask their state education agencies how they plan to integrate computer science into the classroom and prepare the teaching workforce to make that possible.

WHAT'S NEXT

More state boards of education are expected to make decisions on adoption and implementation of computer science standards in the coming year. Multiple organizations and coalitions are working to increase available instructional resources ahead of standards adoption. The K-12 Computer Science Framework is the work of one such coalition, whose members are reviewing states' efforts to improve computer science instruction and encouraging collaboration among them.⁵

The Southern Regional Education Board is another such partnership, set to release a report this fall showcasing its member states' efforts, as well as its findings on the state of K-12 computer science education nationwide.

Other organizations give guidance on standards adoption. For example, the Computer Science Teachers Association (CSTA) is set to release model standards this fall. Mary-

land will likely adopt these standards with minor modifications.

Although many states are poised to adopt and implement computer science standards, there is no guarantee that doing so will close the gap the industry sees between available jobs and the number of employees capable of filling them. But Maryland and Arkansas are betting that better teacher preparation will increase the odds of success.

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NOTES

1. According to a 2015 Gallup poll, 90 percent of parents want computer science standards ("Searching for Computer Science: Access and Barriers in K-12 Education," csedu.gallup.com/home.aspx).

2. Change the Equation, "New Data: Bridging the Computer Science Access Gap," (August 9, 2016), <http://changetheequation.org/blog/new-data-bridging-computer-science-access-gap-0>.

3. Alexis Martin et al., *Path Not Found: Disparities in Access to Computer Science Courses in California High Schools* (Oakland, CA: Level Playing Field Institute, 2015).

4. For example, states may want to consider students in a juvenile detention center without access to computers or students at schools that cannot provide the requisite computer or internet access.

5. Members of the coalition developing the K-12 Computer Science Framework are the Association for Computing Machinery (ACM), Computer Science Teachers Association (CSTA), National Math and Science Initiative (NMSI), Cyber Innovation Center (CIC), and Code.org.

Table. SBE Authorities for Computer Science Standards and Teachers^a

State	Standards authority	Has K-12 standards	Authority over teacher certification	Has certification pathways for teachers	Funds for PD	Has dedicated positions	Authority over grad reqs.	Computer science fulfills grad req.
Alabama	SBE	No	SBE	No	No	No	Independent Board	Yes
Alaska	SBE	No	SBE	No	No	No	Independent Board	No
Arizona	SBE	No	SBE	Yes	Yes	No	SBE	Yes
Arkansas	SBE	Yes	SBE	Yes	Yes	Yes	SBE	Yes
California	SBE	No	PSC	No	No	Yes	Local School Board	Yes
Colorado	SBE	No	SBE	No	No	No	SBE	Yes
Connecticut	SBE	No	SBE	No	No	No	SBE	No
Delaware	SBE	No	SBE	No	No	No	SBE	No
DC	SBE	No	CSSO	Yes	No	No	SBE	Yes
Florida	SBE	Yes	SBE	Yes	No	No	SBE	Yes
Georgia	SBE	Yes	PSC	Yes	Yes	No	SBE	Yes
Hawaii	SBE	No	Standards Board	No	No	No	SBE	No

State	Standards authority	Has K-12 standards	Authority over teacher certification	Has certification pathways for teachers	Funds for PD	Has dedicated positions	Authority over grad reqs.	Computer science fulfills grad req.
Idaho	SBE	No	SBE	No	Yes	No	SBE	Yes
Illinois	SBE	No	SBE	Yes	No	No	SBE	Yes
Indiana	SBE	Yes	SEA	No	No	No	SBE	Yes
Iowa	SBE	No	Independent Board	No	No	No	Local School Board	No
Kansas	SBE	No	SBE	No	No	No	SBE	No
Kentucky	SBE	No	PSC	Yes	No	No	SBE	Yes
Louisiana	SBE	No	SBE	Yes	No	No	SBE	Yes
Maine	SEA	No	SBE	No	No	No	CSSO	No
Maryland	SBE	No	SBE	Yes	No	Yes	SBE	Yes
Massachusetts	SBE	Yes	SBE	No	Yes	No	SBE	No
Michigan	SBE	No	CSSO	Yes	No	No	SBE	Yes
Minnesota	CSSO	No	Standards Board	No	No	No	CSSO	Yes
Mississippi	SBE	No	SBE	Yes	No	No	SBE	No
Missouri	SBE	No	SBE	No	No	No	SBE	No
Montana	SBE	No	SBE	Yes	No	No	SBE	No
Nebraska	SBE	No	SBE	Yes	No	No	SBE	No
Nevada	SBE	No	Standards Board	Yes	No	No	SBE	No
New Hampshire	SBE	No	SBE	No	No	No	CSSO	No
New Jersey	SBE	Yes	SBE	No	No	No	CSSO and SEA	Yes
New Mexico	SEA	No	SEA	No	No	No	SEA	No
New York	SBE	No	SBE	Yes	No	No	SBE	Yes
North Carolina	SBE	No	SBE	No	No	No	SBE	Yes
North Dakota	CSSO	No	Standards Board	Yes	No	No	CSSO	No
Ohio	SBE	No	SBE	Yes	No	No	SBE	Yes
Oklahoma	SBE	No	SBE	No	No	No	SBE	Yes
Oregon	SBE	No	Standards Board	No	No	No	SBE	Yes
Pennsylvania	SBE	No	SBE	No	No	No	Local School Board	Yes
Rhode Island	SBE	No	SBE	No	No	No	SBE	Yes
South Carolina	SBE	No	SBE	Yes	No	No	SBE	No
South Dakota	SBE	No	SBE	No	No	No	SBE	No
Tennessee	SBE	No	SBE	No	No	No	SBE	Yes
Texas	CSSO	Yes	Independent Board	Yes	No	No	SBE	Yes
Utah	SBE	No	SBE	Yes	Yes	Yes	SBE	Yes
Vermont	SBE	No	Standards Board	Yes	No	No	SBE	Yes
Virginia	SBE	No	SBE	Yes	Yes	No	SBE	Yes
Washington	CSSO	No	Standards Board	Yes	Yes	Yes	SBE	Yes
West Virginia	SBE	No	SBE	Yes	No	No	SBE	Yes
Wisconsin	CSSO	No	SEA	Yes	No	No	CSSO	Yes
Wyoming	SBE	No	Standards Board	Yes	No	No	SBE	No

PSC = Professional Standards Commission; CSSO = chief state school officer; SEA = state education agency; SBE = state board of education
a. Blue shading connotes SBE influences over teacher preparation pathways.