ECEP Expanding Computing Education Pathways

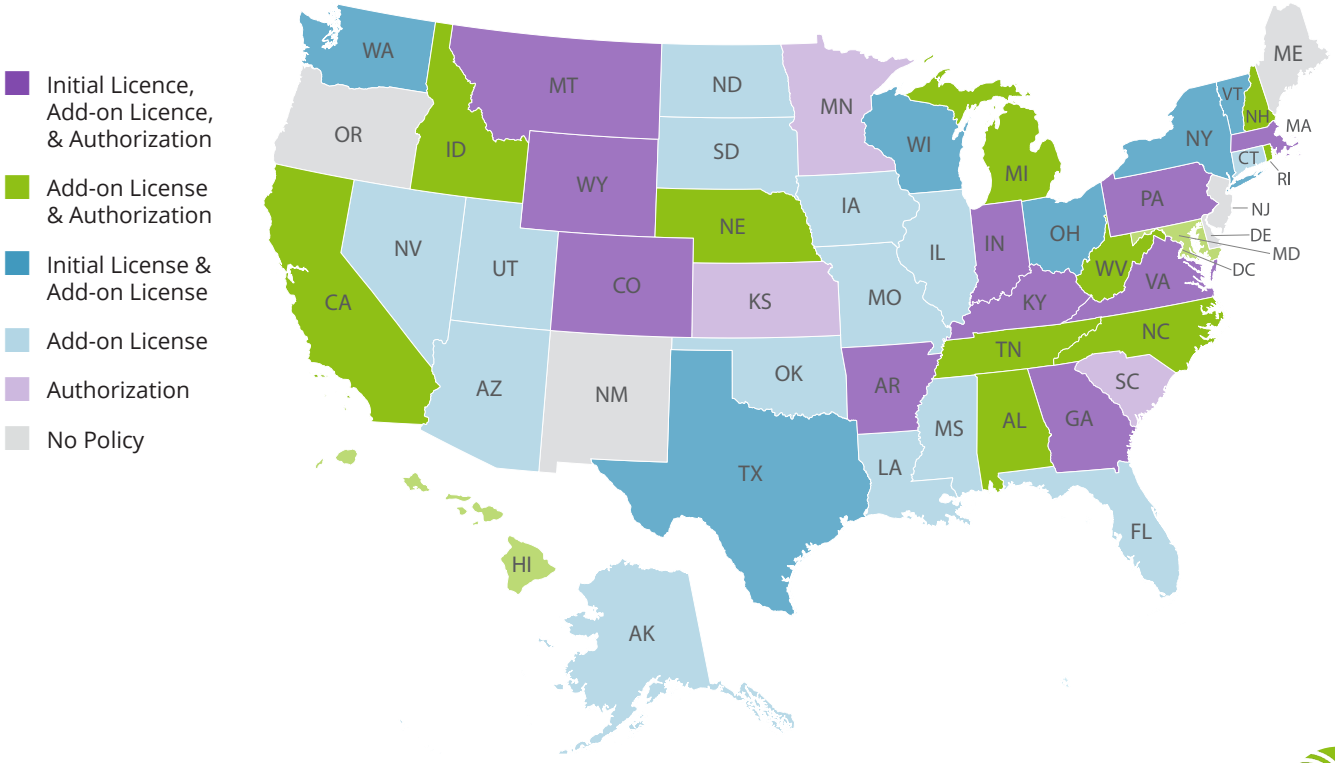
COMPUTER SCIENCE TEACHER **QUALIFICATION PATHWAYS & EQUITY BRIEF**

WHAT ARE COMPUTER SCIENCE TEACHER QUALIFICATION PATHWAYS?

STATE PATHWAYS TO BECOME A COMPUTER SCIENCE TEACHER CAN INFLUENCE WHO GETS ACCESS TO CS

For teachers to teach CS, states have different requirements, ranging from programs to tests to professional development. Qualified teachers have been shown to have an impact on student achievement, which showcases the importance of ALL students having access to a qualified CS teacher.

WHAT DO THESE POLICES LOOK LIKE IN PRACTICE?



POLICY	DEFINITION
Initial (Traditional) License	Standalone pathway
	Some form of quality assurance of CS and pedagogical knowledge.
	Initial license from university/college or other institutions
	May require some or all of these: required BA or BS, passing test, professional development, other requirements
Initial (Alternative) License	Standalone pathway
	Some form of quality assurance of CS and pedagogical knowledge
	Initial license from university/college or other state-approved alternative program
	Received as a post-baccalaureate (teachers without education degree)
	May require some of all of these: required BA or BS, passing test, professional development, other requirements
Add-on License	Add-on to existing teacher license (sometimes referred to as an endorsement)
	Currently teaching in another area
	Pre-service or in-service teachers
	Usually needs something extra to teach CS (e.g., Professional educator certification, passing test, teaching experience, professional development, or other requirements)
Authorization	Legally allowed to teach CS
	Teacher does not need to "prove" they know CS

HOW STATES MEASURE CT TEACHER KNOWLEDGE

MEASURE OF CS TEACHER KNOWLEDGE	NUMBER OF STATES
CS Test (Praxis, Pearson, State-Specific)	26
Coursework	24
State-Approved Teacher Education Program	15
Professional Development	5
Review Process	3
Experience	3

HOW DOES TEACHER LICENSING BROADEN PARTICIPATION IN COMPUTING?

It is critical to examine the unintended consequences when trying to increase CS Teacher Qualification Pathways.

Twenty-six states require a national CS test. However, previous studies have shown a potential racial bias on Praxis tests (Nettles et al., 2011). In another example, certification exams may deter teachers from low-income backgrounds (Barnum, 2017).

If states decide that qualified CS teacher pathways can only be accomplished through national CS tests, this may limit the diversity of CS teachers, as well as what districts have qualified CS teachers. Currently, the most popular national test is the Praxis 5652 (Computer Science), which costs $130. If a teacher needs to take the test multiple times, this can add up to a substantial cost. Some states and/or districts subsidize this cost. For example, the Texas WeTeach_CS program provides a bonus incentive of $1,000 if teachers pass the exam.

Fifteen states have CS teacher education programs. However, this is typically limited to one or two programs in each state, often at larger universities or colleges. This limits who can enroll in these programs, as well as which districts are able to recruit those who graduate from these programs.

Five states had a CS teacher professional development program to help qualify teachers to teach CS. However, the location of the professional development offerings can impact the diversity of CS teachers. Teachers in rural schools may not have access to professional development offerings which would impact how many rural schools could offer CS.

STATE HIGHLIGHTS

Nevada had two endorsements (add-on licenses) created specifically for computer science education. These can be added to any base-licenses and expand the potential for CS offerings.

Introductory Computer Science endorsement: open to all K-12 educators (NRS 391.019). To receive an endorsement to teach introductory computer science that includes issues relating to information technology, tools for productivity, communication and research, and computational thinking in kindergarten through grade 12, a person must have a valid elementary, secondary license or special license, a valid license to teach special education or a valid license to teach middle school or junior high school education, and must have completed nine semester hours of coursework consisting of:

1. Methods for teaching computer science (3 credit hours)
2. Concepts in computer science (3 credit hours)
3. Methods for teaching computer applications (3 credit hours)

Advanced Computer Science endorsement: open to secondary teachers (NRS 385.080, 391.019). To receive an endorsement to teach advanced computer science, a person must have a valid secondary license, and select one of two options:

1. Successfully complete twelve semester hours of coursework, consisting of: (a) Methods for teaching computer science (3 credit hours); (b) Concepts in computer science (3 credit hours); and (c) Programming in computer languages (6 credit hours)
2. Submit to the Department official documentation of passing the "Praxis Computer Science Test" prepared and administered by the Educational Testing Service.

Nevada's methods and concepts courses are tiered. The same courses show up in the Introductory CS endorsement but may be counted towards the Advanced CS add-on license. This helps with allowing teachers to move into teaching CTE, but only requires them to take two additional programming courses.

In **Mississippi**, the ECEP state team is working on the recruitment of new CS teachers by collaborating with the advisers in Schools of Education to understand the need for CS teachers and to help them recruit preservice teachers into CS licensure programs. They have also started working closely with Community Colleges to recruit 20 talented teachers to complete a two-year CS Teacher Training Academy that will prepare them to teach four courses in the Career and Technical Education Pathway for Software Development.

Arkansas has established a policy that each school needs to have at least one certified CS teacher by 2023. In 2015, they started with fewer than 50 teachers, and have increased this to 800 fully certified CS teachers as of 2022. One of the contributing factors to this dramatic increase was due to an incentive program whereby teachers earn $2,000 for passing the CS content knowledge Praxis test. In addition, the state also pays for their Praxis test fees, licensure renewal fees, and CSTA membership. All of the professional development and training is also offered for free.

Maryland recognized in 2018 that its teaching workforce needed support and pathways to be able to teach CS in our K-12 classrooms. With policy and state funding, Maryland has worked to increase the computer science knowledge and skills for both inservice and preservice teachers. The support structures with funding for inservice teachers included taking professional development, pursuing graduate courses, and working toward several pathways to become CS certified. For preservice teachers, modifications to the public and private teacher preparation programs were needed. Planning grants were provided to either create new pathways to become a CS teacher or integrate CS into existing courses. Prior to 2018, there were 3 approved programs to become a CS teacher in Maryland, and now, there are 10 approved programs. All of these efforts have been possible by building the infrastructure of advocates at the state and local levels who work collaboratively to make necessary systemic changes and provide support to the teachers with continued state funding.

BPC ACTIONS + POLICY

As policymakers gather to establish pathways, we implore these individuals to consider the unintended consequences for all student and teacher populations. These are all critical questions that need to be considered to provide equitable CS education experiences for all K-12 students:

How do these pathways impact who teachers CS and what districts they are teaching in?

- ☑ Gather data on CS teachers' qualifications across the state
- ☑ Identify where qualified and non-qualified CS teachers* are teaching CS and the demographics of the school's student population.
- ☑ Evaluate the relationship between who is teaching CS courses, schools offering CS courses, and the demographics of students who are participating in CS courses.

What pathways enable more CS teachers to reach historically marginalized students?

- ☑ Offer incentives for teachers to earn an add-on license (e,g., graduate credits for license renewal and moving up the pay scale; Robert Noyce scholarships)
- ☑ Support all schools to employ a qualified CS teacher by providing professional development and incentives
- ☑ Distribute scholarships for initial CS licensure programs.

How can barriers to CS teacher licensure be eliminated from pathways?

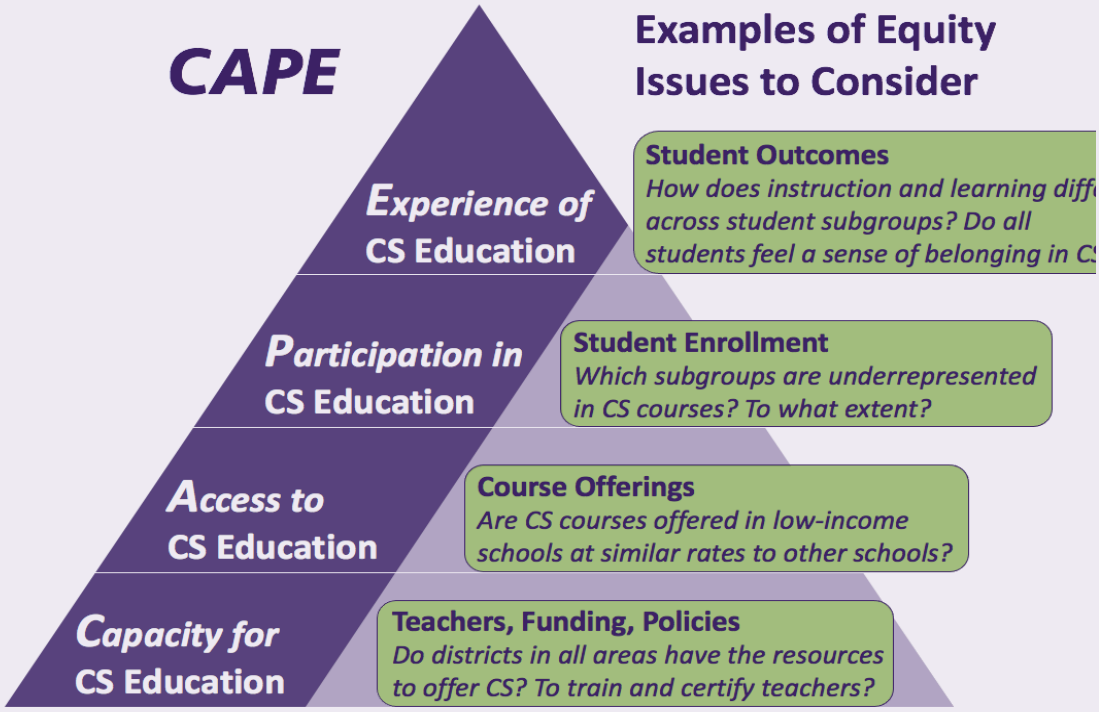
- ☑ Identify the teacher education programs and which pathways they provide
- ☑ Gather support for initial licensure programs to recruit and operate with smaller class sizes
- ☑ Support schools of education to develop computer science expertise (e.g., professional development for all teacher education faculty, see ACT report; hire CS education experts; establish more dual-certification or add-on licenses for computer science;)
- ☑ Provide incentives for teacher education programs to offer CS teacher preparation programs and preservice teachers to add-on CS licenses (e.g., provide scholarships or fee-remissions)

> *With literally thousands of schools across the country in need of a trained and licensed CS teacher, we need multiple, diverse on-ramps to becoming a K-12 CS educator. Balancing the need for innovative pathways with requirements that equip novice CS teachers with the knowledge and inclusive mindsets they need to help all students be successful in CS will be the challenge we must all meet.*
>
> ***Dr. Carol Fletcher,*** *Texas*

CITATION SUGGESTION & AUTHORS

Ottenbreit-Leftwich, A., Childs, J., Dunton, S., Fletcher, C. (2022). Expanding Equity in Computer Education Policies, Pathways, and Practices Policy Brief: Computer Science Teacher Qualification Pathways and Equity. Retrieved from https://ecepalliance.org/

The CAPE Model: A Framework for Assessing Equity throughout the Computer Science Education Ecosystem. The framework addresses four key components of CS education: Capacity for, Access to, Participation in, and Experience of equitable CS education (CAPE). The CAPE framework is a lens for assessing equity not simply as an end product, but as an integral component to each element of the systems that support computing education. For more information see Fletcher & Warner (2021). https://cacm.acm.org/magazines/2021/2/250074-cape/fulltext



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