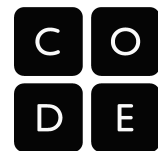# Recommendations for States Developing Computer Science Teacher Pathways

The growth and sustainability of K-12 computer science depends on having an adequate number of well-prepared computer science teachers. However, the pathway to build the necessary skills (including computational thinking) and obtain credentials acknowledging these skills is still not well defined in some states. Though increasing in numbers, few institutions of higher education have preservice teacher preparation programs in computer science. Teacher preparedness and credentials continue to be a topic of concern within states considering a computer science graduation requirement courses at the secondary level. Every state has clear pathways for mathematics and science teachers, but as of February 2024, seven out of 50 states have no pathway for certification of computer science teachers. In those 43 states that have a defined pathway, there are different approaches.

To meet the demand for well-prepared computer science teachers, states should develop multi-pronged approaches to computer science teacher preparation and licensure. Recognizing that states have widely varying rules and regulations on how they approach teacher certification, there are multiple strategies that a state can take to address this problem. States should create pathways to teacher certification that align with their existing preservice teacher preparation, certification, and endorsement pathways. Further, states should not overlook the preparation of elementary teachers and generalists in gaining a basic fluency in computer science.

This document will provide a synthesis of:
- the most prevalent secondary certification pathways, and
- suggestions from Code.org regarding best practices as observed in states that have been successful in computer science teacher training and certification initiatives.

Definitions used in this document

Computer science	The study of computers and algorithms, including their principles, their hardware and software designs, their implementation, and their impact on society.
Licensure	The process of obtaining the initial credential to teach. Example: A preservice candidate in an undergraduate program completing the requirements to earn their initial license as a middle school science teacher.
Certification	The overarching term for the process by which a candidate earns credentials to authorize them to teach a subject at particular grade levels, such as licensure or endorsement. Examples: A preservice candidate in an undergraduate program earning their initial license, a primary school teacher adding a specialization to their license, or a secondary school teacher adding a computer science endorsement to their license.
Endorsement	The process of obtaining an addition or extension onto a teacher license for teachers who already possess licensure in another area. Example: A high school mathematics teacher adding an endorsement to teach computer science or an elementary school teacher adding a STEM specialization.
Micro Credentialing (competency-based credentials)	The process of earning an endorsement in a way that is specific, job-embedded, performance-based, and less expensive and time-consuming than traditional coursework. Examples: A teacher who has been teaching computer science without a computer science certification, micro-credentials provide a pathway for the teacher to officially demonstrate, often through portfolio artifacts, existing skills and prior experience traditionally without the requirements of the teacher to spend hours in traditional models of professional learning or academic coursework.

Existing Secondary Computer Science Certification Pathways

The most prevalent and utilized secondary computer science certification pathways Code.org has found in states are:

Pathway Type	Description	Example(s)
"Testing Out" Endorsement	Earned through passing content knowledge exams; typically the Praxis or Pearson CS content knowledge exams with cut scores established by a governing body within the state (I.E.: State Board, Department of Education, or Legislature)	Arkansas Connecticut Louisiana
Training Based Endorsement	Earned through completing state mandated minimum professional development in the content area; sometimes called a "teaching permit" sometimes also includes a requirement to take and pass a content knowledge exam such as the Praxis or Pearson exam.	Alabama Arkansas New Mexico Tennessee
"Teaching Out" Endorsement	Earned through demonstration of years of service teaching in a particular subject area, this years of service requirement sometimes also includes a requirement to take and pass a content knowledge exam such as the Praxis or Pearson exam.	Alaska Kentucky Wisconsin

Other less utilized secondary computer science certification pathways of note include:

Pathway Type	Description	Example(s)
Postsecondary Coursework Endorsement	Earned through completion of a minimum number of postsecondary courses (often master's level) in the content area, which often also includes a requirement to take and pass a content knowledge exam such as the Praxis or Pearson exam	Illinois (under CTE) Massachusetts Rhode Island
Micro-Credentialing Endorsement	Earned through demonstration of skills in both the content area and the teaching of the content area over a (or multiple) school year(s) by artifact creation and evaluation along with teaching no method observations and reflections.	New York North Dakota Wyoming
Initial Licensure	Earned through completion of a new teacher certification program of study at a certified teacher's college/university, which often also includes a requirement to take and pass a content knowledge exam such as the Praxis or Pearson exam.	Missouri South Carolina Texas

FAQ

Q: Why don't we recommend a K-12 computer science endorsement?
A: The content knowledge and pedagogical content knowledge for teaching computer science is very different at the elementary and secondary education levels. Therefore, we do not recommend that a K-12 (or PreK-12) endorsement or certification is appropriate for computer science. Instead, states should create a full-fledged secondary computer science endorsement and/or certification, and incorporate other strategies, including access to high-quality professional development, for ensuring computer science is taught in every elementary school.

Q: Why don't we recommend an elementary computer science endorsement?
A: All elementary teachers should be able to teach computer science in their classes without needing to acquire an additional endorsement. Instead, we recommend that elementary teachers be able to select computer science as a specialization when earning their degree, that existing technology specialist and STEM endorsements include computer science content, and that *all* elementary teachers be taught computer science methods and integration during existing programs and coursework. Basic *computer science* knowledge, as taught in updated educational technology courses, could replace basic *computer* knowledge in certification requirements for all elementary teachers. Existing elementary teachers could obtain computer science content knowledge via a one-day intensive professional development experience.

Q: What are some related policies that can reduce barriers for teachers who want to become certified to teach computer science?
A: When certification is difficult to obtain or computer science certification doesn't exist, many teachers are teaching computer science under a temporary or out-of-subject area license. Creating new certifications may result (in the short term) in increased barriers to growing the teacher force. Some ways to mitigate such barriers include: tuition reimbursement for teachers taking computer science or computer science methods courses, salary increases for teachers obtaining an add-on endorsement in computer science, scholarships for preservice teachers to become dual certified in computer science and another content area, and allowing for alternative methods of computer science content and methods mastery (such as micro-credentials or participation in high-quality professional development).

Q: What are some considerations as my state embarks on the process of establishing computer science teacher pathways?
A: State planning should focus on long term goals with a series of steps along the way. Early on, it is important to get all stakeholders together and on the same page. Although early implementation may be related to certification only, schools of education and other preservice teacher preparation programs should be involved from the early stages, because they will primarily be responsible for the programs that teachers use to get certified.