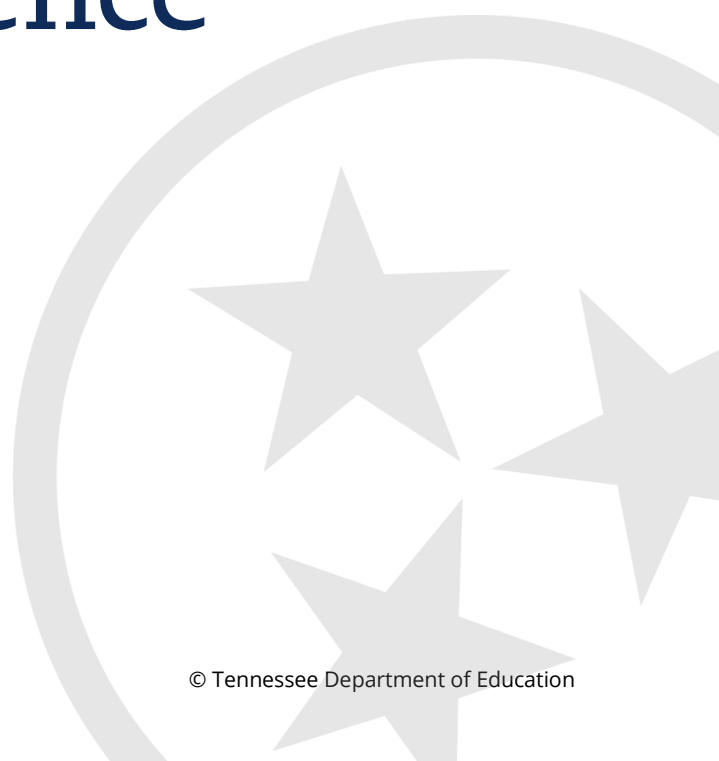




Computer Science

Annual Report

Tennessee Department of Education | July 2024



Executive Summary

Recognizing the importance of providing Tennessee students with a high-quality, 21st-century education that includes computational thinking and computer science, Governor Lee and the Tennessee General Assembly enacted legislation, [Chapter 979 of the Public Acts of 2022](#) (PC 979), that places the state among the first five in the nation to require computer science (CS) as a graduation requirement. This initiative, reflecting a forward-thinking approach, prepares students for careers in a scientifically and technologically advanced future. All local education agencies (LEAs) and public charter schools are required to provide K-12 students with grade-appropriate computer science education. Starting in the 2024-25 school year, CS education will be embedded in academic instruction at the elementary grade level, required for one grading period in middle school, and a mandatory high school graduation requirement. To support this, the Tennessee Department of Education (department) has spearheaded efforts in partnership with the Tennessee STEM Innovation Network (TSIN) to provide teachers with multiple professional development opportunities, as well as a Computer Science Endorsement Pathway (CSEP), offering teachers a no-cost route to obtain CS endorsements. Tennessee's commitment to these initiatives ensures that all students have access to high-quality computer science education, paving the way for a brighter future.

Key Findings

- **Legislation and Implementation:** Tennessee is among the first five states in the nation to make computer science a graduation requirement, with the passage of PC 979 in 2022.
- **Teacher Endorsement Growth:** Since the enactment of the legislation, the number of teachers with a computer science endorsement has nearly tripled, increasing from fewer than 50 to 485 by the 2023-24 school year, supported by the no-cost CSEP.
- **Student Enrollment Increase:** Middle and high school student enrollment in CS courses has nearly doubled, rising from 32,893 in the 2020-21 school year to 60,217 in the 2023-24 school year, even before the graduation requirement takes effect.
- **Professional Development Initiatives:** The Reach Them All initiative and CS Educators Accelerator Week provide teachers with extensive professional development and training, using a train-the-trainer model to ensure broad and effective implementation of CS education across the state.
- **Standards and Industry Collaboration:** The development of Tennessee's K-12 CS standards involved diverse educators and industry professionals, resulting in standards approved by the Tennessee State Board of Education in 2023. This collaborative approach ensures that the curriculum is relevant and comprehensive.
- **Future Projections and Support:** The state anticipates continued growth in CS course enrollments and aims to prepare an additional 500 teachers for CS endorsement by August 2024, which would significantly increase the number of teachers endorsed in CS to nearly 1,000. The ongoing support from Tennessee STEM Innovation Network (TSIN) and strategic partnerships is expected to position Tennessee as a leader in CS education.

Computer Science

Background

Lawmakers and educators recognize the importance of providing Tennessee students with a high-quality, 21st-century education that includes exposure to computational thinking and computer science. Understanding that these skills are essential for career success, Tennessee enacted legislation that has placed us among the first five states in the country to make computer science a graduation requirement. This decision reflects the forward-thinking approach and commitment to preparing students for a future defined by scientific and technological advancements. In an ever-changing world, it is crucial that our students possess the knowledge and skills necessary to thrive in a globally competitive workforce. Adopting computer science as a graduation requirement is a vital step toward ensuring students' success. As Tennessee's economy grows and more Fortune 500 companies, such as Ford, establish operations in the state, the expansion of computer science education ensures that Tennessee's students are equipped with the skills to meet the needs of these employers.

Tennessee is one of the first states to make CS a graduation requirement.

With the passage of PC 979 in 2022 by unanimous vote of the Tennessee General Assembly, all LEAs and public charter schools are now required to provide K-12 students with grade-level appropriate CS education. Beginning in the 2024-25 school year, CS will be embedded in the elementary school level; middle school students will be required to take CS for one grading period during their middle school years; and high school students will take a CS course as a graduation requirement. To ensure teachers are properly trained and endorsed to deliver CS courses in middle and high school, the CSEP was created in partnership with the Tennessee STEM Innovation Network (TSIN). The CSEP provides teachers with a no-cost route to CS endorsement.

Since the enactment of PC 979, the number of students enrolled in a middle or high school CS course has nearly doubled. This is especially notable as the graduation requirement does not go into effect until the ninth-grade cohort in the 2024-25 school year. The number of teachers with a CS endorsement has nearly tripled since the pilot course of the CSEP in 2022.

Computer Science Course Enrollments and Teacher Endorsements

	2020-21	2021-22	2022-23	2023-24
Middle and High School Students Enrolled in a CS Course	32,893	37,728	33,084	60,217
Teachers with a CS 173 Endorsement	>50	90	265	485

Implementation Timeline

To ensure districts were given ample time to prepare to meet the requirements of PC 979, an “on-ramp” of two years was included in the initial legislation. This provided additional flexibility in implementation timelines in high schools, and with the recent passage of [Public Chapter 693](#) of the 2024 legislative session, middle schools are also provided flexibility in their implementation timeline.

The class of 2028 will be the first graduating class required to earn the CS credit. The cohorts may differ slightly by year in middle school, based on the variety of lowest entering grades in middle schools across the state. Over the next three years, the department anticipates exponential growth in the number of students who complete a CS course in middle and high school.

Planning and Preparation

As a first step to launching the CS initiatives and expanding CS across the state, the department updated the CS standards and created a training course for educators.

[The Tennessee K-12 Computer Science standards](#) development took place over the course of the 2022-23 school year. Applications were solicited in early 2022 for interested K-12 teachers to work on the standards creation committee. The committee was selected to represent a variety of grade levels, primary subject areas, school settings (urban, rural, suburban), and Title I status in addition to gender and ethnicity. The 26-person committee met in person on May 10, 2022 in Nashville for an orientation and training on standards writing. Teachers were grouped into grade bands based on their job roles. There were four working groups appointed for grade bands K-2, 3-5, 6-8, and 9-12. Out of the 26 teachers, there were 12 different Tennessee counties represented: five from the eastern grand division of the state, four from the middle or central division, and three from the western grand division. The standard writing process extended from May through July 2022. The first draft of the standards was then vetted by industry professionals from various tech-based companies and higher education institutions across Tennessee by invitation from TSIN. Their feedback was incorporated into the draft and the revised draft was submitted to the Tennessee State Board of Education (SBE) for consideration on first reading at the October 28, 2022 meeting. The standards were approved on final reading in February 2023.

To support districts in implementing the standards, an [Integration Guidebook](#) was developed and shared statewide. This guide contains a suite of CS lessons developed in collaboration with TSIN. The Integration Guidebook serves to provide context to CS integration as well as exemplar lessons and other resources for teachers. Furthermore, in collaboration with the department, TSIN curated a collection of lessons, teaching video exemplars, and other teaching resources; these can be found on the TSIN [website](#).

The CSEP was developed to provide currently licensed teachers with the knowledge and skills needed to teach CS standards successfully. Historically, the CS Praxis exam has had a low passage rate. The CSEP was

developed as an alternative path for already licensed teachers to gain the CS endorsement. It was created by partners at TSIN, following guidelines laid out by the SBE.

In addition to approving the CS Standards and the CSEP course, SBE approved a list of computer science course substitutions to provide districts with multiple avenues of meeting the CS graduation requirement. In accordance with the Tennessee [State Board of Education Graduation Requirements Rule 0520-03-.06](#) and [Graduation Substitutions Policy 3.103](#), students may use a computer science course to substitute for the student's third lab science credit, fourth credit of math, or an elective course.

The Computer Science Endorsement Pathway (CSEP) and other Teacher Professional Development Initiatives

When the CS initiatives first began to take shape, only a small number of teachers were endorsed to teach CS. Micro-credentialing efforts had occurred across the state to provide a stop-gap measure, but the number of teachers with a CS endorsement in Tennessee was less than 50. Through our partnership with TSIN, multiple professional development opportunities were created to provide ongoing CS support to teachers and districts. Also, the department developed the CSEP course, which was approved by the Tennessee State Board of Education. The following sub-sections elaborate on the professional development efforts enacted to support the increase in computer science teachers.

Reach Them All

The Reach Them All initiative was launched in September 2022, and ended in 2024. Reach Them All utilized a train-the-trainer model that allowed each district to select one CS District Delegate to serve as a liaison and support their district by offering professional development opportunities in CS. CS District Delegates recruited CS District Ambassadors from within their district to join them in providing high-quality CS support. The number of Ambassadors depended on the size of the district. The Ambassadors attended the same meetings as the Delegates and were responsible for re-delivering the training to teachers and schools. CS District Delegates and Ambassadors received training from November 2022 to March 2023, and Ambassadors re-delivered the training to schools within their district from April 2023 through Sept. 2023. This training empowered schools and teachers to promote the integration of CS into all Tennessee classrooms, understand new computer science legislation and expectations, and create a network of best practices regarding CS statewide. This timeline gave schools one full year after training to implement the CS education requirements. Each school participating in the Reach Them All training provided by their District Ambassadors received a grade-band-specific kit with materials and resources that complemented their professional learning.

Computer Science Momentum Expedition

The CS Momentum Expedition is an annual industry connector event designed to bring educators together to learn from and network with industry leaders who integrate CS into their fields. This event is offered at no cost to educators or industry partners.

The event aims to increase CS awareness, serve as a creative launchpad, and connects educators with local industry partners. By participating in this event, teachers can explore ways to integrate CS into their instructional toolkit. They can brainstorm opportunities to connect CS to their content areas while networking with other educators. Additionally, teachers can build relationships with local industry leaders and learn how CS is applied in various career fields.

Computer Science Educator Accelerator Week

CS Educator Accelerator Week is hosted every summer by TSIN. This week-long event provides CS training for educators impacted by PC 979 of 2022. Teachers gain a deeper understanding of CS through specific and differentiated workshops tailored to educators of all subjects. These workshops are free for Tennessee public school, public charter school, and private school educators and include in-person and virtual options.

Computer Science Endorsement Pathway

To ensure teachers are properly trained and endorsed to deliver CS courses in middle and high school, PC 979 of 2022 required the department to develop the CSEP that provides teachers with a no-cost route to obtain the CS endorsement.

The course objectives for the CSEP include developing a foundational understanding of CS guided by the Tennessee K-12 Computer Science State Standards and core concepts. Participants also build on their teaching pedagogy, focusing on best practices in CS education, and learn to identify, develop, and teach CS lessons that enable students to demonstrate mastery of the standards. The course consists of eight modules, most of which are named after a Tennessee Computer Science Core Concept, and the course requires a maximum of 60 hours for completion over a semester.

Participants must pass all modules as well as the final exam with a score of 80 percent or better. If they do not meet this criterion, they can resubmit assignments and retake the exam. If they still do not pass, a remediation plan will be provided, focusing on areas of struggle identified through an evaluation of their exam answers.

The CSEP had a pilot cohort in 2022, where a course was created by a team of teachers on the EduNext platform. The EduNext platform was chosen through a competitive bid process by our partners at TSIN. After reviewing feedback from the pilot participants, TSIN went through the bidding process again and in 2023 transferred the course to the Kira Learning platform. The third cohort, running from Aug. 2023 to Jan. 2024, featured a redesigned course by partners at TSIN. The fourth cohort began in February 2024 and is scheduled to conclude in June 2024. The fifth cohort is currently underway and will conclude on July 26, 2024.

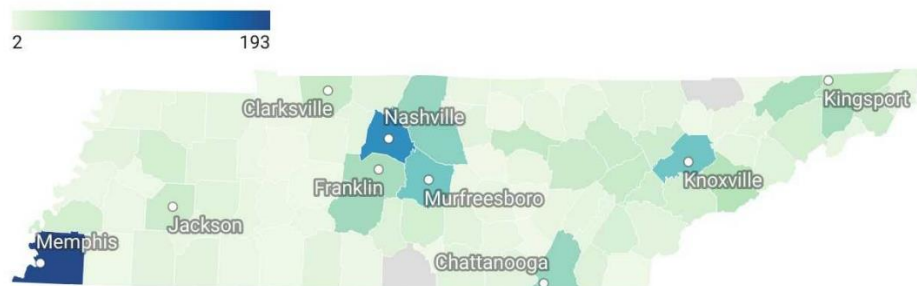
CSEP Outcomes

Cohort	Fall 2022 (Pilot)	Spring 2023	Fall 2023	Spring 2024	Summer 2024
Number Completed	42	167	219	663 (enrolled)	449 (enrolled)

A total of 1,540 teachers have enrolled in the CSEP since 2022. Excluding enrollees from the Spring and Summer 2024 Cohorts, which are still in progress, 429 teachers have successfully earned the computer science endorsement. To date, at least one teacher from 93 of the 95 counties in Tennessee has either completed or is currently enrolled in a CSEP Cohort.

This is a map of Tennessee Counties who have had a teacher(s) enroll in the CSEP since its inception in 2022:

All CSEP Cohorts



Created with Datawrapper

Teachers who have participated in the CSEP cohorts come from a variety of backgrounds and experience with CS. The course content designed by TSIN and hosted on the Kira platform is challenging yet structured in a way that supports teachers and helps them be successful. TSIN included an informal end-of-course survey in the Fall 2023 cohort. The following quotes are from a few of the teachers who completed the Fall 2023 Cohort.

Below are remarks from educators across the state that took part in the course.

“I really enjoyed this course! The workload expectations were rigorous while also very understanding of those who are currently working full-time. There were plenty of supports in place if needed. I appreciate the time that was dedicated to making this process straightforward and engaging.”

“This course was a great introduction for those of us without previous experience in computer science.”

“I feel prepared to teach computer science.”

“Grateful for the opportunity in TN to learn this and be able to help my teammates as they navigate adding CS standards across the elementary curriculum.”

TSIN and Kira have been excellent partners in the implementation of the CS requirements. They are responsive to feedback and implement changes when necessary. The professional development made available through the department, Kira, and TSIN has set districts and teachers up for success in offering high-quality CS education to students.

Looking Ahead

The number of middle and high school students who enroll in a CS course is expected to grow exponentially over the next four years as districts implement the requirements of PC 979.

The department is committed to providing ongoing support to districts, schools, and teachers. The department’s contract with TSIN provides additional support for the CS initiatives through at least June 2025. Guidance and support to ensure the effective implementation of CS education will be ongoing to ensure that schools have the resources and information for success.

Enrollment in a computer science course will grow exponentially over the next several years.

A CSEP cohort will also continue to be offered every fall and spring to prepare as many teachers as possible to teach CS which will improve outcomes for Tennessee students. Furthermore, the department estimates that an additional 500 teachers will earn the computer science endorsement by August 2024 which would bring the number of teachers endorsed in computer science in Tennessee to nearly 1,000, a 200 percent increase in two years.

Through sustained commitment and strategic partnerships, Tennessee is poised to lead the nation in CS education, ensuring that students are well-prepared for the demands of a technologically driven future.

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