



West Virginia K-12 Computer Science Plan

Revised September 2022



**West Virginia Board of Education
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Executive Summary

Introduction

The West Virginia Legislature enacted WV Senate Bill 267¹ in the 2019 Legislative Session. The bill required the West Virginia Department of Education (WVDE) to develop and offer professional development opportunities to ensure educators are equipped with the requisite knowledge and skill to deliver computer science instruction. To date, the WVDE has developed Computer Science and Technology Standards², which were approved by the WVBE in January 2019 and became effective July 1, 2019.

The West Virginia Legislature enacted WV Senate Bill 529 in the 2022 Legislative Session. The bill required the West Virginia Department of Education (WVDE) to submit an updated plan to the Legislative Oversight Commission on Education Accountability (LOCEA) that builds upon specific plans which may have been developed and submitted in previous years, to implement and update computer science instruction and learning standards in the public schools. SB529 describes the computer science education needed for West Virginia students:

Foundational age-appropriate instruction in the computer science field for all students beginning in elementary school with required and optional advanced computer science instruction for middle school and high school students has become an important component of a well-developed education. Computer science standards should align to relevant aspects of the field such as computational thinking, block-based programming, text-based programming, network communication, computer architecture, coding, application development, and cyber security.³

The WVDE developed a four-year plan of implementation from July 1, 2019 through June 30, 2023. This current Computer Science Plan is an update to the 2019 plan and reflects goals to be completed by 2027.

¹ WV Senate Bill 267: https://www.wvlegislature.gov/Bill_Status/bills_text.cfm?billdoc=SB267%20INTR.htm&yr=2022&sesstype=RS&i=267

² WV College-and Career-Readiness Standards for Technology and Computer Science: <https://wvde.state.wv.us/policies/policy.php?p=2520.14>

³ WV Senate Bill 529: https://www.wvlegislature.gov/Bill_Status/bills_text.cfm?billdoc=SB529%20ENR.htm&yr=2022&sesstype=RS&i=529

Current Computer Science Outlook

- West Virginia averages 932 open computing jobs each month.
- The average salary for a computing occupation in West Virginia is \$75,109.
- The existing open jobs alone represent a \$69,917,708 opportunity in terms of annual salaries.
- West Virginia had only 198 computer science college graduates in 2019.

Overarching Vision Statement for Computer Science Education

By 2027, all schools serving students in grades K-12 will offer opportunities for students to develop age-appropriate computer science skills and have access to an educator trained in computer science. The West Virginia Department of Education envisions a future in which students:

- critically engage in public discussion on computer science topics;
- develop as learners, users, and creators of computer science knowledge and artifacts;
- better understand the role of computing in the world around them; and
- learn, perform, and express themselves in other subjects and interests.

Strategic Computer Science Goals

- Provide state-level funding dedicated to high-quality educator professional learning.
- Develop a system for tracking the implementation of WVBE Policy 2510 (Assuring the Quality of Education: Regulations for Education Programs) computer science requirements.
- Ensure that every student K-5 will receive integrated computer science instruction throughout the instructional day.
- Ensure that every student 6-8 will receive integrated computer science instruction throughout the instructional day and may be offered a computer science course.
- Support county school systems in planning K-12 computer science pathways -- including recommending courses aligned to the state-approved standards and integrating computer science content into other disciplines.
- Work with higher education programs to integrate computer science education into all pre-service elementary education programs.
- Work with higher education programs to develop computer science pre-service programs for secondary educators.
- Offer computer science certification.
- Create a process for grandfathering current computer science educators.
- Ensure that middle and high schools have, or will have, access to at least one endorsed or authorized computer science educator.
- Establish at least one educator per grade level that has received age-appropriate computer science professional learning.

⁴ WV Computer Science Plan Summary 2019 – 2023: https://wvde.us/wp-content/uploads/2019/10/WVDE_K12_CS_Plan_Highlights.pdf

Conclusion

Over the next four years, the WVDE and staff will build upon the current computer science plan and assure the updated plan is implemented with fidelity for the educators involved in training and teaching West Virginia students. This computer science plan has been designed in the spirit of student motivation, student engagement, and student employment in West Virginia. Ultimately, the skills West Virginia students will gain while learning computer science will enable them to become socially and globally connected critical thinkers capable of success in whatever career they choose.

Current Outlook

West Virginia Computer Science Landscape

- West Virginia averages 932 open computing jobs each month.
- The average salary for a computing occupation in West Virginia is \$75,109.
- The existing open jobs alone represent a \$69,917,708 opportunity in terms of annual salaries.
- West Virginia had only 198 computer science college graduates in 2019.

High School Offerings

The percentage of high schools teaching foundational computer science in West Virginia increased to 76% in 2021, up from 46% in 2019. While high schools are required to offer computer science courses, if there is not sufficient enrollment, the course will not be taught. For those schools where there is not sufficient enrollment, many students take computer science courses through the West Virginia Virtual School.

When compared to other states within the U.S., the percentage of high schools teaching foundational computer science in West Virginia places the state at number 10 out of 50, for schools offering Computer Science. West Virginia ranks highest when compared to our nearest neighbors (Ohio – 50%, Pennsylvania – 63%, Tennessee – 51%, Maryland – 37%, and Virginia – 73%). While these numbers represent tremendous growth, specifically over a time period that included a global pandemic, it must be noted that while 87% of high school students in West Virginia are enrolled at a school that teaches computer science, only 3.5% of these students actually take a foundational computer science course.

Current High School Computer Science Courses

Currently, all high schools must offer at least one computer science course. These include, but are not limited to:

- AP® Computer Science Principles
- AP® Computer Science A
- Advanced Placement® Computer Science A (as a 4th math credit)
- Computer Science in the Modern World
- Computer Science – Introduction to Geographic Information Systems
- IB Computing Studies
- Basic Programming
- Computer Graphics
- Computer Science & Information Systems
- Computer Science/Programming
- Computer Systems
- Computer Technology
- Network Technology
- Object-Oriented Language Operation Systems
- Pascal Programming
- Courses from CTE pathways:
 - Advanced Careers Informatics
 - Computer Science – Project Lead the Way Best Practices 5
 - Cisco Networking Academies
 - Computer Systems Repair Technology
 - Coding, App, and Game Design
 - Simulation and Game Development
 - Robotics
 - Other CTE courses and county-created courses

⁵ Definition of foundational computer science: <https://code.org/yourschool/about>

⁶ https://advocacy.code.org/state_handouts/WestVirginia.pdf

High School AP® Computer Science Data

- 405 AP® Computer Science exams were taken by high school students in West Virginia in 2020 (up from 285 in 2018).
- Of those taking the exams, 36% were female (23% for AP® CS A and 41% for AP® CSP); only 14 exams were taken by Hispanic or Latino students (5 took AP® CS A and 9 took AP® CSP); only 7 exams were taken by Black students (1 took AP® CS A and 6 took AP® CSP); only 3 exams were taken by American Indian or Alaska Native students (1 took AP® CS A and 2 took AP® CSP); no exams were taken by Native Hawaiian or Pacific Islander students.
- Of the schools teaching foundational computer science, only 46 schools in West Virginia (38% of West Virginia schools with AP® programs) offered an AP® Computer Science course in 2019-2020 (16% offered AP® CS A and 32% offered AP® CSP), which is 12 more than the previous year. There are fewer AP exams taken in computer science than in any other STEM subject area.

Career Technical Education (CTE) Computer Science Data

- 707 students were enrolled in a class under the Computer Science program of study in West Virginia in the 2021-2022 school year.
- In the 2021-2022 school year, the West Virginia Schools for the Deaf and the Blind fully implemented the Computer Science program of study and had their first round of completers.
- The Computer Science program of study was offered in 32 of the West Virginia counties in the 2021-2022 school year.

The CTE Programs of Study currently offered are summarized below.

Computer Science

Courses

- » Computer Science Essentials
- » Computer Science Principles
- » Computer Science Applications
- » Cybersecurity Program Highlights

Program Highlights

- » Students can earn an industry-recognized credential (CompTIA Security+)
- » Students can earn 2 AP courses

Information Management

Courses Program

- » Technical Computer Application
- » Digital Imaging/Multimedia
- » Desktop Publishing
- » Management & Entrepreneurship
- » Fundamentals of Computer Science

Program Highlights

- » Students can earn industry-recognized credentials (IC3, Adobe Photoshop, Adobe Premiere Pro, Adobe Illustrator)

Coding, App and Game Design

Courses Program

- » Coding, App and Game Design
- » Digital Imaging/Multimedia

Program Highlights

- » Students can earn industry-recognized credentials (Unity, Adobe Photoshop, Adobe Premiere Pro, Adobe Illustrator)
- » Offered virtually to all West Virginia students

Computer Systems Repair Technology

Courses Program

- » CompTIA A+
- » Networking+
- » Server+
- » Linux Essentials
- » Security+

Program Highlights

- » Students can earn industry-recognized credentials (CompTIA A+, CompTIA Network+, CompTIA Server+, CompTIA Linux+, CompTIA Server+)
- » Students can earn 16 college credit hours

CISCO Networking Academies

Courses Program

- » CISCO Certified Network Associate

Program Highlights

- » Students can earn an industry-recognized credential (Cisco Certified Network Associate)
- » Students can earn 16 college credit hours

Middle School Computer Science Offerings

West Virginia has specific course standards in computer science for the middle school level, Discovering Computer Science. While Policy 2510 specifies that it is the intent that schools integrate computer science standards into instruction at the middle school level, there is a provision for providing this course at the middle school level. It is up to the discretion of the county school system as to how the computer science instruction is provided, and each county chooses the implementation and curriculum that best meets the needs of their students.

Current Barriers to Teaching Computer Science

Prior to 2019, West Virginia did not yet provide dedicated funding for rigorous computer science professional learning and course support. Given the new support for computer science, and legislative emphasis on computer science, West Virginia can continue to grow computer science programs by creating specific opportunities to support county school systems in computer science implementation.

State Policies

K-12 computer science standards were initially adopted in April 2017. They were updated by the West Virginia State Board of Education (WVBE), and the latest iteration became effective in July of 2019.

Policy considerations:

- Computer science endorsements have been created, but currently no certification is required to teach computer science courses.
- The WVBE updated Policy 2510 requires all high schools to offer a computer science course beginning in the 2016-2017 school year.
- The WVBE updated Policy 2510 requires all middle schools to integrate computer science with the option of offering a computer science course beginning in the 2020-21 school year.
- The WVBE updated Policy 2510 requires all elementary schools to integrate computer science beginning in the 2022-23 school year.
- Policy 2520.14 (West Virginia College- and Career-Readiness Standards for Technology and Computer Science), updated in April 2019, allows AP® Computer Science A; IB Computer Science Program Courses; and Computer Science and Mathematics to count as a fourth math credit if taught by a certified math educator, and Computer Science – Introduction to Geographic Information Systems to count as a third science credit, if taught by a certified science educator. The policy also includes standards for a specific middle school course in computer science if a county school system chooses to use a course over integrated computer science instruction.

WV STEAM Technical Assistance Center (STEAM TAC)

Developing integrated instruction that meets the standards of multiple content areas, including technology and computer science is a challenging process. To meet this challenge and to support West Virginia Educators, the WVDE partnered with West Virginia University (WVU) to launch the WVDE/WVU STEAM Technical Assistance Center which brings transdisciplinary STEAM educational immersions to West Virginia middle schools and high schools. This center brings the expertise of effective integration directly to WV classrooms and supports schools in planning instruction.

Educator Professional Learning Progress

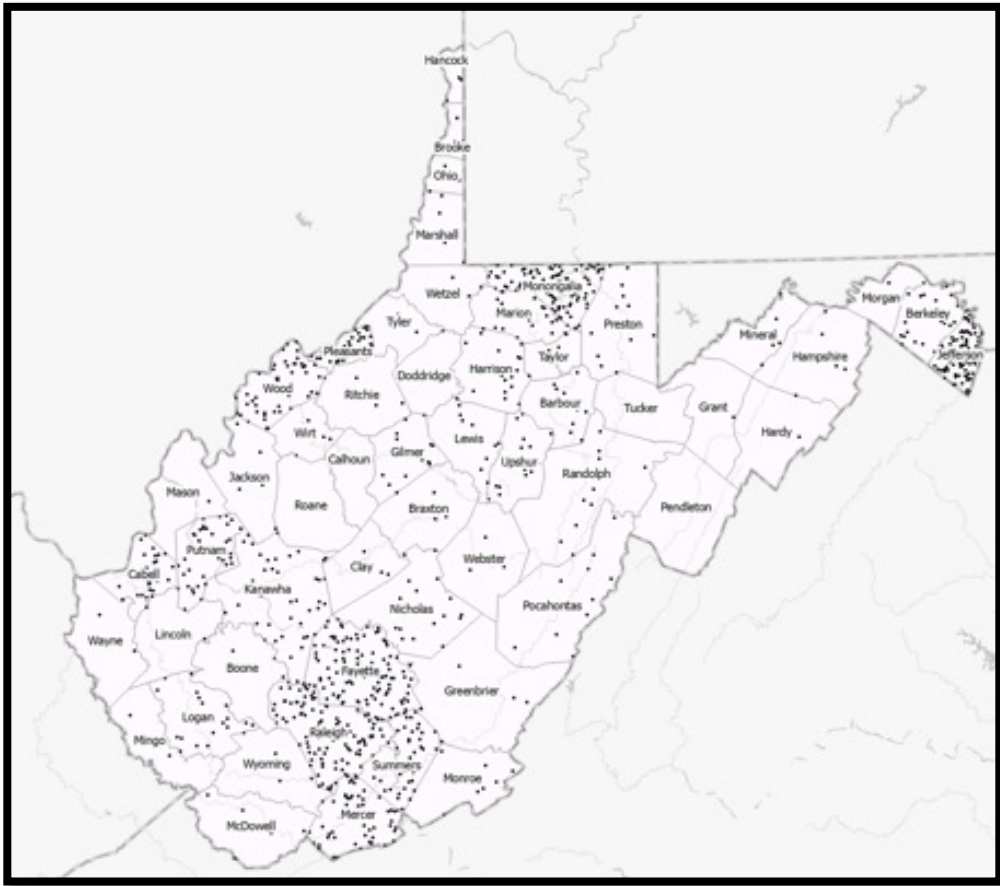
Between 2018 and 2022, 1,116 professional learning courses were taken through CodeWV by West Virginia educators. Code WV is the WVDE computer science training partner. The table below indicates the number of educators trained in computer science through these WVDE-approved programs. Note that the 2020-21 and 2021-22 school years had decreased participation due to the virtual nature of the professional learning.

Year	Educators Trained
2018-19	272
2019-20	433
2020-21	155
2021-22	184
2022-23	72
Total	1,116

The table below indicates the distribution of educators that have taken professional learning through the WVDE-approved partner at each grade band.

Grade Band	Educators Trained
Total Elementary	819
Total High	116
Total Middle	181

Each dot on the map below represents an educator trained in Computer Science through the WVDE partnership with CodeWV.



Overarching Vision Statement for Computer Science Education

By 2027, all schools serving students in grades K-12 will offer opportunities for students to develop age-appropriate computer science skills and have access to an educator trained in computer science. The West Virginia Department of Education envisions a future in which students:

- critically engage in public discussion on computer science topics;
- develop as learners, users, and creators of computer science knowledge and artifacts;
- better understand the role of computing in the world around them; and
- learn, perform, and express themselves in other subjects and interests.

To achieve this vision, the WVDE has developed goals within the following areas:

- Equitable Access to Computer Science
- Educator Preparation (In-service educators)
- Educator Preparation (Pre-service educators)
- Instructional Supports
- K-12 Computer Science Outreach

⁷ Hendrickson, Katie. "A Vision for K-12 Computer Science." <https://k12cs.org/a-vision-for-k-12-computer-science/>

Equitable Access to Computer Science

Goals

- Per policy 2510, all students K-5 will receive integrated computer science instruction during the instructional day.
- Per policy 2510, all students in grades 6-8 will receive integrated computer science instruction and may be offered a computer science course.
- Increase the percentage of students taking a high school computer science course from 3.5% to 10%.
- Within the larger goal of increasing the number of students taking AP® computer science courses, enlarge the percentage of female students taking AP® computer science courses from 36% to 50%.
- Increase the percentage of underrepresented minority students taking AP® computer science courses from 3% to 5%.

Strategies	Start / End	Responsible Party / Partners	Progress (Planning or In-progress)
<p>Provide training for middle and high school educators, so that all middle and high schools will have at least one endorsed or authorized computer science educator.</p> <p>Computer Science Fundamentals (ES) Computer Science Discoveries (MS) AP Computer Science Principles (HS) AP Computer Science A (Advanced HS)</p>	2019 / Ongoing	County Chief Instructional Leaders, WVDE Certification	<p>In-progress</p> <p>Through 2022, 109 educators completed CS Principles, and 181 completed CS Discoveries, representing 89 HS and 109 MS.</p>
<p>Provide training for elementary school educators, so that all elementary schools will have, at each grade level, at least one educator that has received professional learning in computer science.</p>	2019	County Chief Instructional Leaders, WVDE Certification, Principals	<p>In-progress</p> <p>Through 2021, 684 educators completed initial training and 83 completed advanced training, representing 220 elementary schools.</p>
<p>Increase computer science offerings for grades 6-12 in the West Virginia Virtual School to allow computer science for all West Virginia students.</p>	2021	WVDE	<p>Complete</p> <p>WVVS has 4 MS courses, AP CS Principles and AP CS A</p>
<p>Develop a data system to determine which schools currently offer and teach computer science and which schools need support in teaching computer science.</p>	Ongoing	WVDE, County Chief Instructional Leaders	<p>In-progress</p> <p>Data collection to begin in spring 2023.</p>
<p>Develop process to allow an endorsement or authorization to be required to teach computer science at the high school level.</p>	2023	WVDE	<p>Planning</p>

Educator Preparation (In-service educators)

Goals

1. Establish full certification and educator endorsements for computer science, including policies to grandfather those already teaching computer science.
2. All middle and high schools will have at least one endorsed or authorized computer science educator.
3. Establish at least one educator per grade level having received professional learning in computer science at every elementary school.

Strategies	Start/End	Responsible Party/Partners	Progress (Planning or In-progress)
Develop a WV computer science permanent endorsement.	2019	WVDE	Complete Endorsement - 7213: Computer Science Education (Pre-K-Adult) created, PRAXIS Code – 5652
Support educators in earning a computer science endorsement, as demonstration of content knowledge. • Supplemental support for professional learning and PRAXIS.	2022 - Ongoing	WVDE	In-progress Preparation course acquired, practice codes, and PRAXIS courses purchased.
Develop policy to grandfather computer science educators into permanent endorsement.	2022	WVDE	Planning
Provide multiple computer science professional learning pathways for in-service educators utilizing a targeted, regional, professional learning structure.	2019 - Ongoing	WVDE, County School Systems, principals	Continual

Educator Preparation (Pre-service educators)

Goals

1. Work with Institutions of Higher education to integrate computer science education into all elementary education programs.
2. Develop computer science pre-service programs for secondary educators at institutions of Institutes of Higher Education in the state.

Strategies	Start/End	Responsible Party/Partners	Progress (Planning or In-progress)
Work with Institutions of Higher Education to develop a computer science education program for pre-service educators meeting the requirements for certification in West Virginia, as well as providing the background to pass the computer science Praxis.	Current - 2022	Institutions of Higher Education	In-progress In discussions
Update existing pre-service educational technology courses for elementary and secondary educators to include computer science content.	2022	Institutions of Higher Education	Planning Requested to be a required in Policy 5100. EPP delayed.
Develop a supplemental computer science endorsement for those holding another initial endorsement.	2020	WVDE Certification	Complete 7213: Computer Science Education (Pre-K-Adult), PRAXIS – 5652
Develop a stand-alone computer science endorsement.	2022	WVDE Certification, Institutions of Higher Education	Planning In discussions

Instructional Supports

Goals

1. Schools and educators will be able to integrate computer science content into other disciplines.
2. West Virginia schools will provide courses aligned to the state-approved computer science standards.

Strategies	Start/End	Responsible Party/Partners	Progress (Planning or In-progress)
K-12 computer science stakeholders group reviews computer science standards om 2021 as part of policy revision cycle and in 2022 to ensure compliance with updated legislation.	Winter 2021 2022	WVDE Computer Science stakeholders, WVBE	Completed
WVDE will update Policy 2510, as needed, to reflect best practices regarding computer science education.	2019 - spring 2020	WVDE Computer Science Work Group, WVDE, County School Systems	In-progress
WVDE will create and update computer science support page on the WVDE website.	Ongoing	WVDE, County School Systems	In-progress https://wvde.us/middle-secondary-learning/computer-science-and-technology/
WVDE will provide technical assistance to county school systems as they implement computer science in a coherent K-12 pathway. <ul style="list-style-type: none"> • Age-appropriate • Interconnected • Elementary focus on introduction and integration • Middle School focus on exploration and integration • High School focus on specialization 	Ongoing	WVDE, County School Systems	In-progress Provided upon request in partnership with CodeWV.
WVDE will develop additional opportunities through the Office of Technical & Adult Education to allow students to experience advanced courses and attain industry certifications in computer science and cybersecurity.	Ongoing	WVDE, County School Systems	In-progress CS in CTE is offered in 32 WV counties. 720 students enrolled in 2021-2022.

K-12 Computer Science Outreach

Goals

1. The state will track progress toward implementation of Policy 2510 that requires all high schools to offer at least one computer science course annually.
2. The state will track progress toward implementation of Policy 2510 that requires that all elementary and middle school integrate computer science into instruction.
3. Provide technical assistance to county school systems in planning K-12 computer science instruction.

Strategies	Start/End	Responsible Party/Partners	Progress (Planning or In-progress)
Create and maintain computer science education website and listserv to keep stakeholders and county school districts informed.	Ongoing	WVDE	In-progress https://wvde.us/middle-secondary-learning/computer-science-and-technology/
Create computer science education portal/ website/social media presence to keep stakeholders informed. • Publish state plan and relevant information	Yearly	WVDE, Teaching and Leadership, Student Support and Well-Being	In-progress Webinars are presented yearly.
Create materials for counselors related to encouraging minority, and low socioeconomic participation in computer science courses.	Ongoing	WVDE	In-progress AP CS P pass rates, Hour of Code, AP CS diversity award, etc. celebrated.

Community Engagement Services

Goals
 1. Support initiatives for school-based afterschool programs.
 2. Promote computer science extended learning opportunities conducted in communities.

Strategies	Start/End	Responsible Party/Partners	Progress (Planning or In-progress)
<p>Strategies Provide resources to the counties to support partnerships between national, state, and local computer science organizations.</p>	<p>Ongoing</p>	<p>WVDE, County School Systems, West Virginia After School Network, Girls Who Code, 4H, WVU Extension, WVDE/WVU STEAM TAC, CSTA, WVCSTA</p>	<p>In-progress</p>
<p>Provide support for family-friendly computer science community-based activities.</p> <p>Grants will be given to counties to create a family-friendly computer science initiative during Computer Science Education Week.</p>	<p>Ongoing Starting Fall 2022</p>	<p>WVDE, CS is Elementary</p>	<p>In-progress Call for grants in Fall 2022.</p>

Funding

Goals

1. Secure state-level funding dedicated to computer science professional learning for existing educators.
2. Secure funding from federal programs and local industry for expansion of K-12 computer science opportunities and pre-service educator preparation.

Strategies	Start/ End	Responsible Party/ Partners	Progress (Planning or In-progress)
The state will allocate funding for high-quality educator professional learning.	Complete	WVDE	Complete Funding allocated specifically for educator professional learning in computer science.
Provide technical assistance to Institutions of Higher Education in developing proposals for expanding pre-service and in-service educator preparation through intellectual partnerships.	Ongoing	Legislature, WVDE, HEPC, Institutions of Higher Education	In-progress

Funding Narrative

Offering the opportunity to learn computer science is critical for preparing our students to be college and career ready in the 21st century — not just for coding or computing occupations, but for every career. The WVDE will support these opportunities for West Virginia’s students to thrive in their home state by enabling every school to offer computer science. WVDE will allocate funding to enable all schools to offer computer science through the professional learning of practicing educators.



David L. Roach
West Virginia Superintendent of Schools