Cross Sector Computer Science Strategic Plan and Report

Prepared by Washington STEM and Washington Technology Industry Association

Our special thanks to the following generous sponsors of this work: Amazon, Microsoft, Salesforce, and the University of Washington

And a very special thank you to Senator Lisa Wellman for continued leadership in computer science

Table of Contents

EXECUTIVE SUMMARY

Stakeholders across Washington state understand that access to computer science education is critical for growing our economy by engaging and supporting local talent and is key to closing pervasive income gaps. Washington needs a strategic, cross-sector, statewide plan, with clear goals and metrics, to chart a course for strengthening computer science education. To date, implementation and investment in computer science has been inequitable and siloed, though well-intentioned. It has been difficult to track implementation of computer science education mandates, and to assess any progress in improving outcomes for underserved students.

At a time when it's nearly impossible to find an industry or field of study not being transformed, disrupted, or reimagined using software and computer science, all students can benefit from learning computer science. The computational thinking, critical thinking, and creativity skills acquired through computer science education will prepare individuals throughout their education, careers, and beyond. Seven different studies show that children who study computer science perform better in math and science, excel at problem-solving, and are 17% more likely to attend college.[1] With more than 20,000 open computing jobs in Washington today—many of which are high-paying jobs that only require a 2-year degree—entering postsecondary with a strong, basic foundation in computer science is critical for accessing these career pathways.

The goal of this project was to create, iterate, and operationalize a statewide Cross-Sector Computer Science Strategic Plan (CSSP) for access to computer science for all Washington students, outline specific policy, implementation, and educator development goals, and to generate a timeline as well as leading entities to achieve set goals. And we agree with our partners at the Office of the Superintendent of Public Instruction (OSPI), as stated in their Washington State Computer Science Education Strategic Plan, that we must ensure that: *All K-12 schools in Washington will offer CS instruction aligned to the state-approved standards and have a qualified CS teacher to deliver this instruction. Students will have equitable access to CS instruction by a diverse and qualified teaching pool and high school graduates will be prepared for post-graduation opportunities in CS.*

---

[1] 1. Scherer, Ronny et al. “The cognitive benefits of learning computer programming: A meta-analysis of transfer effects.” *Journal of Educational Psychology* (2019): n. Pag.
2. Century, Jeanne et al. “Finding time for computer science in the elementary day: Preliminary findings of an exploratory study.” *Outlier Research & Evaluation | UChicago STEM Education at the University of Chicago*. (2018).
3. Buckley, Jack. “Preliminary results of AP computer science analyses.” *College Board*. (July 2015).
4. Brown, Emily Anne and Brown, Richard S. “The effect of advanced placement computer science course taking on college enrollment.” *West Coast Analytics.* (March 4, 2020).
5. Arfé, Barbara et al. “The effects of coding on children’s planning and inhibition skills.” *Computers and Education, 148.* (April 2020). n. Pag.
6. Prat, Chantel S. et al. “Relating natural language aptitude to individual differences in learning programming languages.” *Scientific Reports*, *10.* (March 2020).
7. 2019 State of Computer Science Education. (2019). Retrieved from https://advocacy.code.org/

This project rolled out in three phases:

- In June 2022, Washington STEM produced an Interim Report of the first phase of work. We worked closely with corporate stakeholders and sponsors to provide feedback and iterate with the project leads, in contribution toward a cohesive plan and next steps. We also worked with stakeholders to identify necessary data to measure progress toward our shared goals and to measure progress toward the reinvisioned goals of the Cross-Sector Computer Science Strategic Plan that we developed in that first phase.
- In December 2022, Washington STEM provided an from the second phase of work. Washington STEM and WTIA shared and strategized with decision makers including legislative champions, K12 and higher education leaders, business leaders, and community members. That second phase of the work focused on near-term policy opportunities ahead of the 2023 Legislative Session.
- The Final Report (May 2023) is a culmination of these efforts with updates from the 2023 Legislative Session, continued partnerships and recommendations for the future.

Major findings, outcomes, and next steps of this project include:

- There is deep interest across the state to work together to credential gaps and address high demand workforce shortages.
- Monitoring implementation and measuring outcomes of key legislation from 2019 and 2021 is underway, but there is not yet enough implementation or outcomes data available to determine effectiveness of those policies yet.
- The solutions are not defined by “computer science” but how computer science is a part of content integration, mastery-based learning, career connected learning, dual credit, and even through gaming education opportunities.
- This project, through data and partnerships, has shown a spotlight on the innovative and powerful solutions implemented across the state and has reinvigorated leaders to work together to scale.
- We are excited and optimistic about the future!

We start this report with the future and lighting a fire for 2024 and beyond. We recognize that for a statewide strategic plan to be implementable and successful, we must work collectively across sectors to remove barriers and create opportunity.

Thank you to the generous support and partnership from WTIA, Washington State Senator Lisa Wellman, Microsoft, Amazon, Salesforce, and the University of Washington and many others across the state for engaging in this work.

2024 and Beyond Proposed Legislative Activity List

Our ultimate goals are to ensure that all students in Washington State have the opportunity and support to learn and be exposed to computer science early and often; to equitably prepare young adults in our state for high-demand computer science and related careers as well as overall informed global citizenship; and to close pervasive demographic gaps when it comes to accessing household-sustaining wage jobs (like computer science), resulting in a diverse and healthy workforce.

To achieve this goal, several steps must be taken to ensure school districts are able to successfully implement computer science education, which includes:

- Timely data collection and reporting
- Recruitment and preparation of qualified teachers
- Sustainable financial support
- Industry partnership to support career pathways

With a focus on this end goal, we should continue to move towards fully implementing the Office of the Superintendent of Public Instruction's (OSPI) Washington State Computer Science Education Strategic Plan to ensure ALL K-12 Washington schools have the tools necessary to offer computer science courses and have qualified teachers to deliver that instruction.

2024 and Beyond Proposed Legislative Activity List:

Update reporting requirements to increase data-informed decision-making

As required by SHB 1577 (2019), school districts must annually submit data on the number of computer science courses offered, the number of students in those courses, and the number of computer science educators to OSPI. Reports from the districts are due on June 30 of each year and a public facing report from OSPI with this data is also due June 30 of each year.

It is becoming clear that the alignment of the district reporting and OSPI posting deadlines does not make sense, as it does not allow OSPI enough time to analyze and normalize the data before the required posting deadline. Additionally, capacity for data review and analysis at OSPI is lacking, resulting in delayed posting of the district data. For instance, the data for the 2021-22 school year was just made publicly available in July 2023.

This data is key to understanding the current landscape and gaps in computer science education in Washington state and identifying opportunities for further action.

- Recommended action:
    - Modify the reporting dates for OSPI to publish the computer science data. This would allow some time for analysis between when the districts report the data and when the agency is required to post it
    - Explore and fund capacity to build public-facing, regional data dashboards to allow for more specialized review and assessment of regional opportunities
    - Explore options for hosting the computer science data dashboard at other state agencies/entities and/or other ways of addressing data capacity issues at OSPI.

Establish industry-led navigators

The nine educational service districts already have STEM leads that help coordinate all science, technology, engineering, and math-related activities and support course creation and post-graduation pathway opportunities for students. These leads also coordinate with local industry representatives to ensure course offerings are current and to make connections for students to on-the-job opportunities.

- Recommended action:
    - Support the WIN for CS group to increase efforts of the existing STEM navigators to increase access to computer science in their ESDs, including having a full FTE dedicated to computer science coursework and pathway navigation
    - Establish a computer science-specific industry navigator at each educational service district to support the statewide strategy for implementing SB 5088 (2019) and other legislative initiatives to increase offerings of computer science courses in all school districts, ensuring computer science courses and pathways are coordinated with industry standards and to encourage students to take these courses
    - Extend provisions in RCW 43.79.195, the Workforce Education Investment Account (WEIA), that allow for funds to be used for expenditures related to K-12 career connected learning

Increase support for teacher recruitment and preparation

The pandemic exacerbated the issues with recruiting and retaining teachers in Washington state, as well as helping prepare existing teachers in emerging fields. Washington needs stronger connections between teacher preparation programs and K-12, both in terms of aligning teacher prep programs to the reality of classroom teaching and in the handoff and structure of early career support. Teachers are a critical resource and students consistently name teachers as a primary source of information.
Adding computer science as a credential to other teacher certification courses can help expand the computer science educator pool.

- Recommended actions:

- Pass E2SHB 1565 from the 2023-24 legislative session to increase the recruitment, retention, and support of appropriately credentialed teachers
- Support and expand STEM teacher preparation and certification courses
- Create a state-supported teacher mentor program, similar to the TEALS model through Microsoft, to have a technologist available to support teachers as they get up to speed and to support increased educator capacity

Fund career and technical education (CTE) dual credit programs

CTE programs prepare students for high-skill, high-wage employment and advanced and continuing education in high demand sectors in our state. These programs provide embedded opportunities to CTE Dual Credit and Industry Recognized Credentials; both of which support credential attainment and gainful employment. Enrolling in dual credit is beneficial and can reduce the time and money required to complete certificate programs or 2- or 4-year degrees, providing a pathway to computer science programs and degrees.

Each year, it is estimated that we are losing between 5,000 and 10,000 students who took dual credit CTE courses in high school but who were not supported to articulate and utilize those credits (and the programs they started) into a career and technical college pathway or degree program. Many community and technical colleges are offering or preparing to offer computer science programs and degrees; many of these pathways are or will be articulated with computer science and related CTE courses at local high schools. Yet if students are not supported in articulating and utilizing those credits that they earned in high school, we will continue to lose hundreds or thousands of burgeoning computer scientists.

The ERDC outlined specific policy recommendations related to tracking students' CTE credits and pathways as well as overall updates needed to the CTE system in their 2022 report; their report underscored the more specific policy recommendations from a 2021 report provided by the State Board and Community & Technical Colleges.

- Recommended actions:
  - Strengthen the transition from K-12 to higher education by improving CTE Dual Credit systems, including funding to support improved CTE articulations, modernization or replacement of the Student Enrollment Registration System, program alignment, transcription fees, and systems such as ctcLink

Increase and reform OSPI computer science grants

OSPI provides grants to the nine educational service districts to train and credential teachers in computer sciences, provide and upgrade technology needed to learn computer science, and for computer science frontiers grants to introduce students to and engage them in computer science. In the 2023-25 biennial budget, the Legislature appropriated $2M over the biennium for this Computer Science Education Grant program.
There are opportunities to reform the Computer Science Education Grant to make it more accessible and effective for the educational service districts.

- Recommended actions:

- Increase investment to Computer Science Education Grants administered by OSPI
- Amend the Computer Science Education Grant program to support regional district strategic planning and implementation.

Implement the Bachelor of Science in Computer Science at the community colleges

In 2021, the Legislature enacted SSB 5401, authorizing the state community and technical colleges to offer bachelor's degree programs in computer science To date, there are nine state community and technical colleges that offer or have proposals to offer a Bachelor of Science in Computer Science. Implementation of these programs, and creation of additional programs in other parts of the state, will expand access to such programs across the state and will reach underrepresented communities that might not have previously had access to these degrees.

- Recommended action:
  - Fund implementation of the Bachelor of Science in Computer Science at the state community colleges, perhaps via a proposed budget proviso from 2023
    - $16.52M in the first year and $13.12M in the second year for the Community and Technical Colleges from the Workforce Education Investment Account
    - Solely for implementation of 4-year computer science degree programs at 17 state community and technical colleges, serving 408 underrepresented students
  - Support existing efforts within the community and technical college system, like AppConnect, to continue and broaden applied software development degree programs – including fully funding an FTE dedicated to this work

Expand Core Plus to include computer science

Core Plus offers industry-validated, skills-based learning for high school students, resulting in a certificate or credential upon graduation, in manufacturing jobs in the aerospace, construction, and maritime industries. Such hands-on learning experiences are equally as valuable for students seeking careers in computer science-related professions, trading the manufacturing skills for the technical knowledge required for cloud services, cybersecurity, software development, and more.

- Recommended action:
  - Appropriate funds for expansion of the Core Plus program to create a computer science track.

FINAL REPORT
APRIL 2023

Since the publications of the Interim Cross Sector Computer Science Report and Plan in June 2022 and the December 2022 update, Washington STEM and WTIA shared the report and update and strategized with decision makers including legislative champions, K12 and higher education leaders, business leaders, and community members. This final report provides a summary of what has been done, what was learned, and encourages all of us to think forward to the next ten years of computer science in Washington.

WHAT WE'VE DONE:

When we started this project, our goal was to create, iterate, and operationalize a statewide Cross-Sector Computer Science Strategic Plan (CSSP) that will help provide access to computer science for all Washington students, outline specific policy, implementation, and educator development goals, as well as a timeline and lead entities to achieve set goals.

Through conversations with partners across the state, we learned that there are multiple system level barriers to achieving full implementation but critical investments in an attempt to address those barriers. We also learned that there are bright examples across the state of districts, businesses, and communities coming together to implement innovative solutions to improve computer science access for students across Washington.

Washington STEM prioritized five opportunities to disrupt and change the system barriers to full implementation.

- **SUPPORT K-12 IMPLEMENTATION OF EQUITABLE ACCESS TO CS:** Fully- funded statewide, cross-sector Computer Science leadership structure.
- **ACCOUNTABILITY THROUGH DATA:** Mandate improved data visualizations and accountability metrics in statute
- **TEACHER PREPARATION:** Expansion of teacher training programs
- **COORDINATION & PARTNERSHIP:** Provide input on Cross-sector Strategic Plan & support implementation; Organize and host convenings to connect educators, Computer Science advisory, stakeholders
- **UNDERSTAND POSTSECONDARY PATHWAYS INTO CS:** Utilize data from Washington STEM's Computer Science Credential Opportunities by Region Index (CORI) dashboard to prioritize policies and funding for increasing access to computer science programs in each region of the state.

After further conversations with partners, educators, and stakeholders and in anticipation of the 2023 Legislative Session, we expanded on the above to include the **near-term policy opportunities** in each of the five opportunity areas:

- **SUPPORT K-12 IMPLEMENTATION OF EQUITABLE ACCESS TO CS:**
  - Policy Opportunity: Increase funding for CS grants and explore opportunities for public/private partnership.
  - Policy Opportunity: Revision of grant requirements to support multi-year, cohorts of computer science planning and implementation for districts
- **ACCOUNTABILITY THROUGH DATA:**
  - Policy Opportunity: Create data visualization of K12 CS course availability for/with OSPI with 21-22 data (when available)
  - Policy Opportunity: Revise HB 1577 to include additional data points and reporting date change
- **TEACHER PREPARATION:**
  - Policy Opportunity: Track and support proposals from PESB/OSPI
  - Policy Opportunity: Connection to WA STEM Teaching Workforce Data Project (2023-2024)
- **COORDINATION & PARTNERSHIP:**
  - Policy Opportunity: Public/Visible sharing of interim report during legislative session
  - Policy Opportunity: Continued conversation around action with the STEM Innovation Alliance
- **UNDERSTAND POSTSECONDARY PATHWAYS INTO CS:**
  - Policy Opportunity: Utilize CORI (Credential Opportunities by Region and Industry) to inform, support, and improve legislation.

This final report will share what we learned, what action happened this legislative session, and recommendations for future connections.

1. SUPPORT K-12 IMPLEMENTATION OF EQUITABLE ACCESS TO COMPUTER SCIENCE

For historical context, there were three priority pieces of legislation that have been signed into law during past legislative sessions related to equitable availability of, engagement in, and data about K-12 computer science across the state. These policies are currently being implemented and are intended to provide foundational changes across the state. We have been monitoring their implementation and working toward measuring observable change associated with their implementation:

SB 5088 Awarding credits for Computer Science (2019)

- Requires each school district that operates a high school to offer an opportunity to access an elective computer science course by the 2022-23 school year.
- Allows school districts to award academic credit for computer science to students based on student completion of a competency examination starting with the 2019-20 school year.

SHB 1577 K-12 Computer Science Education Data (2019)

- Mandates school districts report the following data to OSPI *and* for OSPI to post a publicly-available data report about the following measures related to computer science courses and equitable access:
    - The total number of CS courses offered in each school (including advanced placement designation);
    - The number and percentage of students who enrolled in CS, disaggregated;
    - The number of computer science instructors at each school, disaggregated.

SB 5299 Use of CS Credits for the Purpose of Graduation Requirements (2021)

- Allows a student to substitute an approved CS course for a third-year math or science credit for high school graduation.

As mentioned above, as these policies were enacted in 2019 and 2021 and began implementation thereafter, Washington STEM and the state are working to understand the impact of the legislation as districts across the state continue to prioritize learning recovery, and supporting students' mental health as the COVID-19 pandemic eases.

Learning recovery, special education and student wellbeing were prioritized by education leaders and lawmakers for the 2023 Legislative Session. While there was limited opportunity for new computer science specific legislation policymakers continued their support through sustained investments in computer science grants, increased investments to universities to support high-demand degrees, and legislation just adjacent to computer science to strengthen students' transition from high school to postsecondary.

2023 Legislative Policy Proposals and Status

SB 5243: Concerning High School and Beyond Planning

- Sponsored by Senator Lisa Wellman (41st LD) the bill enacts a statewide tool for the High School and Beyond Plan. The High School and Beyond Plan is one of the three requirements a student must complete to graduate: 24 core credits, selection of a graduation pathway, and the completion of a High School and Beyond Plan. (HSBP)

- The High School and Beyond Plan is a tool students begin in middle school with a career and interest survey and is designed to guide students in their course taking, extracurriculars, and postsecondary pursuits aligned with their individualized career goals and interests. Washington STEM's research and partnerships with schools and districts across the state indicates that when high school staff are aware of students'

intended post-high school plans, such as students' interest in computer science careers, administrators are more likely to adjust course offerings in the school, such as adding or expanding computer science and related courses. This bill would ensure that all schools have a platform for and basic components of high school and beyond planning, so that staff and students can better act on the information collected in the plans.

- There are bright examples of implementation of the High School and Beyond Plan across the state. In Orondo, a small, rural district that serves 162 students pre-k through 8th grade, students and families choose to attend high school in either Waterville, Lake Chelan, or Eastmont SD. All three districts have considerably varied HSBP implementation, but over the past few years, the local network helped an 8th grade teacher prepare a CTE framework that can support students, via their HSBP, through courses that align with their interests and aspirations. Similarly, Federal Way School District has created grade-by-grade checklists, starting in 6th grade, translated into six languages, with helpful videos that explain how it all works together, and all integrated into an online platform for all six years, accessible to parents, students, and school staff. These examples are key ways communities across the state are implementing the High School and Beyond Plan.
- A robust, user-friendly, locally-appropriate HSBP platform will be a critical tool in changing patterns and creating well lit pathways to postsecondary including engaging students early and often in available computer science courses, pathways, and careers.
- The bill passed the legislature, is funded in the budget, and has been signed into law, effective July 23, 2023.

SB 5736: Addressing high demand workforce shortages

- Sponsored by Senator T'Wina Nobles (28th LD), the bill proposes allocating a portion of funds available in the Workforce Education Investment Account (WEIA) to support and build access to higher education programs in advanced computing and other fields. The funding would provide a pathway for students that lead to economic opportunity and household sustaining-wages jobs in every region of our state.
- WEIA: The Workforce Education Investment Account is a state revenue source funded through business surcharges including advanced computing businesses. WEIA expenditures may only be used for higher education programs, higher education operations, higher education compensation, and state-funded student aid programs.
- Washington STEM testified in support of this bill to the Senate Higher Education and Workforce Development committee on February 15, 2023 alongside partners from Amazon.
- The bill did not advance in the 2023 Legislative Session but may be reintroduced next year.

HB 1565: Supporting and strengthening the professional education workforce.

- Known as the "Educator Workforce Act," this comprehensive bill sponsored by Representative Lillian Ortiz-Self (21st LD) proposes to support and strengthen the professional education workforce through recruitment, residency, research, and retention strategies.

- Computer science is a content area of focus in educator shortage data from the Professional Educators and Standards board. Expanding access to and support for the educator workforce is a critical component to ensuring that we have enough overall and enough diverse educators to expand the number and capacity of K12 computer science and related courses across the state.

- The bill did not advance in the 2023 Legislative Session but may be reintroduced next year.

SB 5048: Eliminating College in the High School Fees

- Sponsored by Senator Mark Mullet (5th LD) the bill proposes to eliminate all College in the High School fees for students in Washington.

- College in the High School is one form of dual credit that is taught within the high school setting. Students do not travel to a campus for instruction but take college level courses in their high school and have to pay for the courses. This form of dual credit is open to students in grades 9-12. Colleges across the state are approved to offer College in the High School.

- College in the High School enrollment represent about 14.7% of dual credit in Washington.[2] This is a decrease from the 2017 cohort which reports 17% enrollment in College in the High School.

- Removing the financial barrier to accessing College in the High School courses creates a pathway to remove further barriers of completion and application of similar forms of dual credit, such as CTE dual credit, for students between the K-12 and higher education systems.

- **T**his form of dual credit can be an important and practical option for schools as they figure out ways to offer or to expand capacity in K12 computer science courses. Eliminating fees for such courses can ensure that students in low-income households, who are often also disproportionately students of color and/or students in rural areas of the state, can have access to computer science courses and earn college credit for those courses. This can overall increase the likelihood of more students overall and more diverse students choosing to continue into computer science degrees in higher education.

[2]"OSPI Washington State Report Card." https://washingtonstatereportcard.ospi.k12.wa.us/ReportCard/ViewSchoolOrDistrict/103300

- While courses are offered on a school by school basis, an example of how Computer Science is represented in College in the High School is through courses offered by the University of Washington which includes Introduction to Computer Programming and Introduction to Data Science.

- The bill passed the legislature, is funded in the budget, and has been signed into law, effective July 23, 2023.

HB 1316: Expanding Dual Credit Access

- Sponsored by Representative Dave Paul (10th LD) extends a successful Summer Running Start pilot program to colleges across the state. This allows students to continue Running Start courses in the summer.

- Enrolling in dual credit is beneficial and can reduce the time and money required to complete a 2-year or 4-year degree. Dual credit, particularly Running Start can help students build a college-going identity and confidence, and is associated with a higher likelihood of enrolling in postsecondary education.

- Dual credit is a critical piece to ensuring students have early access and pathways to computer science degrees. Similar to the bill above, extending access to free dual credit opportunities into the summer can ensure that students in low-income households, who are often also disproportionately students of color and/or students in rural areas of the state, can have access to computer science courses and earn college credit for those courses. This can overall increase the likelihood of more students overall and more diverse students choosing to continue into computer science degrees in higher education.

- The bill passed the legislature, is funded in the budget, and has been signed into law, effective July 23, 2023.

SB 5593: Improving the equity in the transfer of student data between K-12 schools and institutions of higher education.

- Sponsored by Senator Marko Liias (21st LD), the bill proposes a clear pathway for institutions of higher education to obtain student contact data for use in communicating with students and families about higher education opportunities.

- Currently in Washington, institutions of higher education have to purchase student-level data from third parties and that data is only inclusive of students who opt into the SAT/ACT or dual credit course testing. Because standardized tests are no longer required by many colleges for admissions, higher education institutions are unable to communicate with highly-qualified students, who in turn, may be less likely to apply to or succeed in higher education because of lack of information or knowledge of their options.

- Enabling higher education institutions to communicate with students more broadly and with fewer barriers will ensure that more diverse students, especially students living in rural areas of the state, students from low-income households, and students of color, feel welcomed into and encouraged to apply to college. This will, in turn, increase diversity in high-demand programs, including computer science, so that we widen the pipeline for that pathway in our state for local students.
- The bill passed the legislature, is funded in the budget, and has been signed into law, effective July 23, 2023.

2023 Washington State Budget Investment Highlights

- **Computer Science Education Grants:** $2 million of the state's general fund is provided to OSPI to continue to administer computer science grants. The grants support work to train and credential teachers in computer sciences; provide and upgrade technology needed to learn computer science; and, for computer science frontiers grants to introduce students to and engage them in computer science.
- **AP Computer Science Grants:** $174,000 of the state's general fund is provided to OSPI to continue to administer competitive grants to school districts to increase the capacity of high schools to offer AP computer science courses. The budget mandates OSPI to prioritize districts in rural areas who do not offer AP computer science and have substantial enrollment of low income students.
- **Computer Science Elective Courses**: $400,000 if the state general fund is provided to OSPI to offer grants to school districts and educational service districts operating institutional education programs for youth in state long-term juvenile institutions to provide access to computer science elective courses.
- **Investments in Computer Science in Postsecondary**:
    - Support High Demand Faculty: $40 million of WEIA funds provided to SBCTC to continue to fund high-demand program faculty salaries, including but not limited to nurse educators, other health-related professions, information technology, **computer science,** and trades.
    - Expansion of Computer Science Degrees at the University of Washington:
        - $14 million of the education legacy trust account provided to the University of Washington Seattle Campus for continuance and expansion of degrees in the department of computer science and engineering.
        - $14 million of the WEIA fund source provided to the University of Washington for continuance and expansion of the Paul G. Allen school of computer science and engineering. $6 million dedicated to award an

additional **100 degrees per year** focusing on traditionally underrepresented students.

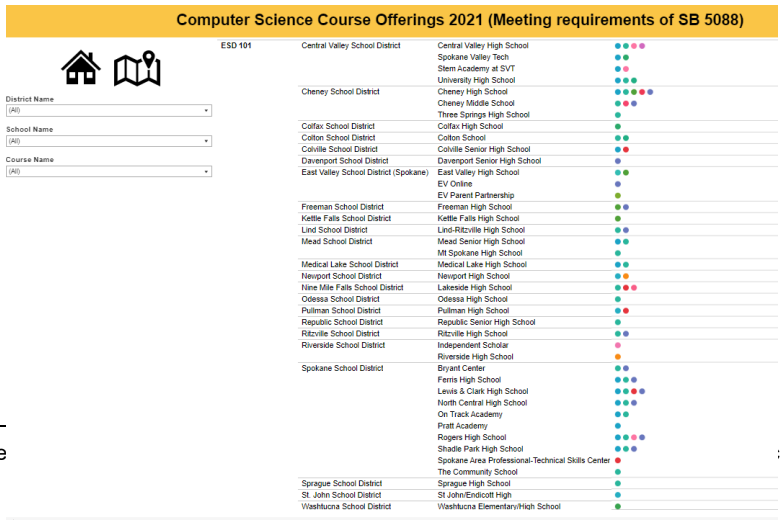
- Expansion of Computer Science Programs at Eastern Washington University: $2.44 million of the WEIA fund source provided to Eastern Washington University for the operation of a bachelor of science in cybersecurity degree option through the computer science program.
- Expansion of Computer Science Programs at Central Washington University: $240,000 of the WEIA fund source provided to Central Washington University to expand cybersecurity capacity by adding additional faculty resources in the department of computer science.

2. ACCOUNTABILITY THROUGH DATA

UPDATE July 2023: OSPI released updated data for the 2021-2022 school year in July 2023. We worked with OSPI from February to July to access the data and are grateful for the work of the data teams in the agency to collect, analyze, and release this legislatively mandated data. The data shows course taking and course availability as well as educator data in the following dashboards.

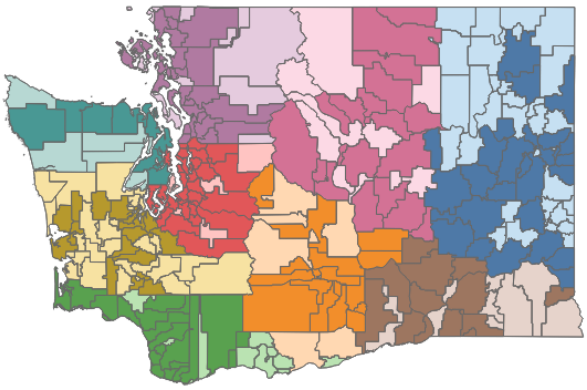
Analysis across the three available data sets from OSPI from school years 2019-2020, 2020-2021, and 2021-2022 show that enrollment in computer science from grades 9-12 are not yet at the pre-pandemic level. In the 2019-2020 school year, OSPI reported 8.9% of total students were enrolled in a computer science course. In 2020-2021, that number dropped to 7.6% of total students enrolled. With the newly released 2021-2022 data, the total number of students enrolled in computer science courses was reported at 8.4%.[3]

1. **Computer Science Course Offerings Dashboard**: Using the 2020-2021 and 2021-2022 data available from OSPI, the dashboard provides a map and list of CS courses offered by School District and School. See example below.



[3] 2021-22 K–12 Compute : Instruction (OSPI), July 2023

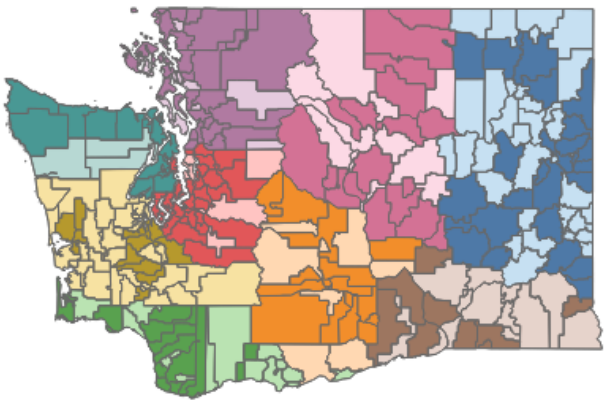
2020-2021 Data Map



The Computer Science Course Offerings Dashboard displays which districts across the state are in compliance with SB 5088 (2019), so far, in offering at least one computer science elective course. Further, it displays the course availability by high school as well as the type of computer science course offered. This allows regional and local leaders and practitioners to see and develop or scale articulated computer science course pathways in a given region or district in order to expand both general access to as well as deepened engagement in computer science for K12 students across the state.

Users analyzing the data map will note districts with a dark color are districts that reported at least one computer science course offering. Districts in the lighter color have no available data meaning a district could have no course offerings, could have missed reporting, or OSPI has not included the data for student identifying concerns. We are working with OSPI on improvements to the data reported.

2021-2022 Data Map



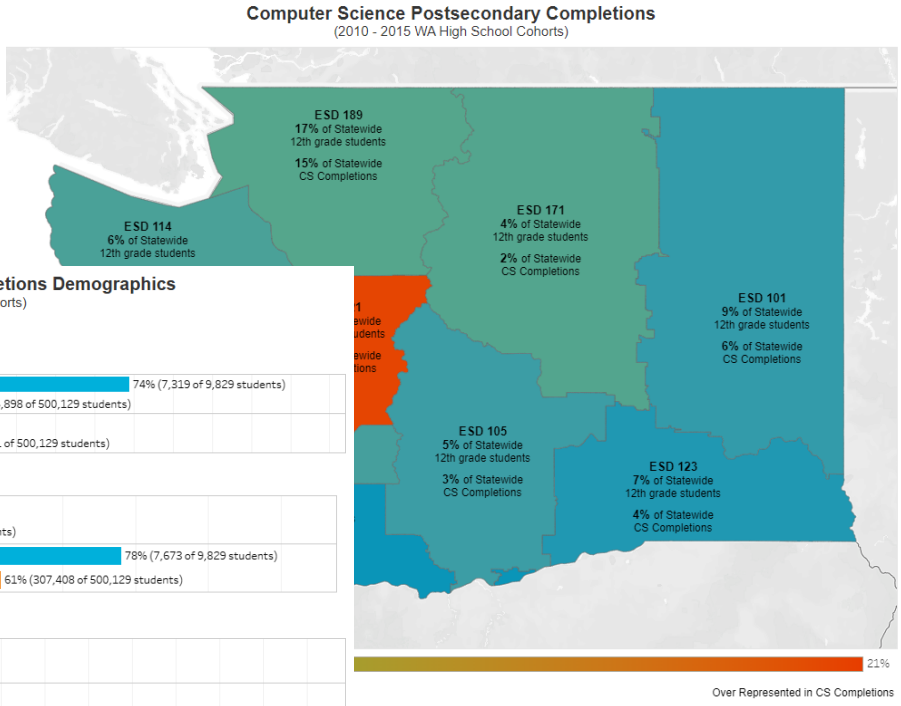
There was a minimal increase in computer science course offerings across the state between 2020-2021 and then 2021-2022 school years, however each Educational Service District added at least one more school district offering a computer science

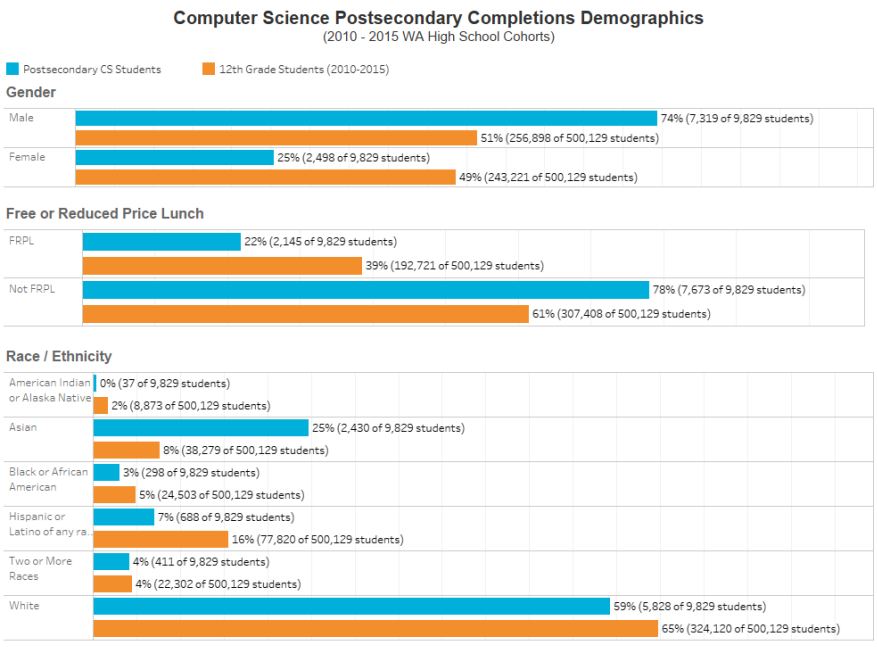
course. This is the right direction but there is more work to be done.

We expect that partners will be able to use this data to investigate any gaps or capacity issues for any districts that have been unable to offer the courses.

Prior to the 2021-2022 data release, we worked to provide the below data dashboards showing completions and labor market demand.

2. **Computer Science Postsecondary Completions**: This set of dashboards looks at the 2010-2015 Washington State High School Cohorts and the number of postsecondary computer science credentials earned by those students. The data for each dashboard was provided by the Education Research Data Center as well as the Integrated Postsecondary Education Data Set. By comparing the percent of statewide CS degrees earned to the percent of the population of students who reside in that region (above, first dashboard tab), we can see discrepancies and inequalities by geography. For example, while 10% of our state's high school seniors live in the ESD 112 region, only 5% of the CS degree completions were obtained by students from that region. This may indicate that students in that region need more exposure, engagement, support, or other removal of barriers to pursuing a CS degree. Conversely, ESD 121, which is composed of King and Pierce County, accounts for 57% of CS credentials earners, but only 36% of HS students statewide.

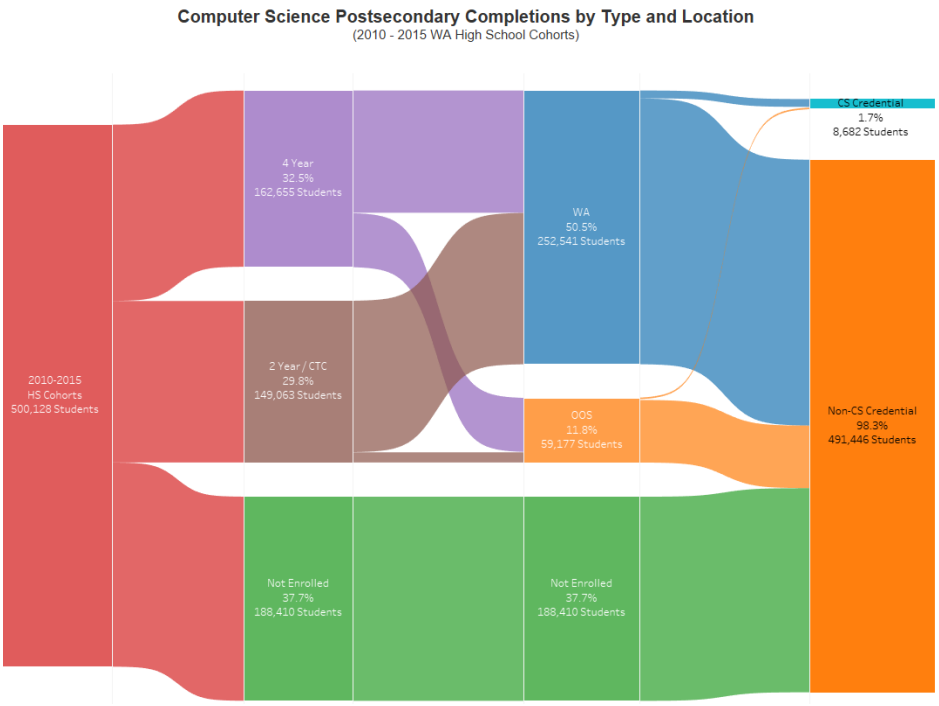




The dashboard (above photo) also shows demographics of

students earning CS credentials in comparison to the demographic composition of the six high school cohort years those students originated from. In this graphic we can see male students are overrepresented in CS (74% CS credential earners compared to 51% of the high school cohorts).

The last visual (below) shows us the path Washington State-originating high school students have historically taken from high school to postsecondary completion. Of the over 500,000 high school seniors from the 2010-2015 cohorts, only 1.7% of students in ended up earning a computer science-related postsecondary credential. Over one-third of students didn't ever enter into a postsecondary program. The majority of students who did go on to postsecondary stayed in state, indicating a need to expand CS degree capacity in the state substantially



3. [Computer Science Credential Opportunities by Region Index (CORI) dashboard]: The Credential Opportunities by Region and Industry Index is a tool designed to inform users of in-demand occupations, the credentials typically needed to enter those occupations, and the institutions or apprenticeship programs offering those credentials in a given region.

	Occupation Title	Job Openings	Related Job Openings	Credential Production	Credential Gap
15-1252	Software Developers	13,943	6,873	1,936	-18,880
15-1254	Web Developers	2,714	17,542	1,203	-19,053
15-1211	Computer Systems Analysts	2,398	18,263	781	-19,880
13-1082	Business Operations Specialists, All Other	1,674	2,363	1,881	-2,156
	Managers, All Other	270	2,363	1,881	-752
15-1232	Computer User Support Specialists	1,244	231	6	-1,469
27-1024	Graphic Designers	846	2,885	307	-3,424
15-1244	Network and Computer Systems Administrators	629	19,958	673	-19,914
27-1014	Multimedia Artists and Animators	493	17,158	206	-17,445
15-2051	Data Scientists	369	26,194	1,997	-24,566
15-1242	Database Administrators	340	20,361	571	-20,130
15-1221	Computer and Information Research Scientists	295	20,485	1,634	-19,146
	Occupation Title	**Job Openings**	**Related Job Openings**	**Credential Production**	**Credential Gap**
27-1021	Commercial and Industrial Designers	135	53	218	30
17-2071	Electrical Engineers	128	206	348	14
17-2141	Mechanical Engineers	120	0	356	236
17-3011	Architectural and Civil Drafters	95	0	199	104
17-2031	Biomedical Engineers	45	0	96	51
17-3023	Engineering Technicians, Except Drafters, All ..	0	0	38	38

The tool reveals whether enough capacity exists in a given region and across the state to adequately prepare young adults to enter into particular occupations and industries. In this case, the tool displays this for computer science occupations in Washington.

We hope that by utilizing the forthcoming 2021-2022 data and releasing a transparent, local, relevant data dashboard that provides all of these measurement elements will allow OSPI and others to understand the extent to which schools and districts have been able to implement the legislative mandates and will realize the intent of the legislature's mandate for release of the data itself.

3. TEACHER PREPARATION

A strong K-12 experience is a critical component to ensuring young Washingtonians are informed and thriving global citizens equipped for multiple viable career pathways of their choosing. And that experience is driven by our teaching workforce.

Washington State continues to experience a statewide teacher shortage. More credentialed K-12 computer science teachers are necessary to reach statewide goals for high school CS course availability, expansion of Computer Science Bachelor of Science/IT degrees at community and technical colleges and continued expansion of computer science related workforce. System-level investments are needed in supporting, retaining, and expanding the computer science and STEM teaching workforce.

In the 2023 Legislative Session, lawmakers proposed legislation (HB 1565) that would strengthen the recruitment and retention of teachers across the state. The bill would have helped mitigate some of the reasons that people with teaching credentials either never enter or soon depart the field, by addressing commonly cited issues: early-career compensation, coherence between preparation and career, and ongoing professional support–all factors in recruiting and retaining effective teachers. The bill did not advance in the Legislature, but Washington STEM has focused on the STEM teaching workforce in partnership with the National Science Foundation (NSF), the University of Washington, and the Education Data and Research Center (ERDC.)

We have been listening to and working with partners with specific knowledge of regionalized STEM teacher shortages, pathways, and issues, and we can provide localized information to researchers as they investigate trends in the data. What we know is we need stronger connections between teacher prep programs and K-12, both in terms of aligning teacher prep programs to the reality of classroom teaching and in the handoff and structure of early career support. Our partners have also shared that elementary teachers don't often see themselves as STEM teachers, but elementary teachers are absolutely critical for ensuring that all students (particularly from priority populations) can build on their early learning experiences and develop the STEM literacy for their various career and life paths. And we know these findings are not unique to the STEM teaching workforce and computer science.

We are working to produce disaggregated data on Washington's STEM Teaching Workforce by 2024 that drive action toward diversifying, improving, and increasing the workforce. We hope this data will best inform future investments to teacher retention by providing more support for early-career teachers (first 5 years) and navigate investments in public/private partnerships to

provide scholarships and free tuition to future teachers at the community and technical college level and at the four-year institutions.

Computer science and STEM teachers are KEY to our future workforce.

4. COORDINATION & PARTNERSHIP

Nothing happens without partnership. At the local level through the unique work of Regional STEM Networks who are deeply rooted in their communities and provide local expertise to ensure that local needs are met. At the state level with passionate legislators who transform state policies to prepare students in their transition from high school to postsecondary and into high demand, household sustaining careers. Or at the state agencies with system level changemakers implementing policies and investments. And with business partners working together to provide generous support and feedback to create a truly unified vision and sustainable strategic plan for computer science in Washington.

Spotlight on the Northwest STEM Network: The Northwest STEM Network is leading the region in understanding access to computer science pathways through alignment with dual credit including CTE Dual Credit. CTE Dual Credit integrates technical skills with curriculum to prepare students for postsecondary and professional technical careers. Courses are taught at the high schools but they are a cooperative effort between K12 schools, community and technical colleges, and the community. Application of the credits students earn is varied and reliant on system level articulations between K-12 and higher education. With recent expansions of computer science in the community and technical college system, there is a greater opportunity to earn CTE dual credit in computer science. Read more about this emerging work.

Examples of Partnership in Action:

During the 2023 Legislative Session, Washington STEM hosted five Advocacy Engagement Days in Olympia, WA with Regional Network partners. Together with representatives from Tacoma STEAM and the Foundation for Tacoma Students, Central Puget Sound STEAM Collective, Northwest STEM Network, Snohomish STEM Network, West Sound STEM, Career Connect Southwest, and the Apple STEM Network we connected with over 50 legislators at strategic moments throughout the legislative session. Partners highlighted work connected to computer science including content integration in K-12, expansion of internships and apprenticeship opportunities, and increased access to computer science career pathways.

OSPI hired a new Computer Science Specialist, Terron Ishihara. Washington STEM and OSPI meet regularly to share implementation and agency level ideas stemming from the work done in this report. We also continue to partner on the need for data and future policy recommendations. Washington STEM also continues to serve on the board of the Washington Science Teachers Association, keeping connected with science teachers across Washington.

The CTE Department at Seattle Public Schools reached out in partnership for data and is planning to Washington STEM's Computer Science Data dashboard and report with the Seattle School Board as they work to address workforce shortages and support students in high demand fields.

Washington STEM advocated alongside Amazon in support of SB 5376 to the Senate Higher Education and Workforce Development committee in February 2023. The bill proposed a dedicated funding stream to support students in high demand, advanced computing degree fields.

Prior to the start of the legislative session, the Senate Early Learning & K-12 Committee hosted a work session focused on Education Technology and the use of game development and play in education. Tammie Schrader, a partner who serves as the Regional Science and Computer Science Coordinator at the Northeast Educational Service District (ESD 101) presented the innovative practices of the region alongside national partners.

WTIA provided a letter to legislative leaders in support of computer science funding in the Governor's proposed budget.

We know a robust cross-sector career pathways system is key to preparing students for the most in-demand, high-paying careers in our state. Partnerships have been critically important to bring together education, community, and business partners to expose and prepare students for exciting careers in high-demand industries in which STEM fuels innovation, economic mobility, and job growth.

Career Connect Washington has provided a mechanism and funding to create programs across the Career Connected Learning Continuum that lead to well-lit pathways for our students to access meaningful careers that contribute to the economic needs of our local communities. Computing For All (CFA), a partner in the stakeholder engagement of this plan, is a CCW Sector Intermediary grantee. As a sector intermediary, CFA proposed a systematic approach to engage employers, understand their talent needs, map those needs to the programs being offered by educators, and encourage collective action by all stakeholders in the workforce system. The investment supports expanding availability of industry-recognized certifications for high-demand occupations: Cybersecurity, Cloud Computing, Software development, Data Science/Analytics/AI. Washington STEM is a member of the CCW statewide team and we support systems in place to execute these recommendations through state and federal funds.

Spotlight on High School to Postsecondary:

Over the past four years, Washington STEM has formed research-practice partnerships with schools and systems-level partners throughout Washington State to create a scalable approach to assessing and creating a plan to increase postsecondary enrollment and completion of postsecondary credentials, and sustain a pathway to the high-demand, household-sustaining

jobs available in our state such as computer science. This is through our High School to Postsecondary Project.

In a collaboration with Eisenhower High School in Yakima, and subsequent partnerships with four additional high schools, Washington STEM has learned:

- 90% of students surveyed aspire to pursue a postsecondary credential
- School staff surveyed believe 48% of students aspire to pursue a postsecondary credential—a 40%+ discrepancy that suggests school staff largely do not yet have enough information about pathways and students' aspirations
- Students largely rely on teaching staff and peers to share information about dual credit and postsecondary pathways
- Students want postsecondary information early, often, and in-class: i.e., financial aid information starting in 9th grade or earlier and regular class periods (advisory/homeroom) dedicated to filling out forms and learning about pathways

At Eisenhower they have taken the data and student feedback and changed how they do postsecondary preparation with their students. They are also learning from peer high schools and school districts through our network of partners about best practices to implement.

Some of the practices that Eisenhower implemented include providing already-developed (and free!) career- and postsecondary-readiness curriculum during advisory period for all students (9^{th}-12^{th} grade) and including curriculum about financial aid each year of a student's high school career; AND expanding dual credit offerings to include AP Computer Science.

Partnerships are key. From the state level to business champions to the local, regional levels, the implementation of investments, access to computer science courses, internships and apprenticeships, and alignment to career pathways to meet the high demand workforce needs of our state are driven by partnerships.

RECOMMENDATIONS AND NEXT STEPS

At a time when it's nearly impossible to find an industry or field of study not being transformed, disrupted, or reimagined using software and computer science, all students can benefit from learning computer science. The computational thinking, critical thinking, and creativity skills

acquired through computer science education will prepare them throughout their education and beyond.

Legislative Action:

- Sharing and staying connected throughout the interim with key lawmakers to seek funding support to partner and scale programs across the state that are addressing all of the above issues, including actions like supporting teacher workforce, expansion of computer science degrees, access to computer science career pathways, and expansion of access to internships.
- Seek data improvements to data available in the teaching workforce, specifically STEM teaching workforce.

Alignment to Pathways:

- Implementation of expanded dual credit program access with the elimination of College in the High School fees, expansion of Summer Running Start, and continued conversations leading improvements in CTE Dual Credit.
- Further data: Student pathway data (course completion, dual credit completion, High School and Beyond Plan and Graduation pathways)
- K-12 and HS to college enrollment data/Post-college data (e.g., from Higher Ed. and/or community partners); Postsecondary pathway participation data and subsequent admissions/enrollment data.

Partnership:

- Interim connections with state agency partners including but not limited to Professional Educator Standards Board (PESB), Office of the Superintendent of Public Instruction (OSPI), State Board of Education (SBE) and the Workforce Training and Education Board (WTB)
    - Supporting OSPI Computer Science Specialist on agency level recommendations and changes.
    - ERDC
- Continue to partner with business leaders and higher education leaders.
- Continue to partner with Regional Networks and ESDs (through AESD) about the need for staffing in each Educational Service District to support Computer Science implementation. Explore content integration specialist position.
- Washington STEM presented to the STEM Innovation Alliance in May 2023.

Future Vision:

In Washington State, STEM is at the forefront of discovery, on the frontlines of creative 21st century problem-solving, and serves as one of the largest pathways to household sustaining careers and long-term economic security. Each one of us plays a critical role in supporting students across the continuum, from supporting our earliest learners to creating well lit pathways for young people.

Washington has made critical investments and system improvements to mandate increased access to computer science but there is more work to be done. The solutions are no longer defined by “computer science” explicitly but how computer science and computational thinking is integrated into the fabric of our learning from our earliest learners to professionals. This is where the work is headed. From strengthening our foundations in mathematics for the earliest learners to ensuring all students have access to robust dual credit opportunities in computer science that illuminate pathways to household-sustaining wages.

Through data and partnership, this project has spotlighted the innovative and powerful solutions already implemented across the state and has reinvigorated leaders to work together to scale. Data and partnerships are the driver of this work including revisions to current computer science policies and standards.

Systems-level improvements to increase the availability of computer science and related coursework including CTE dual credit will be important levers for supporting the postsecondary aspirations of students across the state. But we must do this alongside the recruitment and retention of the STEM teaching workforce. What we know is we need stronger connections between teacher prep programs and K-12, both in terms of aligning teacher prep programs to the reality of classroom teaching and in the handoff and structure of early career support. Our partners have also shared that elementary teachers don’t often see themselves as STEM teachers, but elementary teachers are absolutely critical for ensuring that all students can build on their early learning experiences and develop the STEM literacy for their various career and life paths. And we know teachers remain the primary source of information, especially for students of color and students from low-income households.

We envision a computer science ecosystem in partnership with industry, K12 education, higher education, students and families, state agencies, and policy makers, working together to ensure every student in Washington has access and opportunity to the incredible 21st century careers computer science provides.

Thank you to sponsors and industry leaders who contributed, to leaders across Washington, and to our generous partners. We look forward to partnering with you in the future.

DECEMBER 2022 UPDATE

Since the publication of the Interim Cross Sector Computer Science Report and Plan in June 2022, Washington STEM and WTIA shared and strategized with decision makers including legislative champions, K12 and higher education leaders, business leaders, and community members.

The Computer Science ecosystem experienced transitions in staffing including primary contacts at the Office of Superintendent of Public Instruction and Washington STEM. However, the work moves forward with a larger renewed interest to improve Computer Science through the publication of this interim report and data provided. Washington STEM received further feedback that has informed more specific policy opportunities for the action items proposed:

SUPPORT K-12 IMPLEMENTATION OF EQUITABLE ACCESS TO COMPUTER SCIENCE:

- Washington STEM met with partners from OSPI and AESD (Association of Education Service Districts) to discuss the efficacy and equitable distribution of OSPI's Computer Science Grant Program and may propose criteria modifications and/ or increased funding. The program received sustained funding from the Governor's proposed budgets.

ACCOUNTABILITY THROUGH DATA:

- Washington STEM created a set of Computer Science Postsecondary Completions dashboards. The data for each dashboard was provided by the Education Research Data Center as well as the Integrated Postsecondary Education Data Set.The data in these dashboards display the following information.
    - "ESD Map" tab: This dashboard shows both the percent and number of students from Washington State public high schools who completed a Computer Science postsecondary degree or credential for the high school cohorts of 2010-2015. This dashboard also tells us the regional representation by student population (geographical over- or underrepresentation) of students who completed a credential in Computer Science and by demographic.
    - "Demographics" tab: This dashboard shows the demographic (race, gender, low-income status) of students who completed Computer Science degrees or credentials from Washington State public high schools in 2010-2015 and the relative representation of students by demographic as compared to the overall grouping of high school students during that time period. For example, of all students who completed CS degrees or credentials from the 2010-2015 high school cohorts, 74% were male, which means that males were overrepresented among CS degree-holders as compared to the 51% they make up of all public high school students in their cohorts.
    - "Sankey" tab: This dashboard shows the overall pathways of all public high school students into postsecondary education/pathways and eventually into CS degrees or credentials. This displays the number who make it through CS degrees or credentials via 4-year and 2-year college routes as well as in-state and out-of-state routes.
- OSPI made publicly available data from the 2020-2021 school year that showed availability of courses school-by-school, including listing of courses, offering of courses, and availability of contiguous CS course pathways; access and engagement in those courses by students from key populations that have been systematically underserved,

and certification, training, and demographics of teachers who could or do teach computer science to determine equitable access to adults who reflect student demographics of the school or district. However, this data set does not tell us the number of students served or times the course was offered. For example, a district may have a coding course but the data currently collected does not explore how often that course is offered and how many students are taking the course. Washington STEM is working directly with OSPI to improve the data available and reported and we anticipate an update in February 2023.

TEACHER PREPARATION:

- Washington STEM is closely watching budget and policy proposals that support the teacher workforce including retention and expanding programs for pre-service teachers for inclusion of computer science.

COORDINATION & PARTNERSHIP:

- Washington STEM presented the Cross-Sector Computer Science Report to the STEM Education Alliance in October. The STEM Education Alliance is a group of leaders that advise the Governor in STEM Education. The Alliance consists of labor, education, government, and nonprofit organizations and produces an annual report card in STEM Education. WA STEM-led recommendations for updating the report card ,which was presented on September 29, 2021. Washington STEM proposed a new framework and indicators and recommended outcomes of students from K-12 into WA State High Demand STEM jobs. The framework was approved by members at this October meeting.
- Washington STEM in partnership with WTIA, hosted a meeting with the generous sponsors of this work in November and presented the updated, near-term opportunities.

UNDERSTAND POSTSECONDARY PATHWAYS INTO COMPUTER SCIENCE

- Washington STEM has produced a Computer Science Credential Opportunities by Region Index (CORI) dashboard. The Credential Opportunities by Region and Industry Index is a tool designed to inform users of in-demand occupations, the credentials typically needed to enter those occupations, and the institutions or apprenticeship programs offering those credentials in a given region.

WHAT IS NEXT:

- The 2023 Legislative Session begins on January 9, 2023. We will support partner priorities in Computer Science and continue to explore improvements with policy makers, business leaders, and community members.

2021-2022 INTERIM REPORT- JUNE 2022
OVERVIEW

In Washington, STEM skills and postsecondary education provide a pathway that leads to economic opportunity and family-sustaining-wage jobs in every region of our state. And yet, not all students have equitable access to these opportunities. Washington STEM's work primarily focuses on ensuring students of color, rural students, students experiencing poverty, and girls and young women have equitable access to the skills, education, and the transformational possibilities that STEM has to offer.

The purpose of this report is to share work done in 2021-2022 in partnership with Washington STEM and the Washington Technology Industry Association (WTIA) and to engage with funders to support the work moving forward.

Engagement of Stakeholders

Over the course of four months, we held a sequence of focused feedback conversations with internal and external partners including University of Washington, Code.org, Educational Service Districts (ESD), and Regional STEM Networks. We asked partners and stakeholders these five questions:

- What are barriers to achieving the goals outlined (funding/policy change/culture change/awareness etc)
- Are these strategies clear and easy to understand for implementation?
- Is this the right entity responsible to lead this work? Any partner entities you would add?
- Are these the right metrics for progress? What would you add? What would you remove?
- Who else should be talking to for feedback?

In partnership with the WTIA, we held an additional feedback conversation with industry partners from Amazon, Apple, Google, Microsoft, Meta, and Salesforce. These industry partners were key in refining the recommendations below.

What we found:

In tandem to this process, OSPI has prepared and released their final version of the K-12 focused Washington State Computer Science Education Strategic Plan. Washington STEM partnered with OSPI throughout this process, providing feedback and sharing what we continue to hear from partners. OSPI received and implemented some of the recommendations including reorganizing the plan itself but what has been released does not address or recommend

solutions to known barriers and is missing connections to postsecondary pathways and industries.

In the focused conversations held by Washington STEM, partners and stakeholders shared their experience with computer science in K-12, higher education, and industry spaces. Highlighted most in the conversations are barriers to expansion and implementation of Computer Science-Dedicated FTE for computer science; data that focuses on pathways and includes industry; funding for regional programs that can be scaled; investments in teacher preparation to combat a growing workforce shortage; and continued coordination and partnership with industry partners who can bring career activities to the classroom.

Below are more details of the recommendations for action at the policy and industry level that will impact Washington students.

1. **SUPPORT K-12 IMPLEMENTATION OF EQUITABLE ACCESS TO CS:** Fully funded statewide, cross-sector Computer Science leadership structure.
2. **ACCOUNTABILITY THROUGH DATA:** Mandate improved data visualizations and accountability metrics in statute
3. **TEACHER PREPARATION:** Expansion of teacher training programs (ex. UW)
4. **COORDINATION & PARTNERSHIP:** Provide input on Cross-sector Strategic Plan & support implementation; Organize and host convenings to connect educators, Computer Science advisory, stakeholders
5. **UNDERSTAND POSTSECONDARY PATHWAYS INTO CS:** Utilize data from Washington STEM's Computer Science Credential Opportunities by Region Index (CORI) dashboard to prioritize policies and funding for increasing access to computer science programs in each region of the state.

1. SUPPORT K-12 IMPLEMENTATION OF EQUITABLE ACCESS TO CS

Why: OSPI's role is generally to coordinate/guide statewide strategy for content areas and programs, in close partnership with the Washington Association of Educational Service Districts (AESD). While OSPI is a resource for districts and schools, it is the ESDs that provide regional support, guidance, professional development, and sometimes resources for teaching and learning. This is particularly true for smaller and rural districts. However, currently there is one (1) position at OSPI that coordinates all computer science implementation across the state and 295 school districts. A few ESDs have small amounts of FTE dedicated to computer science but there is not a systemic approach, meaning, the likelihood of reaching smaller, rural, and/or under-resourced districts is diminished. Washington STEM advocated in 2022 for regional

ESD-based leads in computer science. While the proviso was not introduced, the need for a statewide cross-sector computer science leadership structure remains.

What was proposed:
Computer science leads will help district implementation and strategic planning by:

- Ensuring the mandate to offer CS courses and to ensure equitable accessibility is delivered with fidelity by each school and district in the state.
- Increasing awareness of professional learning standards and expanding professional development opportunities for teachers, administrators, and district CS leaders;
- Supporting teachers integrating CS standards into their current practices;

Computer science leads will support diversity, equity, and inclusion efforts by:

- Helping districts identify curricula and resources that are culturally relevant, accessible, and inclusive;
- Utilizing inclusive instructional practices and applying for grants to expand equitable access to CS; and
- Supporting districts, OSPI, and the Office of Equity to measure and report local and statewide metrics.

Cross Sector Connection: A statewide computer science leadership structure will foster relationships and partnerships by connecting community members, trusted messengers, community-based organizations, nonprofit organizations, businesses, and industry with school districts to increase computer science access and inclusion initiatives. Structures could include ESD Computer Science leads at each of the nine Education Services Districts, sustainable for existing leadership groups like CS 4 All Washington, or other structures. Leadership will also liaise and support implementation and scale of current programing (eg: Career Connect Washington Sector Intermediary strategy and/or Computing For All programming.)

Policy Recommendation/Action: Build from the momentum of 2022 to ensure a proviso is introduced and passed in the 2023 legislative session to support a cross-sector statewide computer science leadership structure focused on building a coalition of support from industry, agency, community, and education; identifying the leader; cultivating a relationship with a sponsor and legislative champions; supporting the proviso through legislative process, tracking implementation.

2. ACCOUNTABILITY THROUGH DATA

Why: While the legislature has made moves to mandate availability of, equitable access to, and improved data collection and reporting about access to computer science across the state, Washington STEM and partners reviewed raw data released in 2021 that suggest that not all districts offer computer science courses and/or that even if courses are technically listed on

school or district course catalogs, students are unable to enroll in the courses and/or cannot access the courses equitably across demographics.

We had intended to access updated OSPI coursetaking and course availability data in June of 2022, however, due to internal capacity as well as interpretation of the reporting timeline, OSPI has estimated that updated data will be released in the first quarter of 2023. We plan to use that data to confirm whether and where courses are offered and taken and whether equitable access is available across the state. OSPI and WA STEM was also made aware that the information from schools, districts, and their partners that the data released in 2021 had inaccuracies due to data inputting errors, data coding errors, or other unknown factors; OSPI has since resolved as many of the errors as possible and has re-released the 2021 data. We hope that by utilizing the forthcoming 2022 data and releasing a transparent, local, relevant data dashboard that provides all of these measurement elements will allow OSPI and others to understand the extent to which schools and districts have been able to implement the legislative mandates and will realize the intent of the legislature's mandate for release of the data itself.

The following bills have been signed into law related to equitable availability of, engagement in, and data about K-12 computer science across the state:

SB5088 Awarding credits for Computer science (2019)

- Requires each school district that operates a high school to offer an opportunity to access an elective computer science course by the 2022-23 school year.
- Allows school districts to award academic credit for computer science to students based on student completion of a competency examination starting with the 2019-20 school year.

SHB1577 K-12 Computer Science Education Data (2019)

- Mandates school districts report the following data to OSPI *and* for OSPI to post a publicly-available data report about the following measures related to computer science courses and equitable access:
    - The total number of CS courses offered in each school (including advanced placement designation);
    - The number and percentage of students who enrolled in CS, disaggregated;
    - The number of computer science instructors at each school, disaggregated.

SB 5299 Use of CS Credits for the Purpose of Graduation Requirements (2021)

- Allows a student to substitute an approved CS course for a third-year math or science credit for high school graduation.

Even with these legislative investments, available data from OSPI via their 2021 report shows that in the 2019-2020 school year only 8.7% of students in grades 9-12 were enrolled in a computer science course (8.7% is based on Washington STEM's calculation using the most

recently updated enrollment data for grades 9-12 in the 2019-2020 school year). Further data collected from Code.org reported that in 2019, only 49% of public high schools in the state offered a computer science course. Washington STEM's analysis of OSPI-released data in their 2021 report reveals that up to 58.3% of school districts overall offered a computer science course, though availability by high school was not provided in that report, resulting in differences from Code.org's report. Washington STEM hopes to be able to examine updated data, to be released very soon by OSPI, to see if progress was made.

Teacher workforce data from OSPI's 2021 report reveals computers science teachers in grades 9-12 were more likely than teachers statewide to hold limited certificates-limited certificate status means a teacher taught under a certificate that was initiated by a school district on behalf of the educator because the educator was not (yet) eligible for full certification. OSPI currently only reports teaching workforce data by certification, gender, and highest degree.

Cross Sector Connection: Data is currently siloed from early learning (limited to no data available), K-12 (OSPI), Higher Education (each institution reports, or SBCTC), teacher workforce (PESB) and additional data that is collected in other agencies and nonprofits like Education Research and Data Center and Code.org. Labor market data reflects the industry need.

Policy Recommendation/Action: Legislate and fund a statewide, comprehensive Computer Science Data Dashboard. Dashboards should be housed on a publicly available website, easily accessible, and updated when new data sets are available. Ensure that timing of data due from schools and agencies allows for enough time to synthesize and release a report on the data roughly 3-6 months later. Data points could include:

- Student pathway data (course completion, dual credit completion, High School and Beyond Plan and Graduation pathways)
- K-12 and HS to college enrollment data/Post-college data (e.g., from Higher Ed. and/or community partners)
- postsecondary pathway participation data and subsequent admissions/enrollment data
- Seats available in postsecondary computer science
- Addition of basic elementary science data with a specific question around computational thinking in elementary science time (how many districts, how much time offered)
- Current dual credit articulations in computer science in Washington
- Data of the OSPI Computer Science Grants- grantees, regions, impact
- Teacher Educator Prep enrollment, completion and endorsement data
- Professional Development Enroller participation data
- Educator Data System state teacher certification data
- SCRIPT participation and implementation data
- District curriculum adoption data

3. EXPAND TEACHER PREPARATION

Why: Washington State is experiencing a statewide teacher shortage in specific content areas and endorsement areas, including STEM. Data currently available from the Professional Educator Standards Board (PESB) shows computer science has been included on the subject area lists facing the highest shortages since 2019.

There are promising programs that support teacher prep program innovation to increase the number of computer science teaching credentials. At the University of Washington, Dr. Amy J. Ko is working to create a new pre-service secondary computer science teacher education program, preparing grade 6-12 educators to teach computer science and data science in middle and high schools, either as standalone computer science courses or through integration in existing subject areas. It is built upon the existing highly regarded University of Washington College of Education Secondary Teacher Education Program (STEP), which has a successful history of recruiting gender, ethnicity, and race diverse teacher cohorts, placing them in underserved schools and districts, and preparing teachers for future leadership. Currently, the STEP program graduates about 70 teachers per year across all disciplines. Similar pre-service programs across 4-year institutions have shared struggles in recruitment due to tuition. [4]

Specific to computer science, between 2018-2020, there has been a 5% decline of computer science teachers in the state leading to approximately 300 teachers for 650 high schools who are to offer computer science courses. This is a deficit of 350 teachers in high school level computer science. [5]

There is also a growing consortium of pre-service providers in Washington, Oregon, Alaska, Idaho, and Hawaii to do regular information sharing, strategize on program structure, share data on demand and placement. At the Community and Technical College level, there is a consortium called AppConnect Northwest (AppConnect NW) composed of seven colleges working collaboratively to offer Bachelor of Science in Computer Science and BAS degree in Software and Application Development. A key function of the collaboration is sharing teaching resources and instructors across the colleges to fill demand and gaps of credentialed instructors.

Cross-Sector Connection: More credentialed K-12 computer science teachers are necessary to reach statewide goals for high school CS course availability, expansion of Computer Science Bachelor of Science/IT degrees at community and technical colleges and continued expansion of computer science related workforce.

Policy Recommendation/Action: System-level investments in supporting, retaining, and expanding the computer science and STEM teaching workforce.

[4] Direct email communication from Dr. Amy J. Ko, University of Washington
[5] Direct email communication from Dr. Amy J. Ko, University of Washington

- Legislate collection and dissemination of longitudinal data around the teaching workforce to align teacher preparation programs with workforce demand.

- Invest in teacher retention by providing more support for early-career teachers (first 5 years.)

- Invest in public/private partnerships provide scholarships and free tuition to future teachers at the community and technical college level and at the four-year institutions. Computer science and STEM teachers are KEY to our future workforce.

4. COORDINATION AND PARTNERSHIP

Why: In absence of a unified vision and strategic plan, implementation and investment in computer science has been inequitable, siloed, and missing critical partnership between community, educators, and industry.

Policy Recommendations/Actions:

- Support implementation of a statewide cross-sector leadership structure with ESD regional leads
    - Find volunteers for classrooms presentations in local schools
    - Connect with the CCL Coordinator to discuss apprenticeship and Career Launch opportunities
    - Connect with teachers for summer internships
    - Connect with CTE Advisory Boards
    - Connect with CS leads for Classroom needs

- Organize and host convenings to connect educators, CS advisory, stakeholders and industry
    - Provide venues to share resources & best practices
    - Support/ fund opportunities for educator travel & professional development
    - Strategize grassroots advocacy

Example of Partnership In Action: Regional STEM Networks

STEM Networks are deeply rooted in their communities and provide local expertise to ensure that local needs are met. Each area of our state is unique and STEM Networks know how to drive maximum impact in STEM for every student in their region. Learn and connect with Regional STEM Networks.

Case Study Example (one of many): Apple STEM Network (Wenatchee, WA)

In partnership with Microsoft Philanthropies and TEALS (Technology Education & Literacy in Schools), North Central Educational Services District, OSPI, Code.org and Career Connect

Washington, the Apple STEM Network leveraged just over $378,000 in the last year to expand access to computer science education in the region. Four school districts have strategic plans for K-12 computer science education (SCRIPT plans) that identify teaching capacity as a top priority for implementing equitable computer science education. In 2021, the regional network helped with outreach and recruitment, and NCESD and Code.org provided professional learning for just over 200 elementary educators and counting.

NCESD partnered with Microsoft TEALS to support CS implementation efforts in 18 regional school districts, and through regional network collaboration, students can now articulate their coursework to Big Bend Community College, Wenatchee Valley College, or Central Washington University to get ahead in certificate and degree programs. In the fall of 2021, Microsoft Techspark and the Apple STEM Network recruited Seattle-based nonprofit, Computing for All, to the region to support the development of a Data Center Technician prep pathway for Quincy High School Students in partnership with Big Bend Community College, and the Grant County Industrial Alliance. The region also hosted a Computer Science Education week.

The above is just one example of the work currently happening in regions. Support for these partnerships and together, we will:

- Achieves high-quality CS education in Washington
- Facilitates CS education equity for all students in Washington
- Identifies root causes of inequity in access to participation in, and success in CS for Black, Brown, and Indigenous students, rural and low-income students, and girls. Identifies solutions and operationalizes access to CS
- Includes specific and sequenced milestones and actions that create measurable outcomes (not recommendations).
- Identifies issues by region and by target population and provides strategic solutions
- Includes next steps and future implementation goals to keep CS education growing and developing beyond 2022-23 to be relevant and responsive to the evolving educational needs of students and the workforce needs in Washington
- Provides recommendations for statewide and agency-level policy change to further pathways to CS
- Provides regional supply data and technical assistance to drive an expansion of WA-originating CS workforce in the state
- Provides data and measurement for current career pathways or degree programs providing credentials for each CS and related occupations
- Has buy-in from a variety of stakeholders including students, families, educators, business, philanthropy, agencies, and community-based organization.
- Moves educators beyond their personal training to defined CS instructional practice
- Helps align authentic CS pathways for students
- Addresses the root problems surrounding the lack of CS education and pushes the limits of solutions

5. DATA DASHBOARD

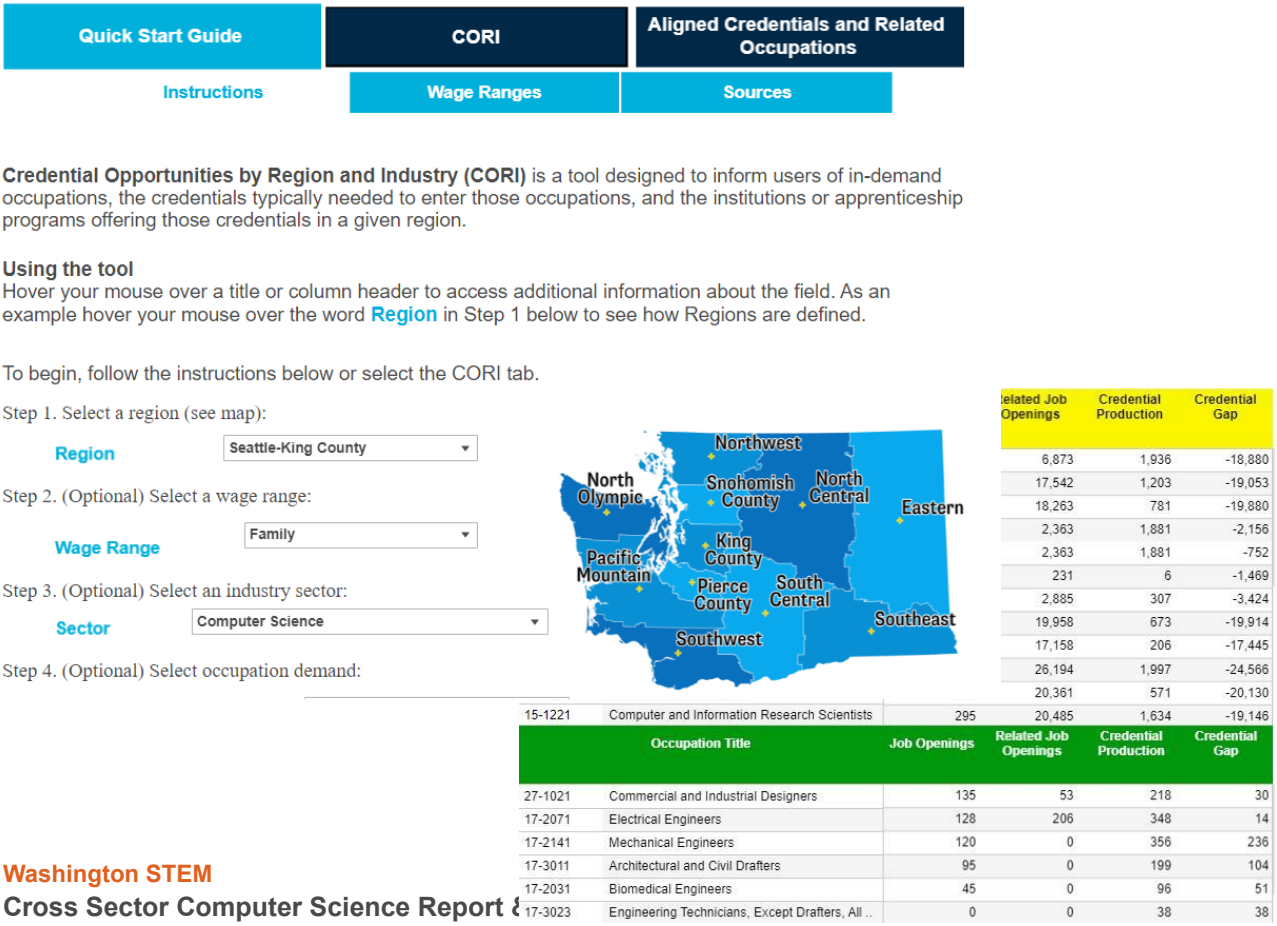
Washington STEM has produced a **Computer Science Credential Opportunities by Region Index (CORI) dashboard**. The Credential Opportunities by Region and Industry Index is a tool designed to inform users of in-demand occupations, the credentials typically needed to enter those occupations, and the institutions or apprenticeship programs offering those credentials in a given region. The tool reveals whether enough capacity exists in a given region and across the state to adequately prepare young adults to enter into particular occupations and industries. In this case, the tool displays this for computer science occupations in Washington.

This tool informs 2-year and 4-year colleges, apprenticeship providers, employers, and K-12 schools about what career pathways are available in their region. Users can compare the data to future job openings so that they can work with the community to add or scale programs.

Computer science occupations were selected from the Standard Occupation Classification Code system using the Washington State Definition of Computer Science as guidance.The list of careers in computer science from ComputerScience.org was also used to identify relevant occupations.

CORI COMPUTER SCIENCE DATA DASHBOARD

Access the Data Dashboard: https://washingtonstem.org/cori/



NEXT STEPS:

There is more work to be done in partnership with industry, K-12, higher education, state agencies, and students and families. OSPI has just released their final version of the OSPI Computer Science Strategic Plan and we anticipate a release of a raw data summary report in a matter of days.

Washington STEM and WTIA are turning focus to:

- The emergent legislative proposals to further support and codify computer science expansion, including:
    - Fidelity of computer science offerings and equitable access and uptake among students, district-by-district across the state;
    - Availability of computer science postsecondary programming at the regional level and overall capacity across the state;
    - Dual credit course offerings (computer science among them) as related to funding formulas between high schools and local community and technical colleges;
    - Equitable access to computer science majors and programs within higher education institutions for Washington state resident students/K-12 originators in comparison to non-resident students;
    - Availability of teacher education and certification programs for computer science endorsement as well as subsidized funding for prospective teachers and inservice teachers that represent underserved student demographics;
    - Incentives and data tracking on the part of individual districts related to the district and school strategic plans and continuous improvement plans.
    - Mandating data reporting on the number and demographics of students who have completed and been awarded credit for taking a competency examination for computer science proficiency.
        - This would include the data on which districts have developed a competency examination policy for the awarding of credits.
    - Availability of and access to student/youth/early career computer science internships via mechanisms like Career Connect Washington initiative's career launch and career prep endorsed and registered programs, including:
        - Pre-apprenticeships
        - Approved State Registered Apprenticeships
        - Career & Technical Education coursework pathways
        - Career prep internships offered in each region of the state
        - Career Launch Endorsed programs that lead to industry recognized credentials, 2-year degrees, 4-year degrees, and other higher education outcomes.

- Access to OSPI-held data:
    - availability of courses school-by-school, including listing of courses, offering of courses, and availability of contiguous CS course pathways;
    - access and engagement in those courses by students from key populations that have been systematically underserved, and
    - certification, training, and demographics of teachers who could or do teach computer science to determine equitable access to adults who reflect student demographics of the school or district.
- Creation of data dashboards related to the above data from OSPI as well as:
    - Longitudinal data that follows Washington's K-12 students, including those to take computer science courses in their time in K-12, through higher education (inside and outside of the state), and into the workforce to understand patterns of access by demographic and geography to computer science programming and higher ed programming as well as eventual access to high-demand computer science jobs, especially related to race, income, originating geography/school district, and other factors and student characteristics.
- Seeking funding support to partner and scale programs across the state that are addressing all of the above issues, including actions like supporting teacher workforce, expansion of computer science degrees, access to computer science career pathways, and expansion of access to internships.al skills with curriculum to prepare students for postsecondary and professional technical careers. Courses are taught at the high schools but they are a cooperative effort between K12 schools, community and technical colleges, and the community. Application of the credits students earn is varied and reliant on system level articulations between K-12 and higher education. With recent expansions of computer science in the community and technical college system, there is a greater opportunity to earn CTE dual credit in computer science. Read more about this emerging work.

Cross-Sector Computer Science Strategic Plan

Washington STEM set out to create, iterate, and operationalize a cross-sector statewide Computer Science Strategic Plan that will help provide access to computer science for all Washington students. Using the OSPI Statewide Computer Science Strategic Plan draft, our intent is to create a cross-sector version with policy, implementation, and educator development goals, as well as a timeline and lead entities to achieve set goals. We had hoped to complement the plan with comprehensive data dashboards that accurately reflect the computer science landscape in our state including course availability, completion, and educator data. During this time, OSPI was finalizing a legislatively mandated Statewide Computer Science Strategic Plan and data dashboard. Washington STEM and many mutual stakeholders were involved in the

initial discussions and iterations of the OSPI plan but the plan remained focused on the K-12 space and was missing a connection to early learning, career pathways, and industry.

We held focus group discussions with stakeholders that revealed an earnest interest in computer science expansion and connections to careers but surfaced policy and data barriers to truly implement what OSPI was proposing in their plan. We shared feedback throughout the process to OSPI leading to a redesign and reorganizing of OSPI's plan. This plan includes funding recommendations to support sections of the plan. Washington STEM does not have a formal position on the funding recommendations but supports the agency efforts to fully implement. OSPI's final version is here: OSPI Statewide Computer Science Strategic Plan.

Washington STEM's proposed Cross-Sector Statewide Computer Science Strategic plan below reflects the feedback from partners across sectors. There are four main sections to the plan: Outreach, Diversity, Equity, and Inclusion, Curriculum and Courses,and Teacher Pathways. Within each section, we propose strategies to reach the goal, suggested partners and leads, and recommendations to address known barriers. The recommendations are the current best thinking Washington STEM has but we invite feedback. Washington STEM does not have sole ownership of these recommendations. Each section includes a status column that we hope to use in the future to measure progress to achieving the goals of the plan.

We look forward to future iterations of this work in partnership.

OUTREACH

Vision: WA State seeks to provide open communication channels for students, educators, administrators, community members, and industry leaders from diverse backgrounds and identities to learn more about CS, ask questions and provide feedback using a variety of channels.

Goal: Computer Science PR campaign: Develop communication materials that present general messaging across multiple channels and multiple audiences. Review messaging plans with the Computer Science Advisory Committee.

Strategies	Suggested Leads/Partners	Recommendations	Status
Collaborate with trusted messengers in communities, community-based organizations (CBOs), nonprofit organizations, and industry to make clear, consistent, and timely messaging about CS opportunities available and to decentralize OSPI's communications role, including but not limited to: - Use AESD network to create clear, consistent, and timely messaging about CS opportunities. - Connect with tribal partners for outreach in their communities. - Use the Digital Navigator platform	Suggested Lead(s): OSPI, CBOs and Community Partners Suggested Partners: AESD, Districts, Industry Leaders	DEI: Educators actively seek out vetted resources and regular opportunities to learn about the current and historical cultures of their students (Kapor Framework Core Component 3.3) Educators incorporate student voices and perspectives throughout the curriculum and classroom experience, engaging them as cultural experts (Kapor Framework Core Component 4.1) Policy: Form a Computer Science consortium in statute, including implementation of ESD based Computer Science Leads. Data: Partnerships will include cross-sector representation and represent regional demographics. Partnership: Internally shared list	

to explore community connections. - Provide a script for each of the legislators (legislators have a communications budget and could put together a video about updates/successes in CS education). - Connect with the military for outreach in their communities. - Ask local school boards and PTSAs to tailor information to the needs of their communities.		of partnerships (existing and possible) Externally shared list of CS opportunities available through current partnerships (e.g., summer programs, HS internships, alignment with CCW Computer Science statewide sector strategy)	

Goal: Maintain and increase current partnerships and continue to explore possible partnerships with local, national, and international CS/STEM organizations.

Strategies	Suggested Leads/Partners	Recommendations	Status
Collaborate with trusted messengers in communities, community-based organizations (CBOs), nonprofit organizations, and industry to make clear, consistent, and timely messaging about CS opportunities available and to decentralize OSPI's	Suggested Lead(s): Community Partners, OSPI Suggested Partners: AESD, Code.org CS4All, Industry Partners, Higher	DEI: Educators actively seek out vetted resources and regular opportunities to learn about the current and historical cultures of their students (Kapor Framework Core Component 3.3) Educators incorporate student voices and perspectives throughout	

communications role, including but not limited to: - Use AESD network to create clear, consistent, and timely messaging about CS opportunities. - Connect with tribal partners for outreach in their communities. - Use the Digital Navigator platform to explore community connections. - Provide a script for each of the legislators (legislators have a communications budget and could put together a video about updates/successes in CS education). - Connect with the military for outreach in their communities. - Ask local school boards and PTSAs to tailor information to the needs of their communities.	Education Partners	the curriculum and classroom experience, engaging them as cultural experts (Kapor Framework Core Component 4.1) Policy: Form a Computer Science consortium in statute, including implementation of ESD based Computer Science Leads. Data: Partnerships will include cross-sector representation and represent regional demographics. Partnership: Internally shared list of partnerships (existing and possible) Externally shared list of CS opportunities available through current partnerships (e.g., summer programs, HS internships)	

Goal: Create a CS dashboard to provide access to planning tools and resources for district leadership to engage with and use.

Strategies	Suggested Leads/Partners	Recommendations	Status
Create an OSPI managed WA State CS data dashboard that is open to all and will allow users to examine and analyze current data in order to evaluate CS at all levels in WA State. Create guidelines and methods for how data will be collected. Partner with CS implementation leads and CBOs on data collection and production	Suggested Lead(s): OSPI & WA STEM Suggested Partners: STEM, Networks, Implementation Leads, ERDC, PESB	DEI: Partners are paid for their time and represent the regional demographics. Policy: Comprehensive Data Dashboard Data: Data Dashboard will include course availability by school, district and course type; students enrolled in CS courses by region, school, district, and by demographic; teachers who teach courses by demographic, region, school district. Demographics will include data disaggregated by: gender; race and ethnicity; special education status; English learner status; eligibility for the free and reduced-price lunch program; grade level. Partnership: OSPI will partner with CS Implementation leads, CBOs, and districts on data collection and dissemination, and user statistics.	

Goal: Conduct focus groups to solicit annual feedback on the implementation of the state plan.

Strategies	Suggested Leads/Partners	Recommendations	Status

Engage and partner with leadership organizations (listed below) to support and fund focus groups.	Key leadership organizations, including but not limited to: WA STEM, PESB, ESDs, AESD, CSforAll Fellows, higher ed/TEPs, school districts, as well as principal and teacher unions and parent/caregiver organizations (e.g., WSPTA), families, and students	DEI: Educators actively seek out vetted resources and regular opportunities to learn about the current and historical cultures of their students (Kapor Framework Core Component 3.3) Educators incorporate student voices and perspectives throughout the curriculum and classroom experience, engaging them as cultural experts (Kapor Framework Core Component 4.1) Policy: Funding for focus groups, report to legislature Data: Number of participants, demographics, and regions. Frequency of focus groups Partnerships: Expansion of partnerships to include CBOs, industry partners, and students.	

Goal: Host events for community partners to connect with each other to support possible collaborations.

Strategies	Suggested Leads/Partners	Recommendations	Status
Provide funding support for events. Collaborate with trusted messengers in communities, community-based organizations (CBOs),	Suggested Lead (s): OSPI, STEM Networks Suggested Partners: Code.org, CBOs, community partners,	DEI: Develop opportunities for community participation that are visible to everyone. Increase opportunities for potential partners (including nonprofits, NGOs, corporations, etc.). Promote district-level support and	

nonprofit organizations, and industry to make clear, consistent, and timely messaging about CS opportunities available.	industry partners, districts, parent groups	implementation efforts Policy: Provide a dedicated funding pool from the agency to support events. Data: Number of events per region, report of event outcomes (e.g., partner collaborations), Number of attendees, demographics and regions. Partnerships: Increased connections to pathways for students and families through districts and industry partnerships.	

DIVERSITY, EQUITY, AND INCLUSION

Vision: Increase equity in access to CS opportunities for students and teachers in underserved groups ; Connect students to communities that represent their unique identities and circumstances, providing experiences that are culturally and socially relevant, responsive, and sustaining; Address the unique circumstances, challenges, and opportunities, across the different geographic regions across the state (especially rural and small schools).

Goal: Increase CS course enrollment for students from underserved groups; Integrate CS into K-5 and K-8 courses; 100% of students in Washington engaged with CS curriculum.

Strategies	Suggested Leads/Partners	Recommendations	Status
Mandate CS as a graduation requirement or count towards a graduation requirement for all students in Washington. Support current teacher programs to integrate CS into pre-service teacher education. Support districts to integrate CS into K-5/K-8 learning. .	Suggested Lead(s): OSPI, SBE, WA STEM Suggested Partners: Industry partners, ESDs, Districts, PESB, Curriculum Providers, Higher Ed	DEI: Pre/Post CS course enrollment data shows an increase in the number of students from underrepresented groups. CS achievement data shows continuous improvement for the number of students from underrepresented and underserved groups through the CEDARS system. Policy: Advocate for Computer Science to be a graduation requirement as a part of the core science courses and graduation pathways. Data: Collect and disseminate data around student course taking including data for Number of students and demographics who take CS courses; Number students and demographics who take CS courses /saturation/sequence; Number of courses with CS integration	

		Partnerships: Partnerships between state agencies, and collectors of the data, with community input.	

Goal: Ensure that the racial, cultural, and ethnic identities of CS teachers reflect the identities of students in their communities.

Strategies	Suggested Leads/Partners	Recommendations	Status
Further references in recruitment and retention in Teacher Pathways. Support programs for recruitment of teachers of color (ex: UW Centers of Excellence, PSESD's Grow Your Own) Support increasing numbers of CS endorsed staff in all districts. Provide support to districts/schools in rural areas with a limited CS teacher pool to expand the CS teaching skills of their in-service teachers	Suggested Lead(s): PESB, OSPI, Higher Education Partners Suggested Partners: STEM Networks, ESDs and Implementation leads, Districts, Industry partners, Community Partners, Diversity Engagement Partners, CSTA	DEI: Data shows that the racial, cultural, and ethnic identities of CS teachers reflect the students in their communities Policy: ESD Implementation leads, propose a public/private partnership to support teacher tuition, scholarships. Data: Number of teachers of color with CS endorsements by region and demographic. Number of teaching positions available in CS by region. Number of available CS teacher prep programs per region, and who is completing programs Partnerships: Partnerships between districts, higher ed, industry, and community to showcase pathways to teacher workforce.	

Goal: Develop and implement comprehensive training for teachers to use DEI as a lens for continuous improvement); Provide equitable and inclusive access for teachers to resources and CS professional development.

Strategies	Suggested Leads/Partners	Recommendations	Status
Provide professional learning opportunities for educators based on the Kapor Center's (2021) framework for Culturally Responsive-Sustaining CS Education (Kapor Center, 2021; see also Recommendations in Teacher Pathways section). Develop training modules for teachers to use equity/diversity as a lens for continuous improvement. Offer training and guidance for educators, including counselors/graduation specialists, to help students navigate secondary to postsecondary CS pathways.	Suggested Lead (s): OSPI, ESDs, PESB Suggested partners: Curriculum Providers, Districts/ Schools, STEM Networks, OSPI, ESDs, (WINforCS network)	DEI: Develop training modules with community using the Kapoor Framework for teachers to use equity/diversity as a lens for continuous improvement Policy: ESD Implementation leads funded to help districts identify curricula and resources that are culturally relevant, accessible, and inclusive; Utilizing inclusive instructional practices and applying for grants to expand equitable access to CS; and Supporting districts, the OSPI, and the Office of Equity to measure and report local and statewide metrics Data: Number of teachers and demographics who complete trainings Partnerships: Industry partners with training developers to provide examples of current and future CS pathways.	

Goal: Provide guidance about currently available accessible CS teaching materials.

Strategies	Suggested Leads/Partners	Recommendations	Status

Develop training modules for specific strategies to locate and/or create accessible CS learning materials. Use a data-informed decision-making process when choosing and/or creating resources. Directly coordinate device and internet access gap efforts with CS education efforts to ensure that device efforts are compatible with CS pedagogy	Suggested Lead: OSPI, STEM Networks, PESB, ESDs Suggested Partners: Higher Education, Curriculum Providers, Districts/ Schools, teacher associations	DEI: Develop training modules with community using the Kapoor Framework for teachers to use equity/diversity as a lens for continuous improvement Policy: Comprehensive statewide data dashboard. Data: Collect, disseminate and use data including region of who is accessing materials. Partnerships: Develop opportunities for funding that are visible to everyone. Increase opportunities for corporate involvement and potential funding partners. Promote district-level funding support and implementation efforts.	

CURRICULUM & COURSES

Vision: Standards allow curriculum to be created and selected based on a coherent vision of CS education that sets learning goals for all students, from kindergarten through high school graduation. To provide guidance in curriculum and courses, WA State adopted the CSTA Standards in 2016 (revised 2018).

Goal: OSPI will maintain and update the CS Standards to reflect current changes in the industry (e.g., AI, cybersecurity, robotics, virtual reality), as well as to address issues of social justice, which increases the range of CS curriculum topics.

Strategies	Suggested Leads/Partners	Recommendations	Status
Provide guidance for implementing CS standards at all grade levels though CS data dashboard, professional learning, full time implementation lead. Regularly review and revise CS Standards to include elements of the new knowledge bases (e.g., cybersecurity, artificial intelligence (AI), cloud computing, etc.), based on information gleaned from industry experts	Suggested Lead(s): CS Advisory Board with industry and content experts. Led by CS Leads and OSPI. Suggested Partners: ESDs, Districts, Curriculum Providers, Higher Ed	DEI: Educators demonstrate awareness of white supremacy and racism in education, computing, and CS classrooms as well as commit to ongoing learning to understand systemic racism as a part of their commitment to anti-racist and traumainformed pedagogy (Kapor Framework Core Component 1.2). Policy: Standards are reviewed every 3-4 years. Data: Who is accessing and implementing standards. Partnerships: Align with industry recommendations through CCW CS sector strategy	

Goal: OSPI will perform regular review of CS Standards to integrate new knowledge bases, including relevant education research.

Strategies	Suggested Leads/Partners	Recommendations	Status
Support integration of CS with all subject areas, including literacy, along with standalone CS teaching.	Suggested Lead(s): CS Advisory, CS Leads and OSPI Suggested Partners: ESDs, Districts, Curriculum Providers, Higher Ed	DEI: Educators utilize pedagogy and curriculum which equips students to critically examine technology and interrogate its role in society as well as its ethical, political, and societal implications (Kapor Framework Core Component 3.4 Policy: Computer Science is a graduation requirement; support for basic elementary science education integration. Data: Standards are reviewed every 3-4 years. Partnerships: Districts and local school boards are key partners, working with OSPI and CS leads/advisory to ensure equitable implementation.	

Goal: All districts in Washington integrate CS with all subject areas, including literacy, along with standalone CS teaching; All districts in Washington develop and implement multiple K-12 pathways, including HS to postsecondary pathways and CS in elementary.

Strategies	Suggested Leads/Partners	Recommendations	Status
Districts and teachers attend	Suggested Lead (s): CS	DEI: Educators honor and affirm	

and participate in training of integration of CS standards in elementary Districts and teachers attend and participate in training of integration of CS standards in secondary. Provide elementary school administrators and teachers with a CT Integration Framework Help make preliminary determinations about their and their school's readiness to integrate an instructional focus on CT across the elementary school curriculum Help to develop an implementation plan based on the results of their readiness assessment	Leads, curricula providers and PD providers. Suggested Partners: OSPI, ESDs, Districts, Curriculum Providers, Higher Ed	students' intersecting identities within the curriculum, instructional practices, and classroom culture and support students' navigation of CS and society at large (Kapor Framework Core Component 2.3) Policy: Awareness and scaling of state approved Computer Science equivalencies.Computer Science as a graduation requirement. Data: Number of districts who currently have integrated CS standards in elementary and secondary district wide CS plan. Number of districts who currently have developed and implemented multiple K-12 pathways in CS. Include access and participation data for students Partnerships:Educators actively build relationships with members of the local and national tech community who can lend their knowledge and expertise to the classroom experience (Kapor Framework Core Component 6.2)	

Goal: High-quality CS curricula adopted by all districts/schools.

Strategies	Suggested Leads/Partners	Recommendations	Status

Provide curricular resources for districts Provide support and guidance to districts about available high-quality CS curriculum opportunities (including, but not limited to cybersecurity, artificial intelligence (AI), and cloud computing). Provide elementary school administrators and teachers with a CT Integration Framework Help make preliminary determinations about their and their school's readiness to integrate an instructional focus on CT across the elementary school curriculum Help them to develop an implementation plan based on the results of their readiness assessment	Suggested Lead(s): CS Advisory Committee (defining HQ), CS Leads and OSPI Suggested Partners: OSPI, ESDs, Districts, STEM Networks, Curriculum Providers, Higher Ed	DEI: Educators honor and affirm students' intersecting identities within the curriculum, instructional practices, and classroom culture and support students' navigation of CS and society at large (Kapor Framework Core Component 2.3) Educators expose students to a range of computing and technology-related careers, programs, and opportunities that are aligned to student interests (Kapor Framework Core Component 6.1) Policy: Funding to support partnerships between districts and industry for Computational Thinking integration. Data: Number of districts with current District curriculum adoption. Number of districts in progress and number of districts that have not started. Partnerships: Educators leverage a variety of tech tools to introduce students to industry professionals and career pathways within their classroom, especially when in-person opportunities are a challenge (Kapor Framework Core Component 6.4	

Goal: Schools implement guidance and opportunities for multiple postsecondary pathways. (4 or 2 year, career)

Strategies	Suggested Leads/Partners	Recommendations	Status
Provide examples of K-12 pathways during training. Provide guidance to Districts for implementation of standards-based CS courses. Forge and sustain connections between school levels (elementary, middle, high school, postsecondary, industry, government, and nonprofits)	Suggested Lead(s): CS Leads, Districts, Higher Ed, OSPI Suggested Partners: ESDs, Districts, STEM Networks, SBE, Curriculum Providers, Higher Ed, Career Launch programs/Intermediaries	DEI: Educators honor and affirm students' intersecting identities within the curriculum, instructional practices, and classroom culture and support students' navigation of CS and society at large (Kapor Framework Core Component 2.3) Policy: Support for counselors and career navigators. Expansion of HSBP and the computer science pathway. Statewide dual credit articulations. Data: Student demographic for current graduation pathways (SBE); Partnerships: Forge and sustain connections between school levels (elementary, middle, high school, postsecondary, industry, government, and nonprofits)	

Goal: By 2024, CS credits will count as part of the STEM requirement for graduation.

Strategies	Suggested Leads/Partners	Recommendations	Status
Provide examples of K-12 pathways during training. Provide guidance to Districts for implementation of	Suggested Lead(s): CS Leads, Industry, higher education, OSPI, and SBE	DEI: Educators honor and affirm students' intersecting identities within the curriculum, instructional practices, and classroom culture and support students' navigation of CS and society at large (Kapor	

standards-based CS courses. Expand support to districts to implement AP and early college experience credit courses in CS in HS in partnership with community and state institutes of higher education. Collaborate with Higher Education to allow CS to satisfy an admissions requirement	Suggested Partners: OSPI, ESDs, Districts, STEM Networks, Curriculum Providers, Higher Ed	Framework Core Component 2.3) Educators expose students to a range of computing and technology-related careers, programs, and opportunities that are aligned to student interests (Kapor Framework Core Component 6.1) Policy: Statewide dual credit articulations Data: Amount of students are participating in requirement, completion rates, postsecondary achievement and demographic data. District curriculum adoption data Partnerships: Forge and sustain connections between school levels (elementary, middle, high school, postsecondary, industry, government, and nonprofits)	

TEACHER PATHWAYS

Vision: The purpose of providing CS professional learning for teachers of other subjects is to leverage the existing pool of teachers and provide both a short-term approach for increasing the number of CS opportunities in schools and a long-term approach for cross-curricular integration of CS literacy.

Goal: Recruit, train, and retain a diverse and highly qualified pool of K-12 CS teachers..

Professional Learning

Strategies	Suggested Leads/Partners	Recommendations	Status
Support K-12 teacher preparation programs to prepare teachers for endorsement in both primary and secondary CS Gather data from school districts about their CS needs and share this data with TEPs to help guide their programs to match what districts needed, especially rural districts.	Suggested Lead(s): ESDs Suggested Partners: OSPI, Districts, STEM Networks, Curriculum Providers, Higher Ed, Community Partners	DEI: Educators actively and intentionally confront and dispel stereotypes and biases about the abilities and skills of students from groups marginalized in CS (Kapor Framework Core Component 2.1). Policy: Invest in public/private partnerships provide scholarships and free tuition to future teachers at the community and technical college level and at the four-year institutions Data: Data from school district leads resulting in X teachers participating in high quality professional learning in CS/Early Elementary. Current PD Enroller Data. Partnerships: Industry partnerships with externships as a part of PD	

Goal: Support equitable and inclusive continued professional development opportunities for CS teachers that incorporate culturally relevant CS. Expand the capacity of regions within the state to plan and offer professional learning aligned with state CS goals

Strategies	Suggested Leads/Partners	Recommendations	Status
Support equitable and inclusive continued professional development opportunities for CS teachers that incorporate culturally relevant CS. Provide training for teachers on curricula and content for integrating CS literacy and CS into other K-12 subject areas. Create regional teams of CS teachers to build a supportive community. a. Include CSTA regional chapters b. Ensure that high-quality professional development strategies are leveraged for new CS teachers c. Provide incentives for districts that create alternative pathways for teacher certification (e.g., "Grow Your Own" initiatives, etc.) and who retain teachers with non-CTE endorsements or with specialty endorsements.	Suggested Lead(s): ESDs Suggested Partners: OSPI, CS for All, Washington (ECEP), STEM Networks, Washington MESA, Washington STEM, Microsoft, Code.org, higher ed/TEP	DEI: Educators ensure curriculum is high-quality, rigorous, challenging, and aligned to state and national standards (Kapor Framework Core Component 3.1 Policy: Invest in public/private partnerships provide scholarships and free tuition to future teachers at the community and technical college level and at the four-year institutions/ scale current programs Data: PD Enroller participation data, integration of CS into teacher prep programs, teacher prep program metric. Partnerships: Regional teams, partnership with industry, higher ed and K-12	

Goal: Recruit diverse teacher candidates to join CS programs. Support recruitment and retention of CS teachers.

Strategies	Suggested Leads/Partners	Recommendations	Status
Provide guidance for pre service TEPs to offer both elementary and secondary certifications in CS. Develop and implement an incentive program designed to recruit teachers from currently underrepresented groups and from industry or education to get/add the CS endorsement. Provide incentives for teachers (from industry or education) to get the CS endorsement and for districts to hire CS endorsed teachers (like CTE incentive). Provide incentives for pre-service CS teacher education faculty in pre-service TEPs. Support K-12 teacher preparation programs to prepare teachers for endorsement in both primary and secondary CS	Suggested Leads: ESDs, Higher Education including CTCs, PESB Suggested Partners: OSPI, WEA, CSTA, CS for All, Washington (ECEP)	DEI: Educators demonstrate awareness of white supremacy and racism in education, computing, and CS classrooms as well as commit to ongoing learning to understand systemic racism as a part of their commitment to anti-racist and traumainformed pedagogy (Kapor Framework Core Component 1.2) Policy: TEPs develop and implement a strategic plan for CS endorsement. TEP enrollment and endorsement data. Funding to support from Legislature. Data: Data collection shows number of teachers receive CS certification in elementary grades, number of teachers receive CS certification for secondary grades Partnerships: Industry can fund these efforts and incentives. Educators actively build relationships with members of the local and national tech community who can lend their knowledge and expertise to the classroom experience (Kapor Framework Core Component 6.2)	

Report prepared by:

Jayme Shoun
Policy Director, Washington STEM
jayme@washingtonstem.org

Jenée Myers Twitchell, Ph.D
Chief Impact Officer, Washington STEM
jenee@washingtonstem.org

Tana Peterman
Senior Program Officer, K-12, Washington STEM
tana@washingtonstem.org

Data Team:

Mikel Poppe
Impact Manager, Washington STEM
mikel@washingtonstem.org

Min Hwangbo, Ph.D
Impact Direct, Washington STEM
min@washingtonstem.org

Our special thanks to Bish Paul, Ph.D.