Leading the Advancement of Equitable and Sustainable Computer Science Education

OSPI/AESD Evaluation Brief, 2019–20

AESD ASSOCIATION OF EDUCATIONAL SERVICE DISTRICTS

Nine ESDs. One Network.
Supporting Washington's Schools and Communities.

Kauffman & Associates INCORPORATED

Introduction

Washington State's CS Initiative – The Beginning (2017-2019)

Prior to 2017, the Educational Service Districts (ESDs) offered limited teacher professional development in computer science (CS). Each ESD's capacity to manage a CS professional development varied widely based on resources (e.g., staff and funds) for training and networking. For example only ESD 101 and ESD 121 were regional partners with Code.org and offered robust CS courses for K-12 educators. However, in 2017, key leadership in the ESDs decided to join together through the Association of Educational Service Districts (AESD) to provide coordinated, statewide CS training.

The Office of Superintendent of Public Instruction (OSPI) launched and coordinated CS efforts statewide and provided funding to AESD to improve access to teacher CS training. Initially, AESD formed two consortia, AESD-East and AESD-West, which coordinated training schedules, outreach efforts, resources, partners, and evaluation efforts. Each ESD had a CS Lead that praised the coordinated effort. "This was the best collaborative effort that I'd seen between multiple ESDs," shared a CS Lead. "All of a sudden, we had access and communication with contact people in each ESD who are all working toward the same goal."

The **first year (2017-18)** provided a proof of concept, during which AESD successfully led the statewide effort to advance equitable and sustainable CS education. An evaluation of the initial year brought strong evidence that AESD-East and AESD-West had effectively and efficiently built the internal infrastructure needed to accomplish their goals and objectives. Together, the network of nine ESDs:

- led districts' CS education efforts across the state
- increased the number of Washington CS Leadership Network members statewide
- increased the number of CS opportunities offered
- increased the number of underserved and underrepresented populations supported by CS education
- provided support for CS stakeholders statewide and
- increased the visibility and dissemination of CS education efforts

In **Year 2 (2018-2019)**, the east and west consortia of ESDs merged and continued to provide equitable opportunities to engage teachers in CS training and networking. Developed collaboratively, the strategic plan provided cohesion across the state and positioned each ESD to use their partners in ways that best fit their region's unique requirements. The CS Leads made a big push to create local CS communities with district administrators and teachers and connect them as a statewide CS leadership team. This approach allowed OSPI and AESD to quickly communicate and share what was happening in each region.

The ESDs increased teachers' capacity to alleviate inequity and begin providing all students with access to CS education, even in the most remote districts. Teachers applied what they learned

through their involvement in the CS professional development to create more constructivist and innovative classrooms, rather than mainly using computers for skill remediation and mastery. "I think, in the beginning, it was about introducing computer science. And so, the very first few years of the grant really was about opening up people's minds about what they could do with computer science," shared an interviewee.

Reflecting back to before AESD's CS efforts, an OSPI stakeholder shared, "I don't think that the computer science work could have moved ahead without the ESDs … they're really the connecting piece to all parts of the state … the ESDs have a pulse on their communities and industries and know what their needs are."

Key Partners

OSPI and AESD work closely with partners to augment initiatives across the state that assist and accelerate the work. Key partners that help provide CS training throughout the state are:

- Code.org
- For Inspiration and Recognition of Science and Technology (FIRST) Robotics and
- Technology Education and Literacy in Schools (TEALS)

Code.org has been an important partner in this work. This nonprofit organization has been dedicated to expanding access to CS in schools and increasing the participation of girls and underrepresented minorities. Code.org's vision is that every student in every school should have the opportunity to learn CS, just like they have the opportunity to learn biology, chemistry, or algebra. Some ESDs have a certified Code.org trainer who offers three levels of courses for educators called Fundamentals, Discoveries, and Principles.

- **Fundamentals –** In Fundamentals, students create computer programs that will help them learn to collaborate with others, develop problem-solving skills, and persist through difficult tasks. Code.org offers pre-readers and readers (ages 4 through 8) an introduction to CS and older elementary students (ages 6 through 13) an opportunity to learn CS basics and create their own art, stories, and games.
- **Discoveries –** Discoveries is for students in Grades 6 through 10. It takes a wide lens on CS by covering topics such as programming, physical computing, HTML/CSS, and data. Students engage with CS as a medium for creativity, communication, problem solving, and fun. The course inspires students as they build their own websites, apps, games, and physical computing devices.
- **Principles –** Principles is designed for students in Grades 9 through 12. It introduces students to foundational CS concepts and challenges them to explore how computing and technology can impact the world. The curriculum is flexible enough to be taught as a normal course or as an advanced placement course.

The New Hampshire-based philanthropic organization, FIRST, also received a large grant from OSPI to provide training for CS programs. FIRST STEM Robotics 101 training was provided to

teachers across the state by a CS expert with two decades of experience as a computer chip designer and engineering manager at Intel and Microelectronics. So far, this trainer, together with FIRST Washington, has provided training for over 800 teachers in Washington state.

Microsoft Philanthropies is a key partner at the high-school level. They generously support Technology in Education and Literacy in Schools (TEALS), which helps teachers bring real-life applications into the classroom through video with technology professionals.

Further, OSPI and AESD have forged strong partnerships with national organizations, including Governors for Computer Science, CSforALL, the CS Teachers Association (CSTA), Expanding Computing Education Pathways, the Advancement via Individual Determination, and the Northwest Council for Computer Education. These venues offer ways for OSPI and the ESDs to collaborate with educators between K-12 and postsecondary institutions for alignment and cohesion. Each partner brings expertise, resources, and professional learning opportunities to move districts toward equitable access to CS for every student.

Leading Regional CS Efforts as a Collective (2019-20)

In **Year 3 (2019-20)**, OSPI and AESD operated as a mature collective. Each AESD CS Lead and members of the OSPI CS team has developed deep expertise in several areas, which they share as needed. Some CS Leads work directly with teachers to provide training on coding and computational thinking, while others work directly with administrators to support strategic plan development. The result is a highly functioning, statewide, collaborative network that can achieve significant outcomes with cost savings and in less time than if each organization acted on its own.

The CS Leads are working to expand the reach of CS to all students using varied approaches based on urban, suburban and rural schools' needs within their region. They garner school administrator support around the strategic implementation of CS plan, attend school district leader convenings and lead teacher professional development workshops. CS Leads attend state AESD CS Lead meetings and monthly regional meetings, and serve in CS activities and programs for the districts within their region.

Each CS Lead seeks innovative ways to fold efforts into region-specific opportunities, such as by working with local businesses (e.g., agriculture, technology) and postsecondary institutions. Other grant funds support these innovations, such as robotic competitions and delivering CS-related professional development to postsecondary education majors. For example, one AESD CS Lead works with pre-service teachers at a local university to start teacher professional development early. By blending two pre-service classes, Elementary Teaching Methods and Educational Technology Integration, these pre-service teachers learn how to naturally integrate computational thinking into K-8 classroom activities to build foundational skills. A CS Lead shared, *"Infusing it into the curriculum that all students take is one of the best ways to ensure that everyone has access."* She shared that conversations about equity, computational thinking, and classroom routines led to "*significant a-ha moments for the pre-service teacher attendees."*

OSPI also took an innovative and significant step to define and operationalize CS in K-12 schools. Working closely with a statewide Advisory Committee comprised of state agency, postsecondary education, teachers, and administrators), OSPI led the development of a large guidance document designed to clarify CS practices in the primary and secondary classroom. The document is based on the collaborative work of Washington state teachers, AESD CS Leads, and the Advisory Committee and the CSTA publication *K-12 Computer Science Standards.* The document outlines the fundamental CS knowledge that students should acquire at each grade level, from elementary to high school. It translates the definition and standards of CS into instructional practices so teachers can see what robust CS teaching and learning looks like.[1]

Guiding Schools to Create a CS Ecosystem

Robust CS teaching and learning begins in the early grades. Similar to all content areas, students need foundational CS knowledge in elementary school to prepare them for success in middle- and high-school CS courses. This foundational knowledge leads to mastery of skills and abilities by delivering sequential content that follows established learning progressions.

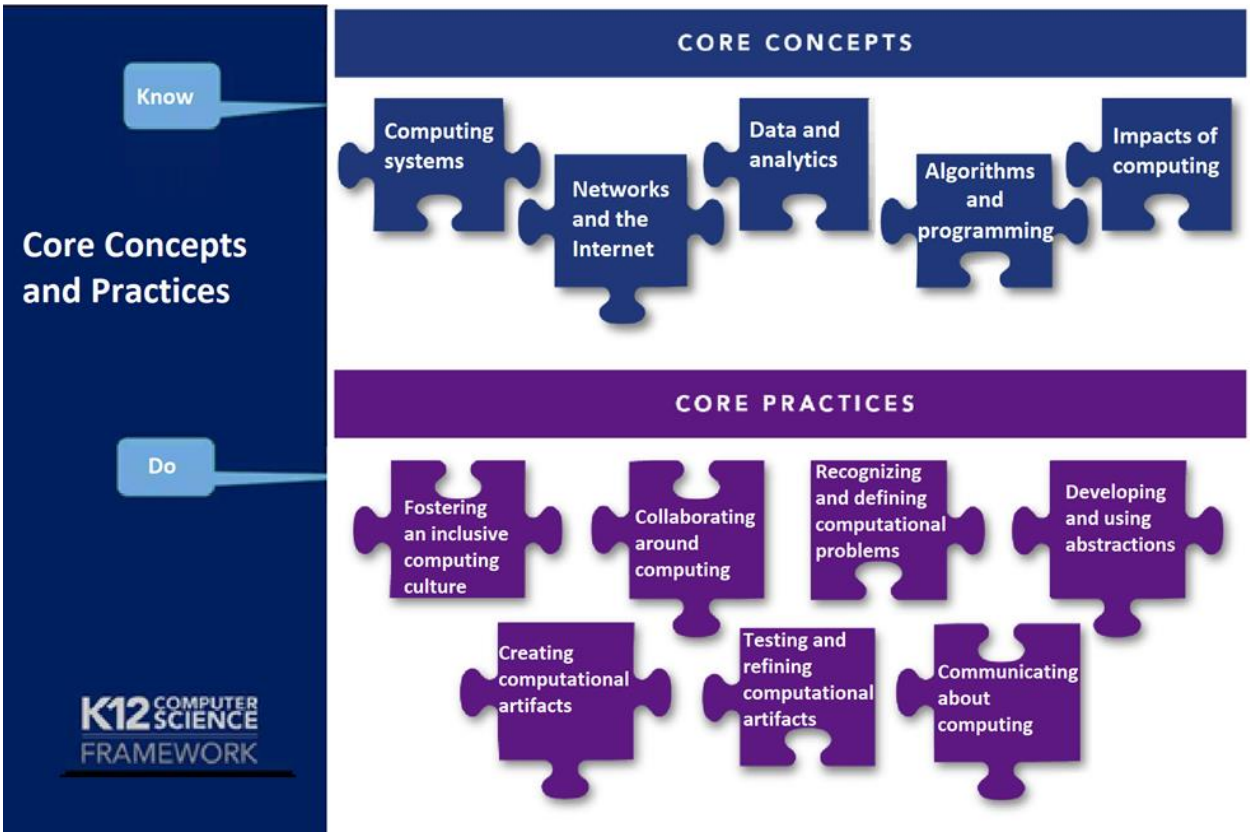
Like pieces of a puzzle, the CSTA outlines five core concepts and seven core practices that describe what students know and do when engaging in CS activities. With the full puzzle, effective teachers can engage students in instruction to learn and practice CS activities. The following five core concepts represent the overarching CS content areas:**Error! Reference source not found.**

- Computing systems
- Networks and the Internet
- Data and analytics
- Algorithms and programming
- Impacts of computing

[1] Office of Superintendent of Public Instruction. (2020). *Guidance on Teaching Computer Science in Washington State K-12 Public Schools.* https://www.k12.wa.us/sites/default/files/public/resources/Publication%2020-0014_Guidance_on_Teaching_Computer_Science_ADA.pdf

The following seven core practices describe the behaviors and ways of thinking that students use when working within the Core Concepts and Practices below (see Figure 1).

Figure 1. Core Concepts and Practices of K-12 Computer Science



Washington state's Computer Science K-12 Learning Standards [2] guide is an essential resource that is based on CSTA's standards. It provides examples of vertically aligned CS practices that build on foundational knowledge in kindergarten and become increasingly complex as students increase their depth of understanding. The OSPI companion document, *Washington State Computer Science Standards and Practices by Grade Band,*[3] help provide clarity by translating the standards into familiar language that is free from technical terms.

Across the state, the CS Leads have taken a coordinated, systematic approach to build teachers' ability to integrate CS into other content areas. They have worked to build awareness in teachers and administrators that the foundational knowledge of how to collect, analyze, transform, present, store, and distribute data are all key bridges to the Common Core and Next Generation Science Standards (NGSS) throughout K-12. After attending professional

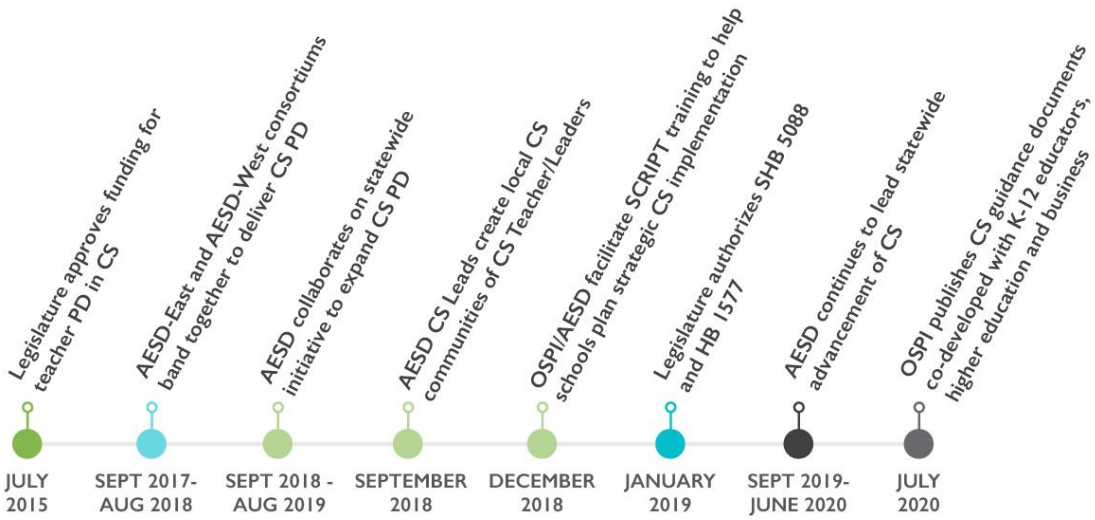
[2] OSPI. (2018). *Computer Science K-12 Learning Standards.* https://www.k12.wa.us/sites/default/files/public/computerscience/pubdocs/cs-standards.pdf
[3] OSPI's Washington State Computer Science Standards and Practices by Grade Band: https://www.k12.wa.us/student-success/resources-subject-area/computer-science/computer-science-k-12-learning-standards

development training, teachers and administrators learn that using a computer program to manipulate data, such as spreadsheets, also sets the stage for learning scripting languages or other programming languages, thus setting the student up for success.

Boosting foundational knowledge and providing encouragement beginning in the early grades can increase young students' confidence and enjoyment in computing. Gaining computer science knowledge early on can help dispel stereotypes and barriers related to diverse participation and engagement in computing and technology.

AESD and OSPI have diligently worked to bring a deeper understanding of these essential components and raise awareness of the importance of CS for all students. Collaboratively, they have achieved significant milestones since July 2015 when the legislature first approved funding for teacher professional development in CS (Figure 3). Raising awareness has led to the legislature authorizing two new bills requiring schools to offer CS. The bills, HB 1577 and SHB 5088, require that all high schools offer CS courses, which should begin with foundational experiences in Kindergarten.

Figure 3. Timeline of AESD computer science activities (July 2015 through 2020)



High-Quality Professional Development

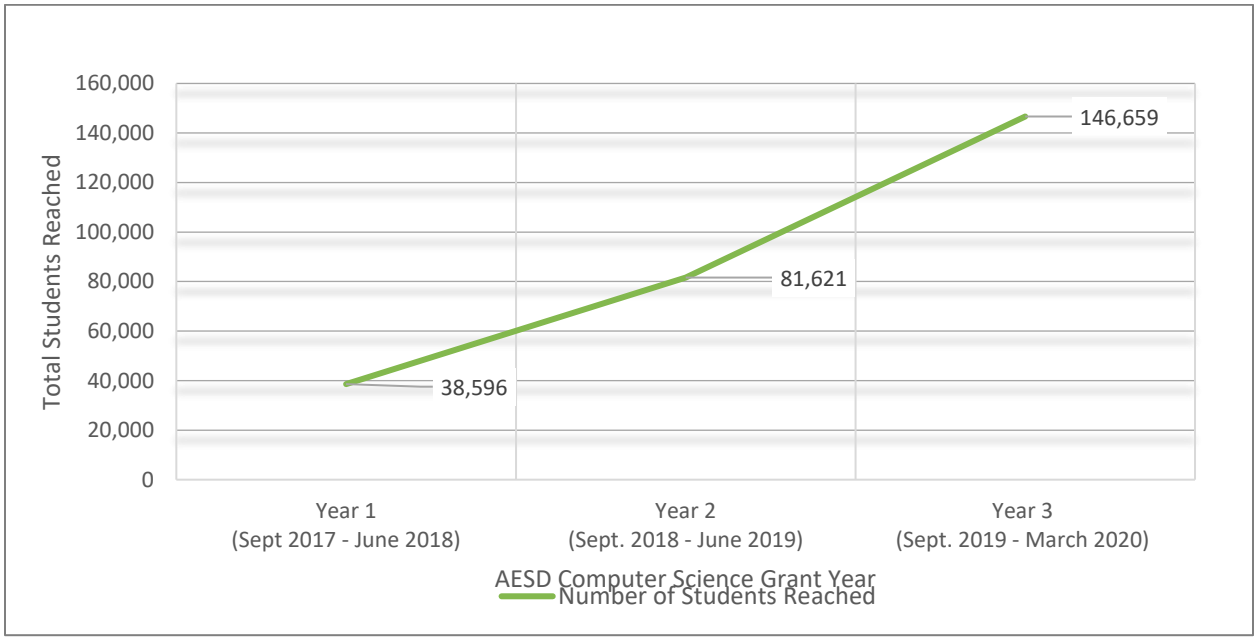
Over the last three years, teachers consistently rated the professional development provided by the ESDs and their partners as high quality, useful, and relevant. Teachers felt highly satisfied with the training and reported increased knowledge, skills, and abilities to teach CS and computational thinking.

The professional development included single-day trainings and intensive, multi-session participatory workshops where teachers received in-class training, one-on-one coaching, and

support to successfully translate what they learned into effective classroom instruction. The professional development helped alleviate some teachers' anxiety about computer technology. Launched by the ESDs, professional learning communities helped dismantle fear and anxiety. These communities were created so teachers could proactively bounce ideas off of their peers and share their frustrations and anxieties. These informal professional learning communities had a tremendous impact on their teaching experience and ability to provide children with powerful learning experiences.

The teacher participants were asked how many students they teach each year to get an estimate of the number of students reached. A longitudinal look at the CS grant outcomes over the last three years shows a steep, positive trajectory of the number of students potentially influenced by teachers who participated in CS training. (See Figure 2.)

Figure 2. Cumulative number of students reached by AESD CS teacher trainings by year (2017–2020)



Professional development also addressed integrating CS into other content areas and reported using CS as a tool to teach physical science, earth science, biology, physics, and mathematics. For example, a seventh-grade science teacher used what he learned in Code.org to model changes in the predator-prey ratio and show the resulting effects on the ecosystem. He said, *"My students could go in and change the number of foxes in an environment… It really worked very well to help students frame an interdependence relationship of an ecosystem because they were able to do 17 manipulations in 30 minutes. They were actually able to see the effects of the ratio being changed."*

The CS grant to AESD has supported teacher training and the creation of pathways for student success, especially for students who have not previously been exposed to CS, through robotics, programming, and virtual reality applications. These CS applications have enabled students to

learn content and build critical thinking, problem solving, communications, and collaboration skills. The teachers apply what they learned in the professional trainings, book studies, and more to build healthy, horizontal relationships where teachers and diverse students engage in 21st century knowledge and skills linked to academic and future career success. Educators may also be more aware of the ways culture and diversity affect user experiences and think critically about cultural relevance and accessibility in the classroom.

Teachers reported that their classroom activities have helped develop students' determination, confidence, persistence, and self-directed behavior, preparing them for academic and career success. Teachers who participated in the CS training shared how they applied the knowledge and skills gained. In the sections below, they reflected on the impacts on historically underserved students, including students with disabilities, girls, and students who are not as closely connected to the school environment.[4]

Inclusion for All Students

Teachers who work with students with disabilities shared how they brought what they learned back to their classrooms. After the training, they presented their students with opportunities to build and program robots and use Code.org. The teachers unanimously expressed excitement about the discovery that their students could successfully apply programming concepts, logic, and problem solving skills. A teacher provided the following insight into their discovery:

> My students [with learning disabilities] generally … don't have the same confidence. Whereas in the computer science classroom, they were learning, they were engaged. [Also] the kids that struggle in [other content] areas were the kids that excelled [in computer science] … you saw a shift of leadership in the classroom … they were the ones that were helping their peers!
>
> In my class [this student with special needs] just excels! He loves programming and is ahead of my whole class. He actually started doing other kinds of programming … he sought out different types of coding things that he could do online. So, he got his first challenge done; it's not even due until this coming Friday, but he got it done last week. And he's working on his next challenge.
>
> My … severely physically handicapped students [are] not always integrated into regular classes. [For them] I have gotten the CINCH robots… We put it out for the students and one of my students was programming it using block coding, it was drag and drop but … parent/teachers wouldn't have expected to see that. This was the most exciting part!

[4] Gordon, JV. (2018). *Connecting Teachers and Students to the World of Computer Science: AESD Computer Science Evaluation Report*.

Dismantling Gender Stereotypes

The CS training has also been a catalyst for reaching young girls to dismantle gender stereotypes and promote gender inclusivity. One teacher explained, *"I always try to take the fear away from the girls. I don't know if it is home, or sometimes the influence of TV that is telling some of the girls that coding and robotics is not for girls, which is very wrong, because my girls have succeeded, and they just love, love doing robotics."*

After training, teachers reach out to girls to dismantle CS gender stereotypes

Supporting English Learners

CS can transcend spoken languages and the need to be proficient in English to enjoy full participation. Teachers reported that some students were intimidated at first, but teachers learned to use instructional strategies to build students' self-confidence. A teacher shared, *"So what I do is I show my students in English and in Spanish. I keep telling them while learning to code, that coding is a language in its own. When we show the kids that almost all the advancements we have in technology have somehow started or improved thanks to the coding part that opens their eyes. And they see that, 'Hey, it's something I can use regularly.' It's a skill that we all need."*

Engaged and Connected

Teacher feedback indicated that technology and CS education increased student engagement. The Code.org and Robotics trainings provided teachers with the tools and pedagogical strategies to create student-centered environments that keep students engaged and connected. Several teachers who attended AESD CS professional development explained how the technology and CS provided high motivation and engagement to students who need alternative teaching methods to lecture-based instruction. One teacher shared:

> "There are kids who are failing every class except for computer science, and it's because it's interesting to them, and they get the logic behind it … they're invested and willing to put forth the time to make their website look good or their game be really awesome.

Another teacher explained:

> The kids that were the so-called 'troublemakers' [were making robots and] they were not troublemakers at all. These were the kids that could not just sit and listen. [And] I did not believe what [other] teachers told me that 'these kids don't like reading.' [I told them], 'Huh? They read 300 and some pages [to build and code their robot].'

Teachers noted that doing CS with traditionally non-participating students can transform students' attitudes about school. For example, participation in robotics competitions gave students confidence in their skills and knowledge, and the CS experience changed their outlook on learning. A teacher recalled an experience from a previous year:

> My kids [that are unengaged in other subjects] won every single CS competition challenge. They got all four main awards. They went from being the 'troublemakers' to being the super stars … to graduating from high school. They're in college now … in computer science. [Already one] graduated, and he got what he wanted. He's a computer scientist. He said, 'I got this [degree] thanks to you because you introduced robotics to us, and we found a reason to go to school.'

This revelatory experiences for students dispel the myth that CS and coding is only for a select group of high-achieving kids. It created a paradigm shift to show that CS programs are inclusive and equitable for all students. As one STEM director reflectively put it, *"We're seeing teachers that are really engaging all kids regardless of what their [state proficiency] might be or whether they have a behavior challenge or learning disability… We're seeing them use it with all kids. It's just fantastic."*

One School District's Journey to Implement CS

Across the state, AESD CS Leads are assisting school districts and buildings, whether novice or expert, to implement CS. The implementation journey is unique to each circumstance, collaboratively driven by administrators, teachers, students, parents, and the community. One school offered a rich portrait of their experience with launching CS throughout their elementary school building.

In a focus group, a participating administrator and teachers shared their step-by-step process to shift staff members' apprehension to confidence. The principal described the importance of initially allotting ample time for teachers themselves to learn and engage with CS. First, six staff attended the ESD's computational thinking course where they acquired a knowledge base and received instructional materials, including an Ozobot[5], a small robot that can teach students programming, and Makey[6] kit, a tool that connects objects to code. The staff played around with the tangible kits and worked as a group to practice and perfect their classroom approach. After gaining confidence, they incorporated CS into their classroom "*and then it really took off,"* exclaimed a focus group participant.

The students *and* teachers enjoyed the exciting new opportunity for active hands-on engagement in basic block coding to third graders. The principal shared, "That was a catalyst for me as a building principal to say, 'We need to be doing more of this.' We get a lot of other units

[5] https://ozobot.com
[6] https://makeymakey.com

that come in that, to me, aren't very engaging and aren't really relevant to 21st century learning."

Next, they created a designated STEAM lab to make CS inviting and less intimidating to all teachers and to illustrate that CS is essential. The principal reflected on the guidance provided by the CS LEAD to help navigate through the requirements and challenges of implementing CS:

> "We decided to rebrand our school as a STEAM school and send all our staff to the ESD training for computational thinking. And it's just taken off from there … that initial stage was just getting some tangible instructional materials, gaining enthusiasm and excitement, and then finding some professional development that was engaging and really well done, which the ESD provided for us."

A new STEAM classroom inspired by ESD professional development.

Essential Components of a CS Implementation Strategy

Across all of the focus groups, participants emphasized that district and building leaders are important to the success of implementing CS. The teachers interviewed emphasized that CS training and teaching CS are not enough for success. *"We had a really great plan that came out of [our professional development], but we still felt it was like, 'Well, nobody that's really a district-level administrator has time to lead this, so you guys just take it.' But when we just take it, nobody really buys in the same way."*

Recognizing that district leadership is critical, CS Leads have designed and provided training to administrators about the importance of K-8 CS and computational thinking integration to secure their buy-in and support. A CS Lead shared, *"It's helping [administrators] understand how moving in this direction could solve other [challenges they have] as well … We've got some tools and some ability to highlight how supporting students with these opportunities early can lead to all kinds of better outcomes."*

The CS Leads support first-time teachers integrating CS in their classroom, and they hold more expansive and detailed conversations with district leadership about the development of a CS ecosystem. The ecosystem illustrates how students learn progressively complex content

beginning in primary school. For example, elementary school preparation includes block coding, basic line coding, and the beginner-level Python language, which allows students to code for drones in later grades. An interviewee shared, *"What we're evolving to now is really looking at computer science as a system… [Defining] the K-12 system for those districts and having them create plans around what that looks like in their district … [such as] unrepresented youth and minorities, especially girls, participating in computer science."*

To develop an ecosystem, some schools create a strategic plan. OSPI, in partnership with AESD, offers assistance to schools for strategic planning to build and implement a cohesive, robust CS program. Schools can take multiple approaches to create a strategic plan. One such approach is the Strategic CSforALL Resource and Implementation Planning Tool (SCRIPT) framework. SCRIPT is systematic process that engages school staff, community, and stakeholders in collaborative activities to identify the components needed to implement a successful CS program. Each ESD and OSPI staff is a certified SCRIPT facilitator and can guide the school through the process of creating a plan that includes the following five focus areas:

- school leadership involvement
- teacher capacity and development
- materials and curriculum selection and content refinement
- use of partners
- community input and involvement

The facilitator guides participants through key components of the plan, including the incorporation of teacher PD into the school plan and collaboration with local, state, and national partners who can help provide high-quality CS courses. SCRIPT training raises awareness of the community's integral role in a CS program's development and sustainability. This awareness can improve school-to-family communication about partner opportunities, extracurricular activities, and in-school CS pathways. The community can also help inform the CS plan and pathways for college and career readiness based on the local workforce needs.

The certified SCRIPT trainer at each ESD can facilitate these discussions to bring different perspectives, help reach parents, and promote community engagement in the vision. CS Leads described how exemplar school districts offer a variety of ways to encourage family engagement in CS and contribute to the district's vision of CS. The school can host an Hour of Code during Family Nights, invite guest speakers from the local community to share how they use CS at their work, and provide a summer CS reading program for elementary students.

Some school districts have exercised their self-determination by prioritizing students, families, and communities' visions of success. Especially in rural areas, families have requested that schools focus on CS career pathways that allow students to be gainfully employed in their rural communities, for example, in the fruit industry. Expanding knowledge of CS applications throughout varied disciplines increases the relevance of CS to students' lives, garners parent support, and opens career pathways.

The Washington state legislature continues to support computer science education resulting in over $1.2 million dollars awarded to the ESDs for computer science over the last five years. Additionally, OSPI supports other stakeholders via Computer Science grant funding, which leverages matching private dollars, particularly around making computer science culturally relevant and connecting it with career pathways. This includes funding for single school districts and networks. For example, West Sound STEM Network, one of ten Washington STEM Networks and one of nine Career Connect Washington Regional Networks, developed and led a consortium of districts, higher education, and businesses across the Olympic and Kitsap peninsulas over the last two years.

The consortium, in partnership with local tribal leadership, co-developed opportunities for teachers that included a foundational understanding that indigenous symbols and navigation by the stars are historical uses of coding and algorithmic thinking. "We are co-creating systems of change with populations who have been underrepresented in computer science—these partnerships collectively support the deep and meaningful work done by the AESD system and OSPI," said a Network Director. By supporting OSPI's statewide computer science vision, partners are contributing better outcomes and opportunities for students.

COVID-19: Pivot and Adapt

Professional development efforts were underway for Year 3 when the COVID-19 pandemic hit in March 2020. While each ESD experienced the COVID-19 emergency in different ways, the following common threads were identified as having an impact on CS programs:

- CS programs and events were significantly altered, delayed, or postponed
- the work was adapted from face-to-face encounters to virtual encounters
- online education demands in basic education (reading and math) have temporarily pre-empted CS education, especially in elementary and middle schools
- ESDs and districts need ongoing CS support for the future

With partners (e.g., FIRST), some ESDs continued to creatively run virtual professional learning sessions with robots and drones mailed to participants. Other ESDs are engaged in the significant task of converting in-person training materials to online formats. An interviewee described how the CS Leads have pivoted and adapted:

> "We are 'all hands on deck'—all of us, everyone. I think we've really come together as a team to provide consistency in our approach [to assist districts], and so all of the specialists, whether it's computer science, ELA, [or] math … are all in on having a complete wraparound to support schools."

The crisis response served as an informal test that highlighted areas of further need and opportunity around CS. The Leads are sharing the message with schools that CS education, in response to COVID-19, is an essential part of recovery planning. For example, cybersecurity and digital citizenship are imperative pieces of the 21st Century virtual learning environment.

CS Leads in the focus groups reflected on the myriad ways students and families' lives will be different, including the expansion of e-commerce and other virtual services (e.g., medical services). They discussed how they can assist schools in making these new, expanded career connections and career pathways for students as the nation rebuilds the economy and recovers from the pandemic. For example, they plan to look for additional tools, resources, and partners to make it possible for students to earn CS credits while in high school. A focus group member reflected, *"When you have a system with the numbers of unemployment that we have currently, and as we start to put [our nation] back together, our graduates are going to face fierce competition. Historically, young people have not fared well in recession, and in recovery."* The CS Leads plan to assist districts' efforts to build a robust CS ecosystem that provides students with the digital skills they need to be competitive in the job market.

Going forward, AESD is also designing ways to bring the CS teachers into the community to build two-way communication. One such idea is to hold a summit in 2021 with local chapters of the CSTA, which have grown in the last few years. The Summit will leverage the CSTA chapters, explore the strengths and assets of each community, and find the best ways to meet individual CS teacher's needs.

Although a lot remains unknown, OSPI and AESD are focused on bringing these CS opportunities to all students. When assisting school districts with these efforts, the ESD asks if there is a system in place. If not, the ESD asks how can they help build one. If there is, they ask if it is equitable.

Conclusion

Across Washington state, OSPI and AESD have made significant progress advancing CS over the last three years. In the first year, 2017-18, AESD successful built a solid infrastructure to support communication and collaboration. The CS Leads used their spheres of influence and leveraged each other's talents to bring scales of efficiency to their newly formed collaborative. Encouraged by the strong start in the first year, as evidenced by the evaluation, the last two years have brought enthusiasm and a honed focus on needs and opportunities. The ESDs used innovative approaches to meet these needs and extend the reach through augmented funding, such as by bringing professional development to pre-service elementary teachers.

The OSPI/AESD collaborative has gained statewide and national recognition with CS leaders and professional organizations for their participatory approach to designing a CS ecosystems with districts while building capacity to provide equitable access to instruction. The annual evaluation participants confirmed that equity is promoted, infused, and present across the efforts in many ways, including:

- increased access to CS content through teacher professional development
- promotion of CS to traditionally underserved students
- heightened student engagement through relevant pedagogical approaches and
- guidance for administrators to establish a student-centered, K-12 CS system

OSPI and AESD are committed to continue to offer teacher PD in CS content, help school districts build a CS strategic plan, and provide support to successfully teach courses. Their efforts have coalesced to provide school districts with clarity about what constitutes CS in each grade. Other state education agencies recognize Washington state for its work in operationalizing K-12 CS instruction, allowing teachers who are unfamiliar with CS to have a greater ability to see how the core concepts and practices can be taught in their classrooms.

Across the nation, states are bringing together K-20 educators and technology professionals to bring to implement a unified strategic approach that grows talented professionals able to meet the technology demands (e.g. cyber security, advances in medical technology, etc.). Washington state's next step is to develop this strategic plan that spans from primary to post secondary and includes community colleges, universities, and business partners able to provide support (e.g. Net Development Group) to align coursework and create pathways to postsecondary degrees and certificates. Both a strong vision from leadership and continued collaboration between OSPI, AESD, professional development partners and Washington educators will bring this initiative into this next stage of advancing CS across the state.