Please find attached CodeVA's annual report, as mandated by the General Assembly, detailing its activities in the previous year to support computer science teacher training and curriculum development, including on collaboration with other stakeholders to avoid duplication of efforts. If you have any questions or need any additional information based on the content of this report, I can be reached directly at cdovi@codevirginia.org or 804-440-7135.

Thank you,

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Since its inception in 2013 with a mission of broadening participation in computing by expanding meaningful access to computer science (CS) education in Virginia's public schools, CodeVA has filled an increasing need for quality CS professional development in school divisions. School divisions are currently facing the challenge of implementing Virginia's new mandatory K-8 Standards of Learning (SOLs) for Computer Science, and in some cases also seeking to add elective middle and high school courses. Therefore, there is a heightened need for CS professional development.

Also increasingly acute, with the sudden interest in Virginia's CS K-12 landscape by curriculum resource vendors, is the need for CodeVA's role as a collective impact organization, serving as a connector and a collaborator among school divisions, teachers and other state educational and economic development entities with an interest in building Virginia's strong CS K-12 infrastructure.

Among the greatest challenges at the K-8 level is the simple fact that no public higher education institution in Virginia with a teacher pre-service training program presently includes relevant instruction on integrating computer science as a core subject. Furthermore, no state institutions yet offer a pathway to primary or add-on endorsement for middle/high school endorsement in CS. Additionally, as Virginia is at the vanguard of CS as an integrated subject in K-8, there is no integrated curriculum on the national level on which to train teachers. This fact makes CodeVA's in-service training programs unique and of frequent interest to other states following the K-8 integration path.

As a result, the level of need from school divisions for training support may be generally described as universally high. CodeVA's call to service is to ensure that training and other support to school divisions available is equitable across the Commonwealth at no cost to divisions, to build regional capacity to train teachers using research-based best practice approaches to CS teacher professional development, and to ensure fidelity in quality of those programs in the regions where CodeVA has developed that capacity.

This model is designed either to serve as a primary - or even sole - program delivery for school divisions and teachers, or as a base level of support for better resourced divisions able to afford the annual licenses with curriculum resource vendors.

In this capacity, CodeVA training is designed not to supplant paid professional development or products that some school divisions may choose to utilize as a part of their implementation plan, but rather to augment such programs. CodeVA works collaboratively at the national level with many of these organizations, providing professional development related to paid curriculum or peripheral devices popular for delivery of CS instruction. Though at the sales level these services are often offered as turn-key, none would suggest in the context of the CSforALL movement that these paid resources are a substitute for sustained, content-agnostic professional development of the kind provided by CodeVA or by other similar state-level organizations serving in the same capacity as CodeVA. These analogous state-level organizations include the Maryland Center for Computing Education at the University of

Maryland, the Friday Institute at UNC Chapel Hill, the Idaho STEM Action Center, CSNYC and the Arkansas State Director for Computer Science Education (which operates out of that state's Department of Education).

CodeVA is asked how its programs do not overlap with those of Code.org. This difference is a significant chapter in the history of Computer Science education in the United States. Though the broader initiative began with CS10K in the early 2000s with the National Science Foundation funding research projects focused on teacher PD best practices, the modern CSforALL movement generally began in 2013 with the launch of Code.org. CodeVA began this same year, independent of - and initially unaware of - Code.org. The national prominence of CodeVA's education director, Rebecca Dovi, led Code.org to seek her out as a member of its education advisory board. This,in turn led to a first-of-its-kind partnership between Code.org and CodeVA. That partnership continues today, and serves as the foundation of Code.org's national affiliate model. As a result, Code.org does not operate directly in Virginia, either as a driver of CS policy (as it is in other states) or as a provider of professional development. Rather, a strategic MOU in place since 2013 means Code.org agrees to stay out of statewide policy unless invited by CodeVA, and CodeVA represents Code.org's training programs across the Commonwealth. Code.org's statewide programs in Virginia are administered and delivered by CodeVA (modified to align with Virginia SOLs and augmented with broader agnostic resources), ensuring no services are duplicated.

CodeVA also is Virginia's representative to the Expanding Computing Education Pathways [ECEP] Alliance, a national K-16 education pathways policy alliance of 23 states and U.S. territories. and works closely with the National Computer Science Teachers Association, the National Center for Women in Technology, and others. ECEP Alliance is a prestigious, research-focused organization and a National Science Foundation-backed institution. CodeVA is the lone non-profit entity among members representing the states, invited because of its national prominence as both a leader and a model for other states in policy and implementation.

Amazon's presence in Virginia K-12 education is likely to be significant in coming years. Again, CodeVA is a valuable partner to the Amazon Future Engineers program, as CodeVA's education director designed the content delivery model and remains the instructor of record, for two of the four Edhesive courses offered through the Future Engineers program for high schools. Those courses were both designed and developed parallel to CodeVA's founding. This (Massive Open Online Course) MOOC-plus, per Rebecca Dovi's design, is intended to benefit from a professional development (PD) model similar to CodeVA's sustained teacher PD model (which is an enhanced design iteration of the Virginia Advanced Studies Strategies (VASS) CS Advanced Placement A professional development model that she developed for that organization when she was its CS lead).

To further explain the Edhesive MOOC-plus model, sustainable programs are best served by a trained teacher, not by a proctor, which is how they are initially offered through the Edhesive model. The Edhesive courses were designed to serve as a bridge that allows school divisions to offer a CS course immediately, but with the relatively short-term goal of having the selected school faculty member who proctors the class also receives training so she or he will eventually teach the course either independent of the Edhesive resources, or utilizing the Edhesive (Future Engineers) course only as supplemental curricular resources.

Regarding concerns about duplicating efforts, most middle and high school teachers statewide who have any formal training in CS instruction received it either through CodeVA during the past seven

years, or from the previous VASS program overseen by Rebecca Dovi. Many of these teachers remain part of CodeVA's network of teachers. The relevance of this statewide teacher community of practice with CodeVA at its core was evidenced by the writing of the CS SOLs in 2017, which included Dovi serving for a few months as an unpaid project manager at VDOE. CodeVA recruited the majority of the teachers who participated on the writing and review teams, as well as the majority of the industry professionals on the outside review team.

Though many school divisions are beginning to develop internal capacity to train teachers, few can do so without relying on CodeVA either for teacher or facilitator PD, or in a consulting capacity. Even Loudoun County, a division well along in its CS education initiative, regularly consults with CodeVA's education staff.

CodeVA's statewide partners include the Virginia Tobacco Commission, Virginia Commonwealth University, Old Dominion University, George Mason University, Richard Bland College of William & Mary, and others. CodeVA also works with University of Virginia's Tapestry training model, which is a part of the National Center for Women in Technology's effort to broaden participation among women. CodeVA's statewide hub network partners, which host training and even share staff members, include the Institute for Advanced Learning and Research in Danville, the Southwest Higher Education Center in Abingdon, the Roanoke Higher Education Center, Harrisonburg Public Schools, Suffolk Public Schools, Chesterfield Public Schools and Fairfax Public Schools. These locations served as training hubs this summer for nearly 700 of the 1001 teachers trained by CodeVA.

CodeVA's design insulates against duplication of efforts by school divisions, and the scaled nature of its programs makes it distinct from future university initiatives. CodeVA is responsive to division needs, and its nimbleness allows it to react quickly to new division and teacher needs as they arise. For example, CodeVA's current initiative to recruit and charter Computer Science Teacher Association (CTSA) chapters in each of the eight superintendent divisions in the state, and to ensure that geographical coverage by those CSTA chapters is broadened through subchapters. Prior to 2018, Virginia had only one active CSTA chapter, which was started by CodeVA's education director while she was still a teacher in Hanover County Public Schools. In 2018, a teacher in Loudoun County launched a Northern Virginia chapter. After CodeVA launched a statewide recruitment effort in summer 2019, there now is a CSTA Southside chapter, a CSTA Shenandoah chapter, and a CSTA Tidewater chapter. CodeVA, in partnership with national CSTA and Microsoft, is developing a model whereby these chapters will receive professional staff support and services, as well as limited funding resources to subchapters for the purpose of developing regular meetings for these localized teacher communities of practice. CodeVA also is coordinating with CSTA to begin "re-branding" its statewide teacher PD hub locations so they will also serve as CSTA training hub locations, allowing for regular regional meetings as required by CSTA national bylaws. CodeVA founded the National Computer Science Honor Society, which it grew to dozens of chapters in Virginia and 13 other states (from California to Texas to Connecticut) before deciding to give the society to the CSTA so it could become a benefit for its new CSTA+ member level.

Notably, the CSTA National Conference 2019 will be held in Arlington, Virginia. This conference, which will draw more than 1,300 guests to Virginia for a three-day conference, was secured through CodeVA's efforts. CodeVA's executive director spent a number of months advocating for Virginia as the site of this conference, based on Virginia's centrality to CS-dependent industry, as well as its significance in the national CSforALL landscape with launch of its mandatory standards this year.

Though CSTA indicated a preference for Richmond, the Greater Richmond Convention Center was unable to accommodate the targeted dates for the conference in July, and Arlington was selected as an alternate location. CSTA Executive Director Jake Baskin announced that Virginia had been selected at the Virginia CSforVA Summit in Harrisonburg this past July. Baskin was invited by CodeVA to attend Virginia's CSforVA Summit, which provided logistical and operational support for the Virginia summit.

In order to further ensure that the organization does not duplicate other efforts, CodeVA's board includes superintendents of schools representing urban and rural school divisions of varying sizes, and CodeVA works closely with division leadership and staff across the state actively seeking their input and responding to their requests.

CodeVA's partnerships with school divisions were evident during the VDOE's recent competitive bid solicitation to state school divisions for its AECS grants, which seek to draw on divisions to develop curricular resources and content for the state's OER. CodeVA is a direct partner in many of the grant submissions at the request of the divisions applying, in all cases providing both PD as well as technical support in the curriculum development process.

Further proving its value as a resource for the state, CodeVA's programs helped secure more than $8 million in K-12 computer science federal research dollars to Virginia in 2019 through the award of two U.S. Department of Education Education Innovation and Research (EIR) grants. Old Dominion University's successful grant is researching CodeVA's Elementary Coach Academy model. And Warrenton Public Schools successful EIR grant proposal will utilize CodeVA training as well as its District CS Roadmap to develop a planning model for school divisions.

These grants are in addition to a prior federal grant awarded in 2018 to George Mason University, which also centers on CodeVA's Elementary Coach Academy, investigating interventions focused on differentiated instruction for students with certain special needs.

In October 2019, CodeVA was also announced as a recipient of one of 10 CSforALL EcosystemsforCS grant awards from the CSforALL national organization. This grant opportunity was the first such opportunity through CSforALL and is backed by a number of national funders, as well as NSF. This grant will allow CodeVA and its lead partners, which include the Gateway Region Economic Development Partnership, Chesterfield Public Schools, Virginia Union University, and the City of Colonial Heights, to develop a model of interlocking collaborative dependencies based on CSforALL's Script tool and CodeVA's District Roadmap tool. This model is envisioned as a tool that could be employed by the state to measure school divisions' meaningful implementation of the new CS SOLs by incentivising compliance through regional and local economic development goals.

Furthering the potential for future resources in support of statewide CS K-12 education, in September, CodeVA got word that Microsoft has engaged a grant-writing team to work for CodeVA over the next couple of years, with a focus on seeking additional federal DOE, NSF and private foundation research grant funding for CodeVA's Virginia initiative. These grants would be in partnership with state and national university research institutions, but also, CodeVA believes, should include partnership with VDOE, with a goal of attracting more than $1 million to Virginia from grants submitted during this first-year cycle.

CodeVA also is a pilot site for Google's CS First program, with CodeVA serving as the national developer of a model for online synchronous delivery of this typically in-person PD.

Virginia's Computer Science K-12 initiative has been among the most successful, but also among the most thinly funded such initiatives nationally. During its first four years of operation, CodeVA

represented all of the state's Computer Science K-8 teacher PD, as well as the majority of its high school CS PD. During those first four years, CodeVA trained more than 1000 teachers, providing the majority of that number with more than 100 hours each of in-person PD, and many of them with stipends provided through an initial funding partnership with CodeVA's national partner, Code.org. Through that partnership, CodeVA brought more than $2 million in value to Virginia teachers over its first four years, through stipends and other program support. Even with this funding, Virginia's total CS initiative (minus teacher participant stipends) in most years has been accomplished significantly for less than $1 million, and prior to 2017 it was entirely funded through private and corporate foundation support gathered by CodeVA.

Today, state support for CS PD and division support through CodeVA remains modest in comparison to funding allocated by other states to their parallel (and less prolific) programs. The Maryland Center for Computing Education, which consulted with CodeVA in its creation, is funded annually at approximately $4 million in direct state aid. Arkansas' initiative is directly funded by that state's legislature for approximately $10 million, with additional funds provided by private corporate dollars through a foundation established to operate in tandem with the legislative funding initiative and to a governor's opportunity fund allocation of nearly $1 million.

By comparison, as of FY 2019-20, CodeVA's total annual programmatic budget for teacher training is $940,000. This covers only teacher training and includes the $550,000 in annual state funding, and additional funding CodeVa has raised through corporate donations, grants and individual donations. CodeVA's total annual operating budget for this FY is $1,737,000, and includes all other programs, including privately funded direct student programs.

As of present, CodeVA's programs have provided direct training to more than 3500 teachers statewide - more than 6500 total when calculating with the multiplier of teachers trained by participants in CodeVA's Elementary Coach and Middle School Coach academies. During the period between April and September 2019 , CodeVA provided training to 1001 teachers across Virginia. This winter and spring multiple new trainings will be offered, so the 1001 represents a portion of the teachers this year's state funding will support.

Of the $550,000 in state funding the money is allocated as follows:

2019-2020 Teacher Training Department Budget

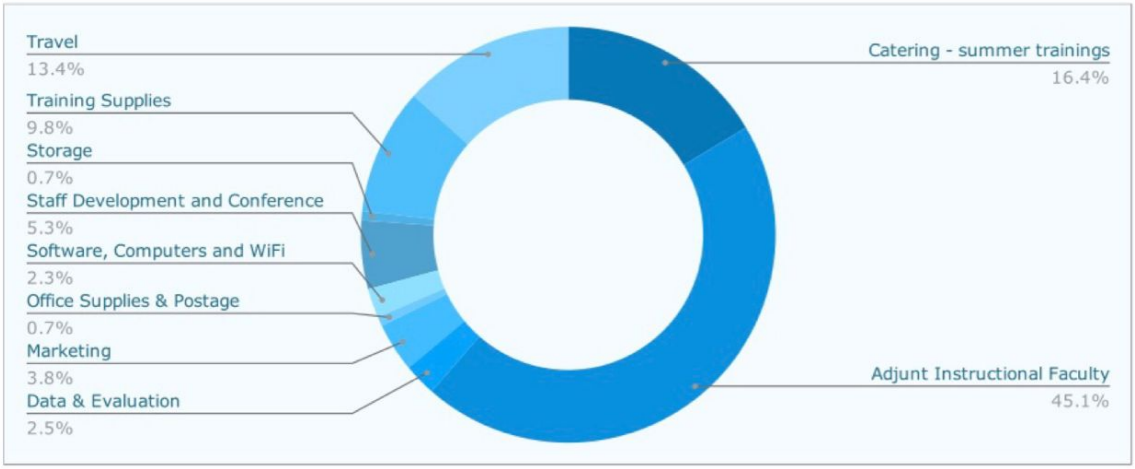
Total Teacher Training Budget	$940,500.00	
State Allocation	**$550,000.00**	
Catering - summer trainings	$90,000.00	16.36%
Adjunt Instructional Faculty	$247,832.00	45.06%
Data & Evaluation	$14,000.00	2.55%
Marketing	$21,000.00	3.82%
Office Supplies & Postage	$3,950.00	0.72%
Software, Computers and WiFi Hotspots	$12,500.00	2.27%
Staff Development and Conference Fees	$29,250.00	5.32%
Storage	$4,000.00	0.73%
Training Supplies	$54,000.00	9.82%
Travel	$73,468.00	13.36%

Notes:

The total budget for teacher training is $940,500.00.

Since April 2019 CodeVA has trained 1001 teachers across Virginia.

This school year multiple new trainings will be offered, so the 1001 only represents a portion of the teachers this annual allocation will support.



CodeVA Summer 2019 Training

Virginia's state funding for Computer Science K-12 education began in 2016 with inclusion of $550,000 annual ($1.1 million per biennium) to go towards teacher professional development, marketing and support for computer science instruction. This funding was proposed by CodeVA as a match to the foundation and corporate funding support that CodeVA had raised for each of the prior three years during which its free professional development for computer science teachers had been offered. In 2019, the

Virginia General Assembly elected to allocate that funding as direct aid to CodeVA through the Virginia Department of Education, as the VDOE and CodeVA began ramping up efforts to support school divisions preparing to implement the state's K-8 computer science Standards of Learning mandate, as well as increasing demand for middle and high school elective courses. And CodeVA continues to raise now significantly more than the amount of the state's annual allocation through foundation and corporate grants.

This evaluation summary is based on survey responses from attendees of CodeVA's 2019 Summer training. Trainings were held at seven regional hubs to facilitate the delivery of professional development across the Commonwealth of Virginia. The map in Figure 1 illustrates the state coverage that CodeVA training achieved during the summer of 2019.

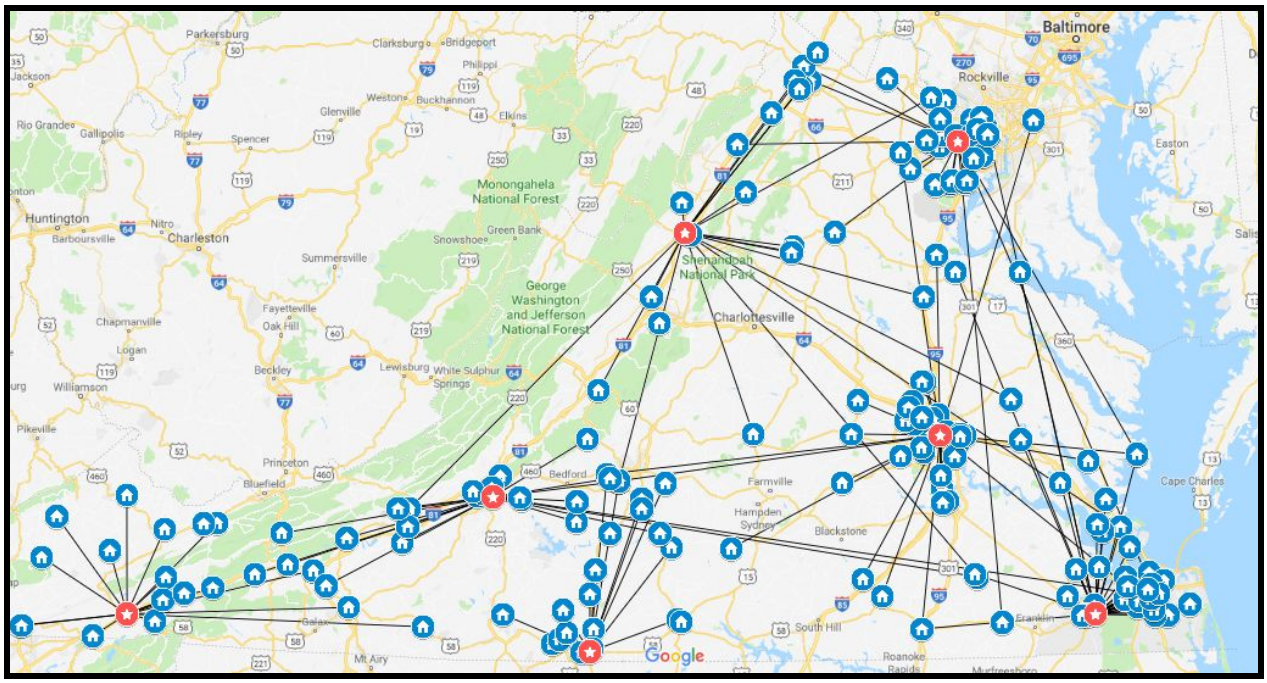


Figure 1: CodeVA hubs (red stars) and participating schools and/or districts (blue houses). The black lines connect participants to the hub(s) attended for the training.

Demographic Information

HS	MS	ES	Total	Divisions Served
156	179	668	**1003**	106

Table 1: Teachers trained, by grade level.

For the 2019 - 2020 school year CodeVA provided training to 1003 educators across Virginia (see Table 1). Of those, 399 participated in weeklong sessions through the seven regional hubs, and 604 participated in a variety of shorter local and online sessions. Of the 399 attending the regional hubs 276 responded to the post-survey of CodeVA's summer professional development. Regions across the state were represented, led by Tidewater (21%), followed by Northern Virginia (17%), Central Virginia (16%), Western Virginia (14%), Valley (13%), Southwest Virginia (12%), Southside (4%), and Northern Neck (3%). Attending school divisions were mostly rural (45%) and suburban (37%), with fewer urban districts (18%). Participants were overwhelmingly classroom teachers (61%) and ITRTs (15%). The majority of educators worked at the elementary (56%) and middle school (18%) level. Seventy-eight percent of participants reported that they agreed (25%) or strongly agreed (53%) with the statement "The local hubs help me attend training. I would not be able to attend training if I had to travel." Having regional hubs across the state has allowed more educators to take advantage of the CodeVA computer science professional development.

The hub locations are:

- Abingdon - SW Higher Education Center
- Danville - Institute for Advanced Learning and Research
- Harrisonburg - Harrisonburg High School
- Northern VA - Fairfax County Public Schools
- Richmond - Chesterfield CTE Center
- Roanoke - Roanoke Higher Education Center
- Tidewater - Suffolk County Public Schools

Because the state mandate requires integrating computer science into instruction from kindergarten through eighth grade, the Coaches Academies are specifically designed as a train-the-trainer model. They prepare school division personnel to conduct local professional learning workshops in computer science. Based on data collected in the 2018 - 19 school year from these programs the estimate is that the Computer Science Coaches trained this summer will impact 2,968 teachers and 83,104 students at the elementary level, and 320 teachers and 36,800 students at the middle school level. The middle school program was new in 2019 and only piloted in three hubs, which explains the difference in scale. Between the 2018 and 2019 Coaches Academies the estimated student impact is 35% of Virginia elementary

school students. CodeVa is currently working with a group of Virginia Commonwealth University PhD in Education candidates to develop an evaluation plan to measure the impact of these programs.

	HS	MS	ES	Total
Teachers Directly Trained by CodeVA	156	179	668	**1003**
Coaches Impact - Teachers	n/a	320	2,968	**3,288**
Estimated Impact - Students **	12,168	36,800	55,504	**104,472**

Table 2, Impact of 2019 Trainings

** CodeVa conducts an annual survey of all educators trained in early November and can update these estimates upon request.

Summer Training Sessions

CodeVA offered seven different training sessions over the summer. Most sessions lasted four or five days over a one week period. The Launching Computer Science was a special one day program. Figure 2 illustrates the proportion of attendance for each of the sessions.

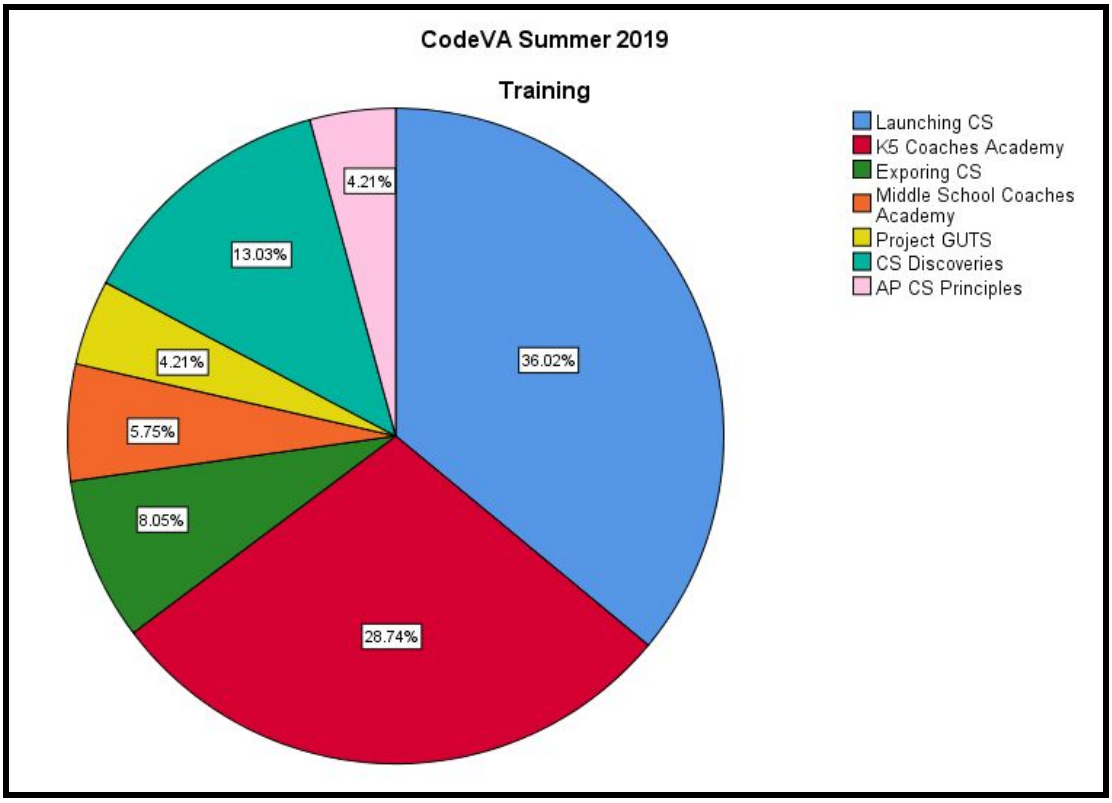


Figure 2: Chart illustrating reported attendance at CodeVA's summer 2019 training sessions

Content and Delivery

"One of best prof. dev I have attended in 23 years"

As part of CodeVA's continuing program evaluation, participants were asked to rate various aspects of the training: overall rating; amount of content covered; content rigor; session pacing; and required workload. Participants rated each aspect on a five star scale, with five stars representing the highest rating, and one star representing the lowest. CodeVA received extremely positive reviews, with fewer than 11% of respondents reporting less than satisfactory performance (three stars) on any aspect of the training. Ninety-six percent of participants gave the training an overall rating of three or more stars, with 61% giving five stars and 23% four stars. On the amount of content covered, 93% rated the training with three or more stars, again with a healthy majority reporting four (26%) or five (54%) stars. Following this pattern, five star reviews were the majority of responses for rigor of content (53%), session pacing (52%), and session workload (56%).

"The instructors were engaged, enthusiastic and interested in my success."

Participants were also asked to rate facilitator performance in the following categories: knowledge of content; delivery of content; and preparedness. Facilitators received five stars on their knowledge of the content by 79% of respondents. On content delivery, 75% of respondents gave facilitators four (16%) or five (69%) stars. Participants also rated facilitators four (13%) or five (75%) stars on preparedness. Eighty-eight percent of respondents indicated that they were likely (28%) or very likely (60%) to use content learned in the workshop in the upcoming year, and 87% of respondents reported that they were likely (20%) or very likely (67%) to recommend CodeVA training to others.

Effectiveness

One of the most important missions of CodeVA's computer science professional development is to engage and empower educators who may have little or no prior computer science experience, and give them the tools to not only successfully teach students, but, in some cases, take the content from the CodeVA training and coach fellow educators in their school divisions. In order to evaluate how the training is accomplishing that mission, post-training, participants were asked to reflect on its impact. The survey had respondents rate their agreement or disagreement with the following statements on a scale from one (strongly disagree) to five (strongly agree).

After attending the workshop …	1	2	3	4	5
I understand what computer science is.	0%	2%	6%	29%	63%
I have a strong working knowledge of the Virginia Computer Science Standards of Learning.	3%	4%	23%	38%	32%
I am experienced with programming (any language).	14%	28%	26%	19%	13%
I am familiar with teaching strategies that are effective at my grade level for teaching computer science.	1%	6%	28%	40%	25%

Looking Ahead

Among speed bumps encountered during summer training was unintended consequences resulting from assignment of course codes for the four standard-level stand-alone elective courses adopted by the VDOE in the computer science Standards of Learning. These courses are Middle School Elective, Computer

Science Foundations, Computer Science Principles and Computer Science Programming, and are in addition to two AP Computer Science and one International Baccalaureate computer science course codes that already existed. Prior to 2019, many divisions offering standard-level computer science courses, particularly an introductory course corresponding to the CS Foundations class, did so utilizing an existing CTE course code for IT Fundamentals. CodeVA saw brisk and enthusiastic enrollment in the four elective courses between January 2019, when enrollment opened, and the end of June. But as the cohorts began meeting, a significant no-show rate for these elective courses was noted. Efforts were made to recapture some of this lost enrollment by contacting the enrolled but absent teachers directly. Between these contacts, and conversations with teachers attending the sessions, an answer soon emerged. Though the new courses had assigned course codes, a number of school divisions decided to not offer the courses when it was discovered there were not corresponding VERSO codes. Because teacher licensure/endorsement as well as classroom funding for CS middle and high school courses often depends on Perkins funding (and its attendant rules for use of those funds), many school divisions determined they would be risking improperly using Perkins funds. An additional issue was discovered related to the middle school elective, with many teachers reporting their division had determined at the 11th hour not to offer the class because of teacher licensure concerns. Many divisions had planned at the middle school level to assign the middle school course to teachers holding science or CTE technology endorsements, but became aware late that many of these teachers were not eligible to teach the course. The VDOE and CodeVA have been in regular communication over these two issues, and VDOE is taking steps to mitigate moving forward.

Amplifying Impact

Based on the educator feedback listed above, CodeVA is adding additional training sessions throughout the school year with both in-person sessions and online sessions available. Based on the feedback that many attendees do not yet feel “experienced with programming” this will be an area of particular focus for these sessions.

To reach teachers that cannot attend in person sessions CodeVA is presently developing a formal partnership, but already working with Virtual Virginia on developing online curriculum with a new model for blended online and in-person professional learning modules. These resources are especially important to support smaller divisions that lack experienced computer science teachers.

Finally, to deepen the understanding around student and teacher learning of computer science CodeVA participates in several national research grants. These include:

- **CSforAll Ecosystem Grant** supports a team of school divisions and industry in the Gateway Economic Development region to develop a strategic plan for computer science education.
- Two national **Education Innovation and Research Grants** awarded this fall in Virginia use CodeVA's training programs as the foundation of their research
- **Project GUTS**, in partnership with Massachusetts Institute of Technology, investigates including computer science in middle school science classrooms. This two year project is National Science Foundation funded, and supports programs in Richmond City Public Schools.
- In partnership with GMU and ODU the **National Science Foundation Computer Science for All Grant** explores implementing computer science at the elementary levels for students with high incidence learning disabilities.

These grants not only expand the understanding of best practices in teaching computer science, they also bring dollars to Virginia that support teachers and students across the state.

Conclusion

CodeVA's 2019 summer professional development was successful in its delivery of a breadth of rigourous computer science content to K-12 educators of all grade levels from diverse regions of the Commonwealth of Virginia. Respondents rated CodeVA highly on both the content and delivery of materials. Participants also found the training as effective in imparting computer science content knowledge, familiarizing the newly adopted VDOE Computer Science SOLs, and sharing effective, grade-level appropriate teaching strategies. Programs moving forward are poised to respond to school division requests for training utilizing the cohort model as well as on a more limited scope to tailor customized or "off-the-shelf" one-day or multiple-day trainings.