



COLORADO
Department of Education

2019 Legislative Report

Computer Science Teacher Education Grant Program

Submitted to:

House and Senate Education Committees of the Colorado General Assembly

By:

The Colorado Department of Education

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Introduction

Grant History

Administered by the Colorado Department of Education (CDE), the Computer Science Teacher Education Grant (CSEd) Program is a state-funded program designed to increase the number of teachers able to provide computer science education in Colorado. The program provides financial support to help local education agencies (LEAs) to train teachers on computer science education. The intent of the grant program is to grow the capacity of schools to offer computer science courses and increase the number of students who interact with computer science content. The CSEd is available to Colorado public schools, district charter schools, institute charter schools, board of cooperative services schools (BOCES), and facility schools.

The Colorado General Assembly initiated the Computer Science Teacher Education Grant Program in 2017 upon the passage of Senate Bill 17-296, with an appropriation of \$500,000 for FY 2017-18. The legislature increased the appropriation by \$500,000 in 2018 through the passage of Senate Bill 18-1322 for a total of \$1,000,000 in FY 2018-19.

The legislation requires that the CDE submit an annual report to the education committees of the Senate and House of Representatives of the Colorado General Assembly annually by January 1, detailing the following:

- The number of grants awarded during the previous calendar year;
- The amount of each grant awarded to each grant recipient;
- The number of teachers in each district who benefitted from the grant;
- The uses of each grant, including postsecondary courses, degrees, training programs, or industry recognized certificates completed and the education provider that provided the education; and
- The expected impact of the additional teacher training.

Fiscal Year 2018-19 Summary

The legislature appropriated \$1,000,000 to administer the grant program for computer science teacher professional development during the 2018-19 school year. Excluding administrative costs necessary to administer the grant allowed under statute, approximately \$857,699 was available for distribution to LEAs.

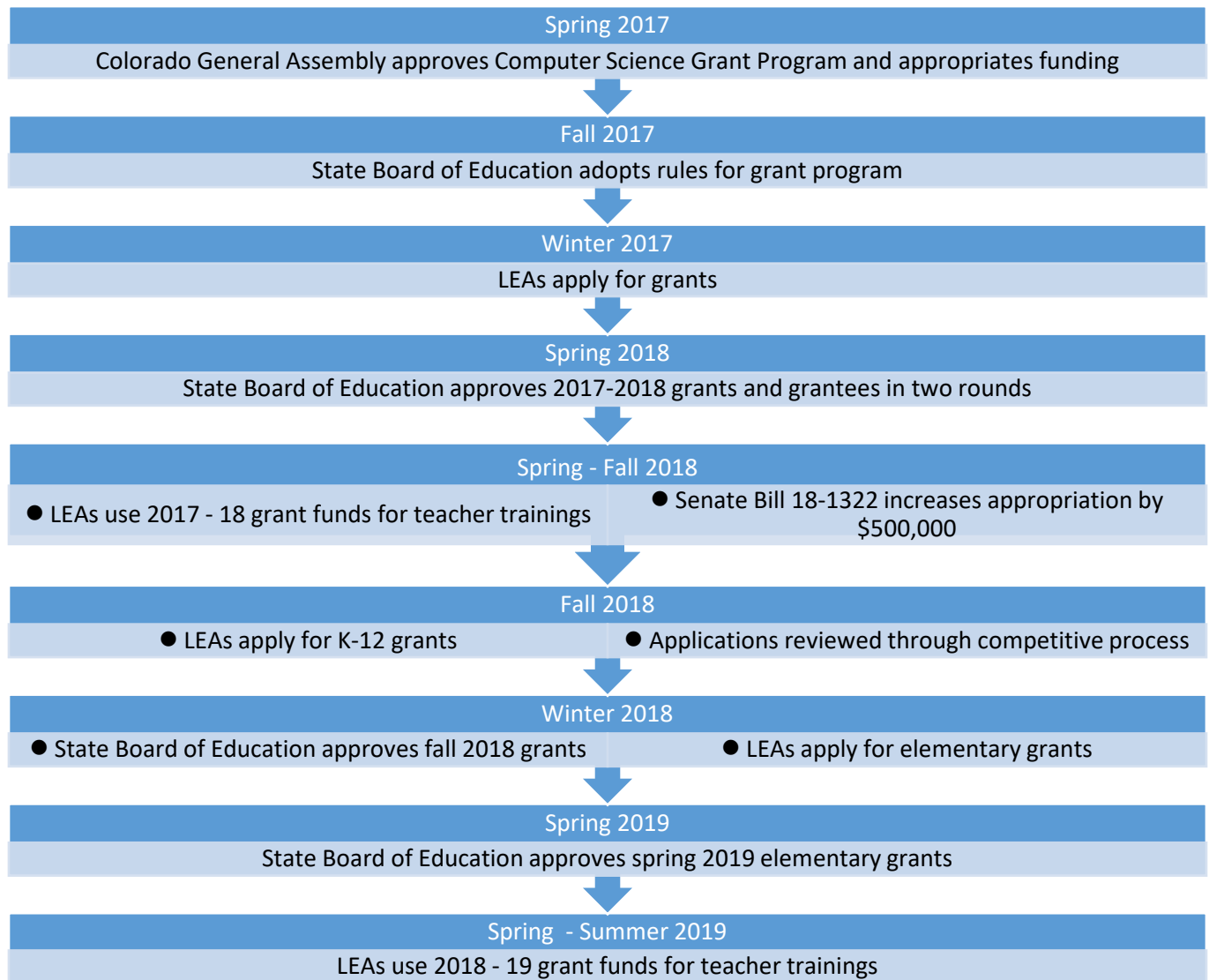
CDE administers the CSEd grant program as three separate professional development programs: (1) a K – 12 district determined program, (2) an elementary district determined program, and (3) a state sponsored elementary regional program in which districts apply for individual teacher slots for the training.

“With the help of the CDE computer science grant, our district is in the process of implementing new computer science curriculum for elementary, middle, and high school courses. Overall, the shift is from teaching Microsoft and Google Suites to prioritizing computational thinking.” -Mesa County Valley



Timeline

For the 2018-19 fiscal year, the application and distribution of grant funds were completed in two cycles in order to accommodate a state provided option: the first in fall 2018, and the second in spring 2019. Grantees have the opportunity to expend funds through winter 2019.



Eligibility

Local education agencies that participate in the CSEd grant program are eligible to receive up to \$30,000 to provide teachers with professional development in computer science. These funds may be used for any of the following:

- Tuition, including fees;
- Professional development training program costs; or
- Professional development books and/or materials used by the teacher during professional development.



The authorizing legislation and CSEd grant rules stipulate that CDE give priority to LEAs designated as rural and those with high populations of minority and/or low-income students. In addition to prioritizing districts with these student populations, CDE provides applying LEAs with assistance in completing the application to aide in meeting their goals for establishing or bolstering their computer science programming.

LEA Participation

CDE received 71 applications across all three grant programs from districts, Charter School Institute schools, and BOCES for the 2018-2019 school year. For FY 2018-19, applicants requested a total \$963,119. Fourteen school districts applied for multiple grant options: Adams 12 Five Star Schools, Branson Reorganized 82, Centennial R-1, Cheyenne County RE-5, Cheyenne Mountain 12, Douglas County RE 1, Falcon 49, Harrison 2, Jefferson County R-1, Littleton 6, Mesa County Valley 51, Southeastern BOCES, Summit RE-1, and Thompson R2-J. After committee reviews, CDE awarded 67 CSEd grants totaling \$857,699 and did not recommend 4 applications due to unallowable items and incomplete applications. Table 1 illustrates the number of grants, amounts applied for, and the amounts awarded by category.

Table 1: 2018-2019 CSEd Grant Applications by Category

Grant Option	# of LEAs Applied	Amount Applied For	# of LEAs Approved	Amount Awarded
K-12 District Determined	26	\$472,877	24	\$465,177
Elementary District Determined	16	\$309,242	14	\$270,302
State Sponsored	29	\$181,000	29	\$122,220
Totals	71	\$963,119	67	\$857,699

In our district, elementary teachers will continue to learn about integrating computer science and robotics across content. Middle school curriculum will be expanded to include physical computing by implementing a curriculum that utilizes Microbits and provides a foundation for high school standards. The computer science department is partnering with middle school math and science content specialist to integrate computer science into existing curriculum, while aligning computer science practices with math practices and science and engineering practices within the standards.

-Jefferson County School District

The figure below illustrates the location of the awarded districts throughout Colorado. Districts highlighted in blue received grant funding based upon submission of individual applications, while those in green were served through an awarded BOCES.

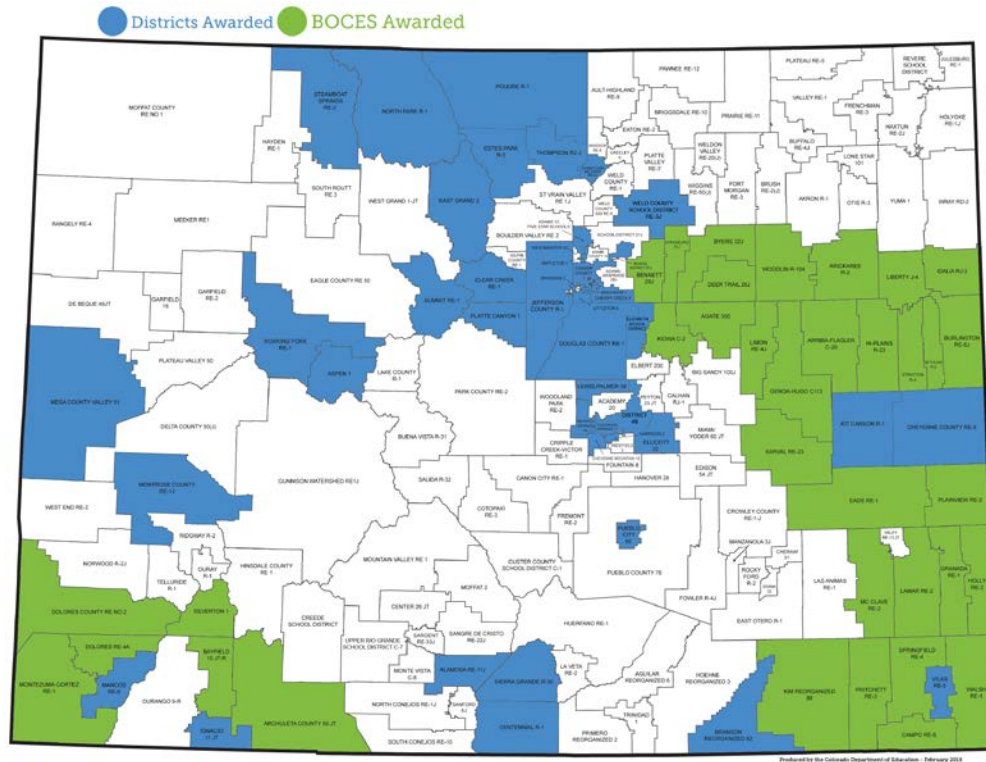


Figure 1. Geographic Location of CSEd Grantees across Colorado

Local Education Agency Priority Criteria

Twenty-two of the grantees are designated as rural or small rural districts, 19 as non-rural, three as BOCES, and three as schools within the Charter School Institute according to CDE definitions¹. It is important to note that all three BOCES also represent rural districts. In addition, 18 grantees have student populations greater than 50 percent receiving free or reduced lunch and 16 grantees have student populations greater than 50 percent minority. Table 2 below lists all grantees and the priority area(s) each grantee met. Three percent of the total grant funds went to grantees that met all three priority areas, 23% went to grantees meeting two priority areas, 38% went to grantees meeting at least one priority area, and 36% went to grantees who did not meet priority criteria.

¹ "A Colorado school district is determined to be rural based on the size of the district, the distance from the nearest large urban/urbanized area, and having a student enrollment of approximately 6,500 students or fewer. Small rural districts are those districts meeting these same criteria and having a student population of fewer than 1,000 students."



Table 2: CSEd Grant Awardees by Priority Area

Local Education Agency	Rural	BOCES	Charter	>50% Free or Reduced Lunch	>50% Minority
Adams 12 Five Star Schools					X
Aspen 1	X				
Branson Reorganized 82	X				
Centennial R-1	X			X	X
Cherry Creek 5					X
Cheyenne County Re-5	X			X	
Cheyenne Mountain-12					
Clear Creek RE-1	X				
Colorado Springs-11				X	X
CSI (Global Village Academy)			X		
CSI (Pinnacle Charter)			X	X	X
CSI (RFM Academy)			X		
Denver County 1				X	X
Douglas County RE 1					
East Central BOCES		X		X	
East Grand 2	X				
Elizabeth C-1	X				
Ellicott 22	X				
Englewood 1				X	X
Estes Park R-3	X				
Falcon 49					
Harrison 2				X	X
Jefferson County R-1					
Johnstown-Milliken RE-5J	X				
Kit Carson R-1	X				
Lewis-Palmer 38					
Littleton 6					
Mancos RE-6	X				
Manitou Springs 14					
Mapleton 1				X	X
Mesa County Valley 51				X	
Montrose County RE-1J	X			X	X
North Park R-1	X			X	
Park RE-2	X				
Platte Canyon 1	X				
Poudre R-1				X	X
Pueblo City 60				X	X
Roaring Fork RE-1	X				X
San Juan BOCES		X			
Sierra Grande R-30	X			X	X
Southeastern BOCES		X			
Steamboat Springs RE-2	X				
Summit RE-1	X				
Thompson R2-J				X	
Vilas RE-5	X			X	
Weld RE-3J	X				
Widefield 3					X
TOTAL	22	3	3	17	15



LEA Total Grant Award and Designation of Funds - K-12 District Determined

The majority of funds allocated to grantees through the K - 12 district determined program were used for professional development (\$228,557.30). The second largest allocation was used to support teacher participation in those trainings through stipends and substitute pay (\$104,216). Seven grantees allocated funds for tuition or fees towards endorsements or certifications (\$44,780.88).

Table 3: Local Education Agency Total Grant Award And Use Of Funds – K-12 District Determined

Local Education Agency	Total Grant Award	Tuition/Fees	Training	Materials	Stipends & Substitute Pay
Adams 12 Five Star Schools	\$10,875		\$10,875		
Branson Reorganized 82	\$14,078	\$8,787.88	\$600	\$3,149.88	
Centennial R-1	\$5,250		\$3,000		\$2,250
Charter School Institute(Pinnacle)	\$3,327	\$1,700		\$175	\$1,452
Cherry Creek 5	\$16,517	\$2,209	\$5,167.30	\$84.38	
Cheyenne Mountain 12	\$22,036		\$13,700		\$8,336
Denver County 1	\$30,000		\$30,000		
Douglas County RE 1	\$19,262				\$19,262
East Central BOCES	\$30,000	\$2,668	\$8,200	\$19,132	
Elizabeth C-1	\$12,409		\$7,537	\$4,309	
Englewood 1	\$1,800	\$1,800			
Estes Park R-3	\$14,000	\$3,616			
Falcon 49	\$30,000		\$8,400		\$21,600
Jefferson County R-1	\$29,980		\$25,200	\$3,644	\$1,136
Johnstown-Milliken RE-5J	\$29,375		\$23,000	\$6,375	
Kit Carson R-1	\$10,000		\$1,400	\$7,900	\$700
Littleton 6	\$29,692		\$22,668	\$7,024	
Manitou Springs 14	\$19,044		\$12,000		\$7,044
Mesa County Valley 51	\$30,000		\$21,400		\$6,664
Montrose County RE-1J	\$15,400		\$13,400		\$2,000
Poudre R-1	\$29,782		\$9,000	\$7,600	\$13,182
Summit RE-1	\$27,100		\$11,010	\$1,000	\$15,090
Thompson R2-J	\$30,000	\$24,000		\$3,000	\$3,000
Vilas RE-5	\$5,250		\$2,000	\$750	\$2,500
TOTAL	\$465,177	\$44,780.88*	\$228,557.30*	\$64,143.26*	\$104,216*

*Some subtotals do not add to total grant amounts due to grant funds yet to be expended.

LEA Total Grant Award and Designation of Funds - Elementary District Determined

The majority of funds allocated to grantees through the elementary district determined program were used for professional development (\$187,482). The second largest allocation was used to support teacher participation in those trainings through stipends and substitute pay (\$69,161). Only one grantee allocated funds for tuition or fees towards endorsements or certifications (\$7,000).

“The workshop made me realize that there is much more to computer science than coding. Understanding vocabulary concepts about computers and developing problem solving strategies are also way to teach about computer science.” -Anonymous Teacher



Table 4: Local Education Agency Total Grant Award And Use Of Funds – Elementary District Determined

Local Education Agency	Total Grant Award	Tuition/Fees	Training	Materials	Stipends & Substitute Pay
Branson Reorganized 82	\$10,625		\$5,087	\$1,038	\$4,500
Cheyenne County Re-5	\$15,000		\$15,000		
Cheyenne Mountain-12	\$25,154		\$12,000		\$13,154
Colorado Springs-11	\$26,093		\$20,000		\$6,093
Douglas County RE 1	\$13,704		\$9,800	\$900	\$3,004
Falcon 49	\$16,500		\$10,000		\$6,500
Harrison 2	\$5,996		\$3,000		\$2,996
Jefferson County R-1	\$29,995		\$27,320	\$581	\$2,094
Littleton 6	\$13,925		\$8,925		\$5,000
Mapleton 1	\$30,000		\$25,000		\$5,000
Mesa County Valley 51	\$10,920	\$7,000			\$3,920
Pueblo City 60	\$26,450		\$20,950		\$5,500
Southeastern BOCES	\$26,500		\$15,000	\$2,500	\$9,000
Thompson R2-J	\$19,440		\$15,400		\$2,400
TOTAL	\$270,302	\$7,000*	\$187,482*	\$5,019*	\$69,161*

*Some subtotals do not add to total grant amounts due to grant funds yet to be expended.

LEA Total Grant Award and Designation of Funds – State Sponsored

The majority of funds allocated to grantees through the state sponsored program were used to support teacher participation in the state sponsored trainings through stipends and substitute pay (\$72,750). The remainder of the allocation was used to cover the selected vendor professional development training fees (\$49,470).

Table 5: Local Education Agency Total Grant Award And Use Of Funds – State Sponsored

Local Education Agency	Total Teacher Participation	Training	Stipends & Substitute Pay
Adams 12 Five Star Schools	43	\$7,310	\$10,750
Aspen 1	7	\$1,190	\$1,750
Branson Reorganized 82	2	\$340	\$500
Centennial R-1	4	\$680	\$1,000
CSI (Pinnacle Charter)	1	\$170	\$250
CSI(RFM Academy)	4	\$680	\$1,000
CSI (Global Village Academy)	7	\$1,190	\$1,750
Cheyenne County RE-5	4	\$680	\$1,000
Clear Creek RE-1	2	\$340	\$500
Denver County 1	29	\$4,930	\$7,250
East Grand 2	6	\$1,020	\$1,500
Ellicott 22	2	\$340	\$500
Harrison 2	11	\$1,870	\$2,750
Jefferson County R-1	37	\$6,290	\$9,250
Lewis-Palmer 38	32	\$5,440	\$8,000
Mancos RE-6	4	\$680	\$1,000



Table 5: Local Education Agency Total Grant Award And Use Of Funds – State Sponsored (Continued)

Local Education Agency	Total Grant Award	Training	Stipends & Substitute Pay
North Park R-1	1	\$170	\$250
Park RE-2	1	\$170	\$250
Platte Canyon 1	4	\$680	\$1,000
Roaring Fork RE-1	2	\$340	\$500
San Juan BOCES	1	\$170	\$250
Sierra Grande R-30	2	\$340	\$500
Southeastern BOCES	9	\$1,530	\$2,250
Steamboat Springs RE-2	16	\$2,720	\$4,000
Summit RE-1	15	\$2,550	\$3,750
Weld RE-3J	14	\$2,380	\$3,500
Widefield 3	31	\$5,270	\$7,750
TOTAL	291	\$49,470	\$72,750

Our district plans to increase the number of computer science courses, particularly with a CTE focus on certifications and awareness, which is a priority for our district as part of our Vision 2020. Our computer science workgroup is focused on creating a vision for computer science in the district and exploring how we can support and realize that vision in the coming years. –Summit RE-1

“This workshop cleared up some common misconceptions held by elementary teachers, especially the most common myth that elementary teachers cannot incorporate computational thinking into their lessons.” -Anonymous Teacher



Program Implementation Activities

Implementation Activities

Through the use of the K-12 and elementary district determined grant programs, grantees were able to select the professional development providers which best met the needs of their districts. Thus, a variety of professional development options were funded through the grant. Districts could use grant funds to contract with a provider to train their teachers, or districts could allocate money to specific teachers to participate in trainings by various providers. Additionally, grantees are able to utilize grant funds for university tuition, online courses, and district directed professional development. Table 6 illustrates the types of training districts provided by grade level across all grantees.

Table 6: Implementation Activities by Grade Level

Type of Professional Development	High School	Middle School	Elementary School
University Courses	CS STEMPath (Masters/Endorsement Courses)	CS STEMPath (Masters/Endorsement Courses)	CS STEMPath (Masters/Endorsement Courses)
	Cryptography Course @ School of Mines		
	Web Programming Course @ School of Mines		
	Java Programming Course @ School of Mines		
	Special Interest Group in Computer Science Education of the Association for Computing Machinery (SIGSCE) Conference		
	Data Science Course @ School of Mines		
Workshops	Colorado School of Mines CS Summer PD	Code.org CS Discoveries	Code.org CS Fundamentals
	Code.org CS Discoveries	Wonder Workshop	BootUp
	3D Printing & Prototyping	MindSpark CS Deep Dives	MindSpark CS Deep Dives
	Bootstrap: Data Science	MindSpark Robotics	MindSpark Robotics
	CSTA Conference	Ozobot Workshop	Ozobot Workshop
	AP Institute	Robotics Cue Training	Robotics Cue Training
	AP Computer Science Principles	School of Mines CS PD	MindSpark Design Thinking
	PBL Academy +CS	3D Printing & Prototyping	School of Mines CS Summer PD
	GJ Makerspace Training	Snap! @ School of Mines	Bitsbox
	PCS Edventures	SparkFun Electronics	3D Printing & Prototyping
		Solidworks	GJ Makerspace Training
		GJ Makerspace Training	
Online Courses	UC San Diego: How VR Works		University of West Alabama – CS in K-5
	UC San Diego: Creating VR Apps		
	CSU Global: IS360: Intro to Cyber Security and Digital Crime		
	CSU Global, ITS350: Information Systems and Security		
District Directed Development		District CS Curriculum Group	District CS Curriculum Group
		District CS Leadership Group	District CS Leadership Group



LEA Computer Science Course Data

Local Education Agency Computer Science Courses Offered

Computer science has the potential to open doors for Colorado students to engage in learning and prepare them for a bright future. The intent of the CSEd program is to increase the opportunities in computer science education in Colorado. The data submitted by grantees shows an increase of 285 computer science courses offered by grantee districts. Table 7 illustrates the aggregated total number of courses in middle and high school offered pre and post grant within grantee districts.

Table 7: Number of Computer Science Courses offered by Local Education Agencies

Local Education Agency	Pre-grant	Post-grant	Net Increase
Adams 12 Five Star Schools	223	333	110
Branson Reorganized 82	1	9	8
Cherry Creek 5	8	11	3
Cheyenne County Re-5	0	1	1
Cheyenne Mountain 12	3	5	2
Colorado Springs-11	67	78	11
CSI (Pinnacle Charter)	5	6	1
CSI(RFM Academy)	5	5	0
Denver County 1	12	14	2
Douglas County RE 1	3	9	6
Elizabeth C-1	11	16	5
Ellicott 22	2	5	3
Englewood 1	3	3	0
Estes Park R-3	7	10	3
Falcon 49	25	26	1
Harrison 2	12	20	8
Ignacio 11 JT	2	4	2
Jefferson County R-1	187	215	28
Johnstown-Milliken RE-5J	0	22	22
Kit Carson R-1	9	11	2
Lewis-Palmer 38	5	8	3
Littleton 6	0	5	5
Mancos RE-6	12	12	0
Manitou Springs 14	3	6	3
Mapleton 1	0	2	2
Mesa County Valley 51	9	13	4
Montrose County RE-1J	4	4	0
Poudre R-1	6	7	1
Pueblo City 60	10	48	38
Roaring Fork RE-1	20	20	0
Southeastern BOCES	22	24	2
Steamboat Springs RE-2	2	4	2
Summit RE-1	5	5	0
Vilas RE-5	0	1	1
Weld RE-3J	15	15	0
Widefield 3	4	10	6
TOTAL	702	987	285



Impact on Teachers and Students

Summary of Impact

Based on information available at the writing of this report, a total of 1,166 teachers were trained through the CSEd grant program. This count does include the total projected number of teachers to be trained across the state as additional teachers will receive training through December 2019. The average cost of training is \$735 per teacher. Based upon data reported by the grantees, the 1,166 trained teachers will impact approximately 62,907 K-12 students within Colorado's public school system. Table 8 illustrates the aggregated total number of teachers trained at each grade band and total number of K-12 students directly impacted by training.

Table 8: Aggregated Totals of Teachers and Students for CSEd Grantees

Total # of Grantees	Total # of Rural Grantees	Total # of Teachers Trained	Total # of Endorsements Gained	Total # of K-5 Teachers Trained	Total # of 6-8 Teachers Trained	Total # of 9-12 Teachers Trained	Total # of Students Directly or Indirectly Impacted
48 Grantees (67 Grants)	23	1,166	10	811	202	153	62,907

Student Numbers by Grade Band

Based on information available at the writing of this report, a total of 62,907 students will be impacted through the CSEd grant program. Figure 2 illustrates the total number of students impacted across all grantees by grade band.

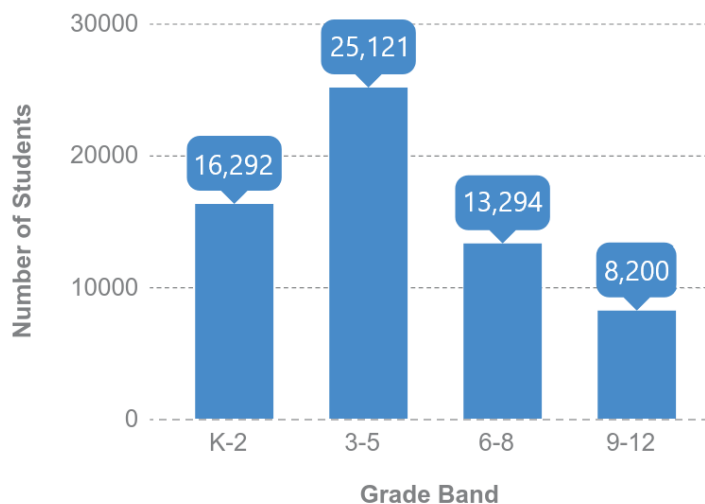


Figure 2. Total Number of Students Impacted by Grade Band

"I have very minimal experience with computer science, and these workshops have helped me understand that computer science is not scary or too difficult for even very young children. My own excitement about computer science will be apparent to my students and staff and will hopefully increase their confidence and excitement as well." - Anonymous Teacher



Conclusion

The Colorado Department of Education has continued to administer the CSEd grant with the goal of increasing the number of teachers available to provide computer science education in Colorado. In its second year, the CSEd grant program has worked towards this goal by providing access to high quality professional development through various providers. This professional development has introduced teachers to computational thinking, the use of computational thinking as a problem solving process across all disciplines, both online and unplugged methods of teaching computer science, and the integration of computer science into general classroom curriculum.

Throughout the 2018-19 fiscal year, the CSEd grant has resulted in growth in the number of teachers trained and LEAs reached. The amount of teachers served increased from 355 in the 2017-18 fiscal year to 1,166, a growth of 228.45 percent, a net increase of 811 trained teachers. Additionally, LEAs have experienced growth in the number of computer science courses offered and reported 10 teachers earning a CDE endorsement connected to computer science education. In an effort to sustain computer science programming, many have started to develop K-12 pathways in their schools.

Furthermore, with the addition of \$500,000 in grant funding focused on elementary education, the CSEd grant program witnessed an increased focus on providing computer science training to elementary teachers. This funding increase led to the creation of the elementary district determined and state sponsored elementary training options within the grant program. Due to the expanded options the number of elementary teachers served increased from 151 in the 2017-18 fiscal year to 811 in the 2018-19 fiscal year. This is a net increase of 660, and a growth of 437 percent. In all, these numbers represent the significant impact of the Computer Science Teacher Education Grant Program in Colorado.

“All of this training made me realize the importance of getting computer science incorporated into our buildings at every level. It's no longer something that is nice to have--it's a vital component of the education we provide in our school district. My barrier was understanding how to teach computer science and what to focus on under such a broad subject. The training made teaching computer science seem practical and more approachable.”
-Anonymous Teacher