



COLORADO
Department of Education

2020 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) 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 including 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 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.

“This workshop helped me to build belief and purpose in computer science, and the why it needs to be part of the learning for every kid!”

- K-5 Teacher

Fiscal Year 2019-20 Summary

The legislature appropriated \$1,048,000 to administer the grant program for computer science teacher professional development during the 2019-20 school year. Excluding administrative costs necessary to administer the grant allowed under statute, approximately \$855,050 was available for distribution to LEAs.

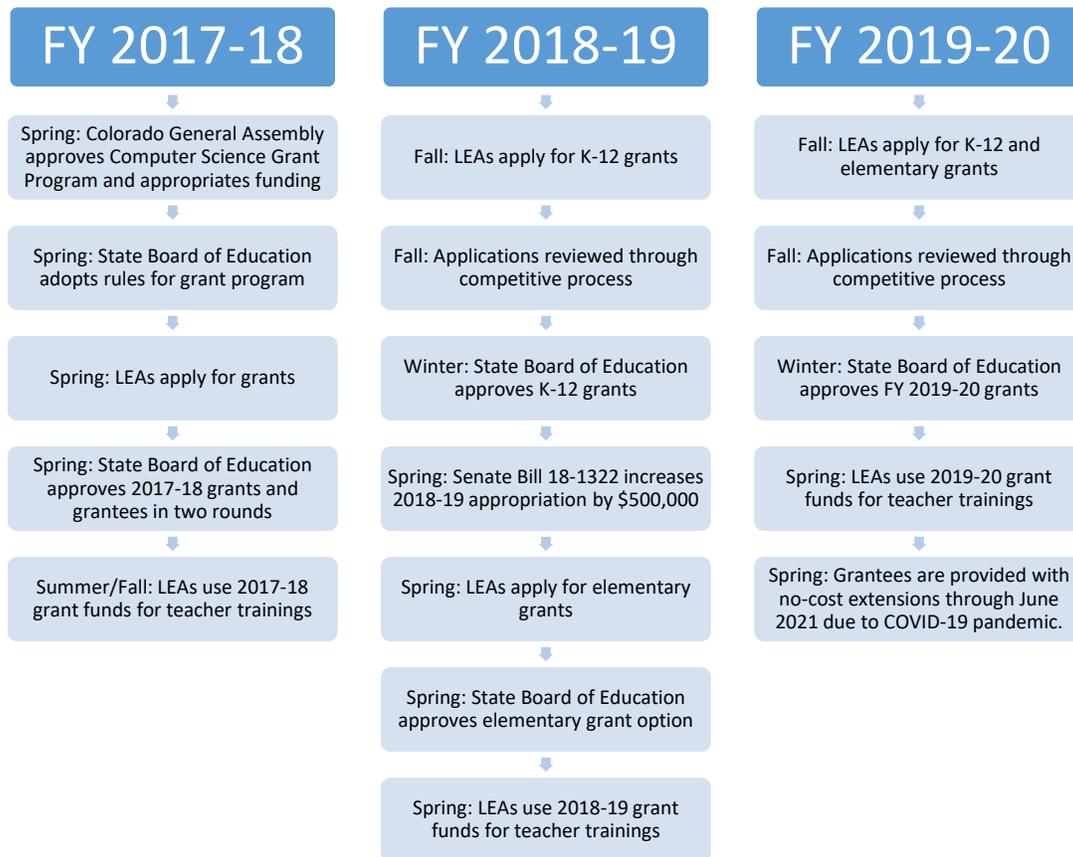
CDE administers the CSEd grant program as three separate professional development programs: (1) a K – 12 district determined program, (2) an elementary district determined program, and (3) a state sponsored elementary regional program in which districts apply for individual teacher slots for the training.

Implementation of this grant program was complicated by the COVID-19 pandemic during the second half of the 2019-20 fiscal year due. The disruption to in-person learning since March 2020, and the need for teachers to plan for remote learning halted the professional development school districts originally had planned for their teachers. Due to these challenges, the grantees of this program were provided with a no-cost extension, which allowed grantees to spend fiscal year 2019-20 funds through June 2021. A no-cost extension extends the project period beyond the original project end date, and as the phrase “no cost” suggests, there is no additional funding. Therefore, this report contains many projections associated with the number of teachers to be trained. The COVID-19 pandemic also led to a change in the delivery format of the state sponsored training with our vendor, the Colorado School of Mines, administering the training in a virtual format.



Timeline

For the 2019-20 fiscal year, the application and distribution of grant funds were completed in fall 2019. Grantees originally had the opportunity to expend funds through September 30, 2020. Due to the COVID-19 pandemic, grantees were provided a no-cost extension, meaning they could expend funds through June 30, 2021. The diagram that follows illustrates the CSEd grant funding cycles since the inception of the program.



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.



Local Education Agency Participation

CDE received 47 applications across all three grant programs from districts, Charter School Institute schools, and Boards of Cooperative Educational Services (BOCES) for the 2019-20 school year. For FY 2019-20, applicants requested a total \$944,608. Ten school districts applied for multiple grant options: Adams 12 Five Star Schools, Branson Reorganized 82, Bayfield 10 JT-R, Cheyenne County RE-5, CSI – Pinnacle Charter School, Frenchman RE-3, Harrison 2, Jefferson County R-1, Mesa County Valley 51, Thompson R2-J, and Westminster Public Schools. After committee reviews, CDE awarded 42 CSEd grants totaling \$787,872 and did not recommend 5 applications due to unallowable expenditures and incomplete applications. Table 1 illustrates the number of grants, amounts applied for, and the amounts awarded by category.

Table 1: 2019-20 Computer Science Education Grant Applications by Category

Grant Option	# of LEAs Applied	Amount Applied For	# of LEAs Approved	Amount Awarded
K-12 District Determined	22	\$528,622	20	\$456,929
Elementary District Determined	16	\$360,226	13	\$289,743
State Sponsored	9	\$55,760	9	\$41,200
Totals	47	\$944,608	42	\$787,872

“The main reasons for the choice to pursue different degrees is content specialization, diversification of master-degree level knowledge, and creating breadth of industry knowledge among staff members in our team. We could get more out of our training by diversifying and having different specializations who later can bring that knowledge into the classroom thus creating well rounded, better prepared future computer science candidates. If the hospital is only filled with orthopedic surgeons, who is going to take care of the patient who needs heart surgery?”

- 9-12 Teacher

Figure 1 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.

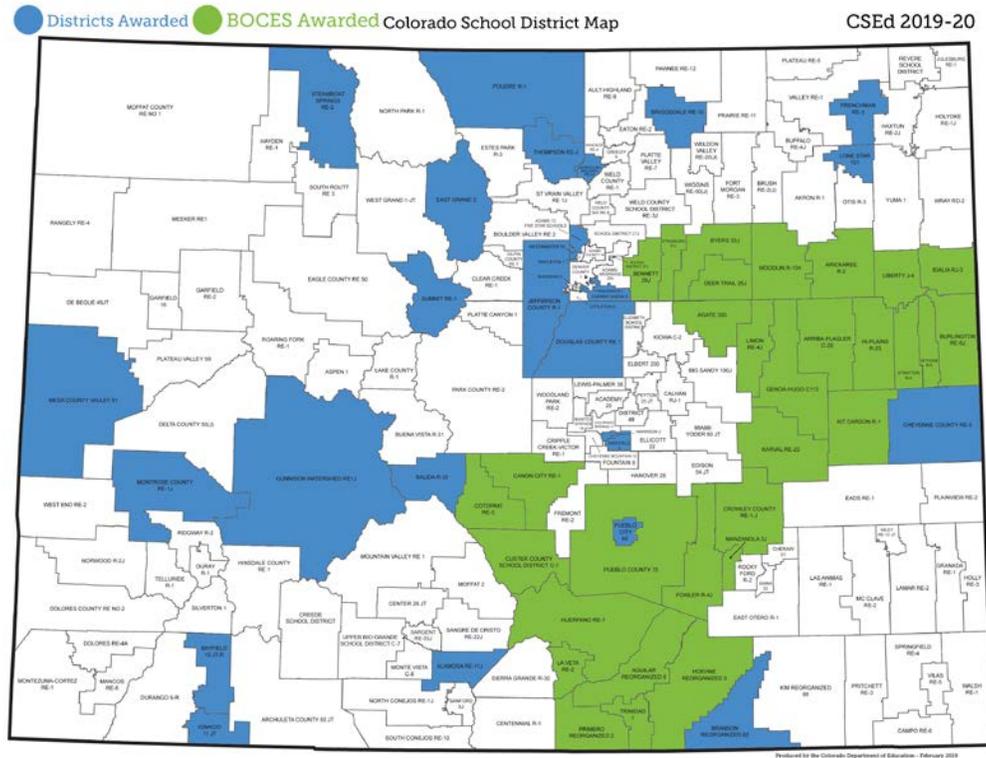


Figure 1. Geographic Location of CSEd Grantees across Colorado

Local Education Agency Priority Criteria

As noted previously, the CSEd grant program prioritizes LEAs designated as rural and those with high populations of minority and/or low-income students. Eighteen of the 2019-20 grantees are designated as rural or small rural districts, 12 as non-rural, two as BOCES, and two as schools within the Charter School Institute according to CDE definitions¹. It is important to note that both BOCES also represent rural districts. In addition, 15 grantees have student populations greater than 42 percent who are eligible for free or reduced-price lunches and 11 grantees have student populations greater than 46.6 percent minority. Table 2 below lists all grantees and the priority area(s) each grantee met. Ten percent of the total grant funds went to grantees that met all three priority areas, 25 percent went to grantees meeting two priority areas, 50 percent went to grantees meeting at least one priority area, and 14 percent 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. - [Rural Education Council | CDE \(https://www.cde.state.co.us/ruraledcouncil\)](https://www.cde.state.co.us/ruraledcouncil)



Table 2: 2019-20 Computer Science Education Grant Awardees by Priority Area

Local Education Agency	Rural	BOCES	Charter	>42% Free or Reduced Lunch	>46.6% Minority
Adams 12 Five Star Schools					X
Alamosa RE-11J	X			X	X
Bayfield 10 JT-R	X				
Branson Reorganized 82	X				
Briggsdale RE-10	X				
Cherry Creek 5				X	X
Cheyenne County Re-5	X			X	
CSI (Pinnacle Charter)	X		X	X	X
CSI (RFM Academy)			X	X	X
Douglas County RE 1					
East Central BOCES	X	X			
East Grand 2	X				
Frenchman RE-3	X				
Gunnison Watershed RE1J	X				
Harrison 2				X	X
Ignacio 11 JT	X			X	X
Jefferson County R-1					
Johnstown-Milliken RE-5J	X				
Lone Star 101	X			X	
Mesa County Valley 51				X	
Montrose County RE-1J	X			X	X
Poudre R-1					
Pueblo City 60				X	X
Salida R-32	X				
South Central BOCES	X	X		X	X
Steamboat Springs RE-2	X				
Summit RE-1	X				
Thompson R2-J				X	
Westminster Public Schools				X	X
Widefield 3				X	
TOTAL	18	2	2	15	11

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

The majority of funds allocated to grantees through the K - 12 district determined program were used for professional development/training (\$217,776). The second largest allocation was by the 11 grantees which allocated funds for tuition or fees towards endorsements or certifications (\$110,220). This is a substantial increase in the amount of funding which was allocated towards higher education courses than the 2018-19 school year (\$44,780). Table 3 shows the LEAs that were awarded funds and the anticipated use of funds.

Table 3: 2019-20 Total Grant Award And Use Of Funds: K-12 District Determined Program

Local Education Agency	Total Grant Award*	Tuition/Fees	PD/Training	Materials	Stipends & Substitute Pay
Adams 12 Five Star Schools	\$24,684.58	\$5,757	\$2,000		
Alamosa Re-11j	\$8,809.84	\$4,224	\$4,000	\$2,000	
Bayfield 10 Jt-R	\$30,000		\$30,000		
Branson Reorganized 82	\$20,019.94	\$3,950	\$13,629		\$1,950



Cherry Creek 5	\$24,455.82		\$23,227	\$1,228	
CSI - Pinnacle Charter School	\$10,075		\$1,249		\$325
Douglas County Re 1	\$25,720.02				\$25,720
East Central BOCES	\$25,800		\$10,700	\$12,009	\$2,400
Frenchman Re-3	\$30,000	\$22,411			\$7,589
Harrison 2	\$2,611.82		\$2,000		\$611
Jefferson County R-1	\$25,787.10	\$1,545	\$8,000		
Mesa County Valley 51	\$25,639.18	\$2,543	\$2,000		\$6,808
Montrose County Re-1j	\$25,714		\$25,714		
Poudre R-1	\$25,181.36	\$12,400			\$23,532
Pueblo City 60	\$25,800	\$25,800			
Salida R-32	\$15,086	\$11,060			\$4,026
South Central BOCES	\$30,000		\$8,232		
Summit Re-1	\$25,744.10		\$14,925		\$10,796
Thompson R2-J	\$25,800	\$100	\$100	\$100	\$150
Westminster Public Schools	\$30,000	\$20,430			
TOTAL	\$456,928.76*	\$110,220	\$217,776	\$15,337	\$83,907

*Some subtotals do not add to total grant amounts due to grant funds yet to be expended, or subject to change, due to COVID-19 pandemic.

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/training (\$185,808). The second largest allocation was used to support teacher participation in those trainings through stipends and substitute pay (\$67,999). To date, no grantee allocated funds for tuition or fees towards endorsements or certifications. Table 4 shows all of the LEAs who were awarded funds and the anticipated use of funds.

“The professional development brought programming to life with real life situations and robots to solve problems.”

- 9-12 Teacher

Table 4: 2019-20 Total Grant Award And Use Of Funds: Elementary District Determined

Local Education Agency	Total Grant Award*	Tuition/Fees	Training	Materials	Stipends & Substitute Pay
Adams 12 Five Star Schools	\$27,911.42		\$3,000		\$5,452
Bayfield 10 Jt-R	\$8,900				\$8,900
Cheyenne County Re-5	\$25,850		\$18,350		\$7,500
East Grand 2	\$28,638		\$25,618	\$520	\$2,500
Frenchman Re-3	\$13,840		\$9,465		\$4,375
Gunnison Watershed Re1j	\$19,690		\$14,390	\$4,460	
Harrison 2	\$12,087.46		\$6,400		\$5,580
Jefferson County R-1	\$28,134.20		\$13,400		\$5,465
Johnstown-Milliken Re-5j	\$28,200		\$28,423		
Lone Star 101	\$28,087		\$18,487	\$1,400	\$8,200
Steamboat Springs Re-2	\$10,547		\$7,775		\$2,772
Thompson R2-J	\$27,857.84		\$18,000		\$9,755
Westminster Public Schools	\$30,000		\$22,500		\$7,500
TOTAL	\$289,742.92*	\$0	\$185,808	\$6,380	\$67,999



*Some subtotals do not add to total grant amounts due to grant funds yet to be expended, or subject to change, due to COVID-19 pandemic.

Total Grant Award and Designation of Funds: State Sponsored

The majority of funds allocated to grantees through the state sponsored program were used to cover the selected vendor professional development training fees (\$32,200), and the additional contractual cost of transitioning the training to a virtual format (\$9,000). The remainder of the allocation was used to support teacher participation in the state sponsored trainings through stipends and substitute pay (\$19,650). Table 5 shows all of the LEAs who were awarded funds and how they anticipate to use the funds.

Table 5: 2019-20 Local Education Agency Total Grant Award And Use Of Funds – State Sponsored

Local Education Agency	Total Teacher Participation	Training	Stipends & Substitute Pay
Branson Reorganized 82	2	\$560.00	\$300.00
Briggsdale Re-10	0	\$0.00	\$0.00
Cheyenne County Re-5	6	\$1,680.00	\$900.00
CSI - Pinnacle Charter School	1	\$280.00	\$150.00
CSI - Ricardo Flores Magon	2	\$560.00	\$300.00
Ignacio 11 Jt	1	\$280.00	\$150.00
Jefferson County R-1	40	\$11,200.00	\$6,000.00
Mesa County Valley 51	40	\$11,200.00	\$8,400.00
Widefield 3	23	\$6,440.00	\$3,450.00
TOTAL	115	\$32,200	\$19,650

“I feel more prepared as a teacher as some of the lessons revolve around pedagogy for teaching computer science. What scaffolding that may work in a traditional classroom may not work with a computer science course. So learning new teaching tools has also been something I have gained from the workshop!”

- 9-12 Teacher

“This workshop helped me understand the importance of teaching computer science to our youngest learners. Computer science helps students become critical thinkers.”

- K-5 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 develop options were funded through the grant. Grantees can use grant funds to contract with a provider to train their teachers, or grantees can 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 grantees provided by grade level across all grantees.



Table 6: 2019-20 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)
	CS@Mines Computer Science Endorsement Program		
	Computer Science Education Graduate Certificate @ College of St. Scholastica		
	Cryptography Course @ School of Mines		
	Web Programming Course @ School of Mines		
	Java Programming Course @ School of Mines		
	Python Programming Course @ School of Mines		
	Data Science Course @ School of Mines		
	Principles of Career and Technical Education @ CSU		
	Building Student Organizations/Partnerships @ CSU		
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
		3D Printing & Prototyping	School of Mines CS Summer PD
		Snap! @ School of Mines	Bitsbox
		SparkFun Electronics	3D Printing & Prototyping
District Directed Development		District CS Curriculum Group	District CS Curriculum Group
		District CS Leadership Group	District CS Leadership Group

Computer Science Course Data

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 67 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. Note that reporting these data is optional for grantees who use funds to support computer science teacher education within primary grade bands. However, these data are required of grantees who use the grant to support computer science teacher education at the secondary level.



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

Local Education Agency	Pre-grant	Post-grant	Net Change
Adams 12 Five Star Schools	220	194	-26
Alamosa RE-11J	5	6	1
Bayfield 10 JT-R	7	1	-6
Cheyenne County Re-5	0	1	1
CSI (Pinnacle Charter)	0	2	2
East Central BOCES	10	14	4
Frenchman RE-3	1	1	0
Gunnison Watershed RE1J	6	7	1
Harrison 2	2	2	0
Jefferson County R-1	512	582	70
Mesa County Valley 51	13	18	5
Montrose County RE-1J	6	9	3
Poudre R-1	19	23	4
Pueblo City 60	4	4	0
Salida R-32	0	0	0
South Central BOCES	12	20	8
Summit RE-1	8	7	-1
Thompson R2-J	8	8	0
Westminster 50	4	5	1
TOTAL	837	904	+67

“It enhanced the importance of critical thinking and problem solving and how it can be done in a fun and interactive way.”

- K-5 Teacher

“I really loved the conversation around equity and artificial intelligence because this sparked more of an interest for me to start more computer science opportunities for girls at the elementary level. Being a female educator of color, it really hit home and opened my eyes at the impact I might be able to have early on in a child’s life.”

- K-5 Teacher

Impact on Teachers and Students

Summary of Impact

Based on information available at the writing of this report, a total of 658 teachers were trained, or have been projected by districts to be 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 June 2021. The average cost of training is \$1,197 per teacher based upon the \$787,872 of grant funds awarded. Based upon



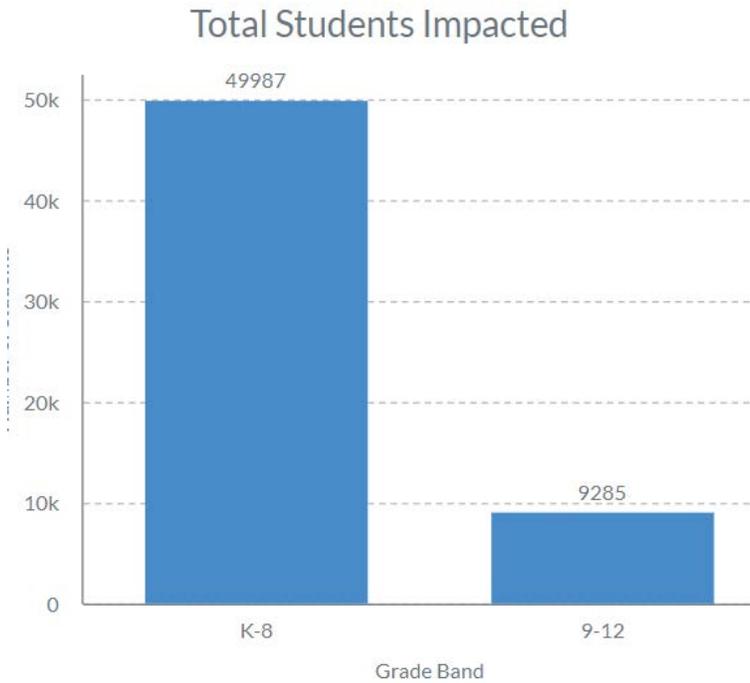
data reported by the grantees, the 658 anticipated trained teachers will impact approximately 59,272 K-12 students within Colorado’s public school system. Table 8 illustrates the aggregated total number of teachers trained at each grade band and total number of K-12 students directly impacted by training.

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
42 Grantees	18	658	0	449	108	101	59,272

Student Numbers by Grade Band

Based on information available at the writing of this report, a total of 59,272 students have been impacted through the CSEd grant program. Figure 2 illustrates the total number of students impacted across all grantees by grade band.



“This workshop helped to expand my thinking of cross-curricular integration when it comes to using computer science outside of my technology classroom with other grade-level teachers, especially in the elementary grades.”

- K-5 Teacher

Figure 2. Total Number of Students Impacted by Grade Band



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 third 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 2019-20 fiscal year, the CSEd grant has resulted in a substantial increase in the amount of funding which was allocated towards higher education computer science courses and awarded grants to numerous rural communities previously unreached. Additionally, grantees have reported an increase in teachers working towards a CDE endorsement connected to computer science education. In self-reported data grantees experienced a net increase in computer science courses offered. While this data is affected by many factors, and therefore cannot be directly attributed to the grant, the increase in teachers trained in computer science education leads to additional staff qualified to teach these courses. Further, in an effort to sustain computer science programming, many grantees have started to develop or modify K-12 computer science pathways in their schools as part of their grant application.

Implementation of this grant program has been complicated by the COVID-19 pandemic during the 2019-20 fiscal year. The impact of COVID-19 is most clearly seen through teacher participation in the CSEd program. The number of teachers served decreased from 1,166 in the 2018-19 fiscal year to 658 so far, a reduction of 44 percent, and a net decrease of 508 trained teachers. The decrease in teacher participation may also be due to the inconsistency of in person learning, the lack of available substitutes, and the need for teachers to plan for remote learning, which halted the professional development school districts originally had planned for their teachers.

Though we have faced many complications due to COVID-19, there have been high points. With the addition of \$500,000 in grant funding focused on elementary teachers in the 2018-19 fiscal year, the CSEd grant program was able to continue the state sponsored training option in an effort to provide more computer science training to elementary teachers. During the spring and early summer CDE was able to collaborate with our vendor, Colorado School of Mines, to quickly change the delivery format to be fully online. This change will be beneficial to any future grantees, as it allows for an expansion in the program's reach into rural areas.

“Building the why, the belief in the need, relevance, and importance of computer science is a barrier for other teachers within my school. This training helped give me tools to remove these barriers, but the barriers are not yet completely removed.”

- K-5 Teacher