COLORADO
Department of Education

2022 Legislative Report

Computer Science Teacher Education Grant Program

Submitted to:
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 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. This is accomplished through providing funding for professional development to introduce 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. 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. Due to COVID-19 budget restraints, funding for this grant was reduced back to $500,000 in FY 2020-21 and has remained at that level for the past 3 years. Complications related to COVID-19 also shifted how sections of the grant program operated, such as shifting the state sponsored training to a virtual format.

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.

Fiscal Year 2021-22 Summary

The legislature appropriated $551,658 to administer the grant program for computer science teacher professional development during the 2021-22 school year. Excluding administrative costs necessary to administer the grant allowed under statute, approximately $458,000 was available for distribution to LEAs.

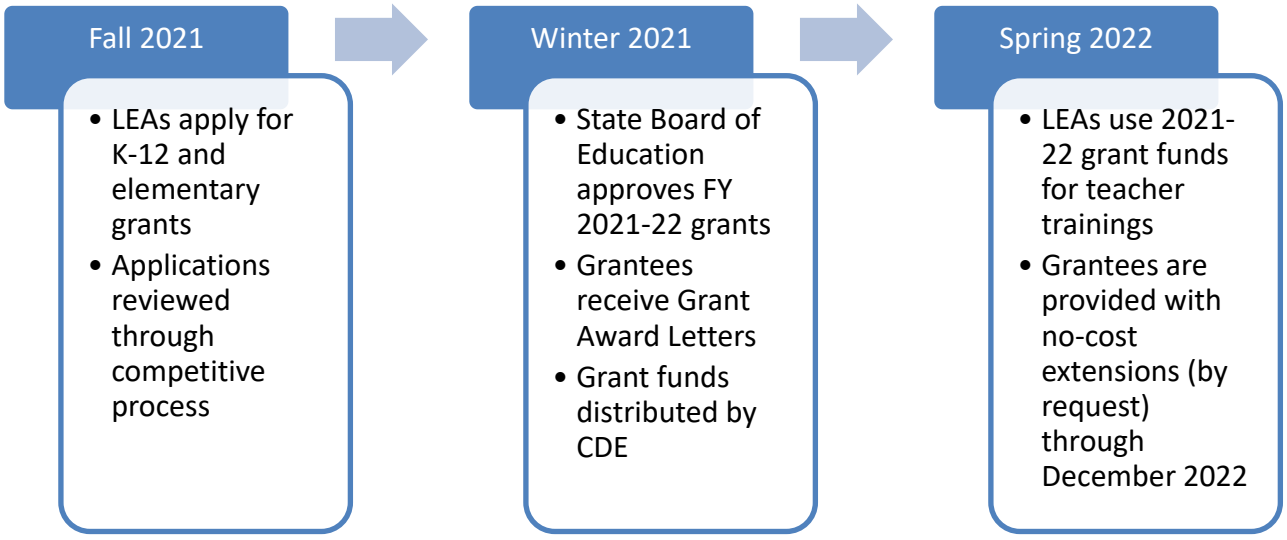
In previous years, CDE administered the CSEd grant program as three separate professional development programs: (1) a K – 12 district determined program, (2) an elementary district determined program, and (3) a state sponsored elementary regional program in which districts apply for individual teacher slots for the training. Due to the COVID-19 related allocation reduction, CDE administered only two of the three grant programs: (1) a K – 12 district determined program; and (2) a state sponsored elementary regional program.

Implementation of this grant program was complicated by the continuation of the COVID-19 pandemic during the 2021-22 fiscal year. The continued disruption to in-person learning, staff shortages, and the reduced availability of professional development providers halted or slowed much of the profession 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 upon request, which allowed grantees to spend fiscal year 2021-22 funds through December 2022. A no-cost extension extended the project period beyond the original project end date, and as the phrase "no cost" suggests, there was no additional funding. Therefore, this report contains many projections associated with the number of teachers to be trained for those districts requiring an extension, as end of grant reporting was not available by the drafting and submission of this report. The response to, and recovery from, the COVID-19 pandemic also led to a continued change in the delivery format of the state sponsored training with CDE's vendor, the Colorado Schoolof Mines, administering the training in a virtual format.

Timeline

For the 2021-22 fiscal year, the application and distribution of grant funds were completed in fall 2021. Grantees were to expend funds through September 30, 2022. If grantees were provided with a no-cost extension, they could expend funds through December 31, 2022. Diagram 1 below illustrates the CSEd grant funding cycles through the 2021-22 fiscal year. Appendix A shows more information about the CSEd grant funding cycles since the inception of the program.

DIAGRAM 1: Funding Levels and Distribution



Eligibility

Local education agencies that participated in the CSEd grant program were eligible to receive up to $30,000 to provide teachers with professional development in computer science. The funds could be used for any of the following:

- Tuition, including fees;

- Professional development training program costs (including substitute/stipends); 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 in the grantee selection process, CDE provided applying LEAs with assistance in completing the application to aide in meeting their goals for establishing or bolstering their computer science programming.

Computer Science Grant Participation & Funding Allocations

Local Education Agency Participation

CDE received 17 applications across both grant programs from districts, Charter School Institute schools, and Boards of Cooperative Educational Services (BOCES) for the 2021-22 school year. For FY 2021-22, applicants requested a total of $422,516. Three school districts applied for multiple grant options: Adams-Arapahoe 28J, Jefferson County R-1, and Pueblo City 60. After committee reviews, CDE awarded 17 CSEd grants totaling $422,516. Table 1 illustrates the number of grants, amounts applied for, and the amounts awarded by category.

TABLE 1: 2021-22 Computer Science Education Grant Applications by Category

Grant Option	# of LEAs Applied	Amount Applied For	# of LEAs Approved	Amount Awarded
K-12 District Determined	14	$386,516	14	$386,516
State Sponsored	3	$36,000	3	$36,000
Totals	17	$422,516	17	$422,516

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.

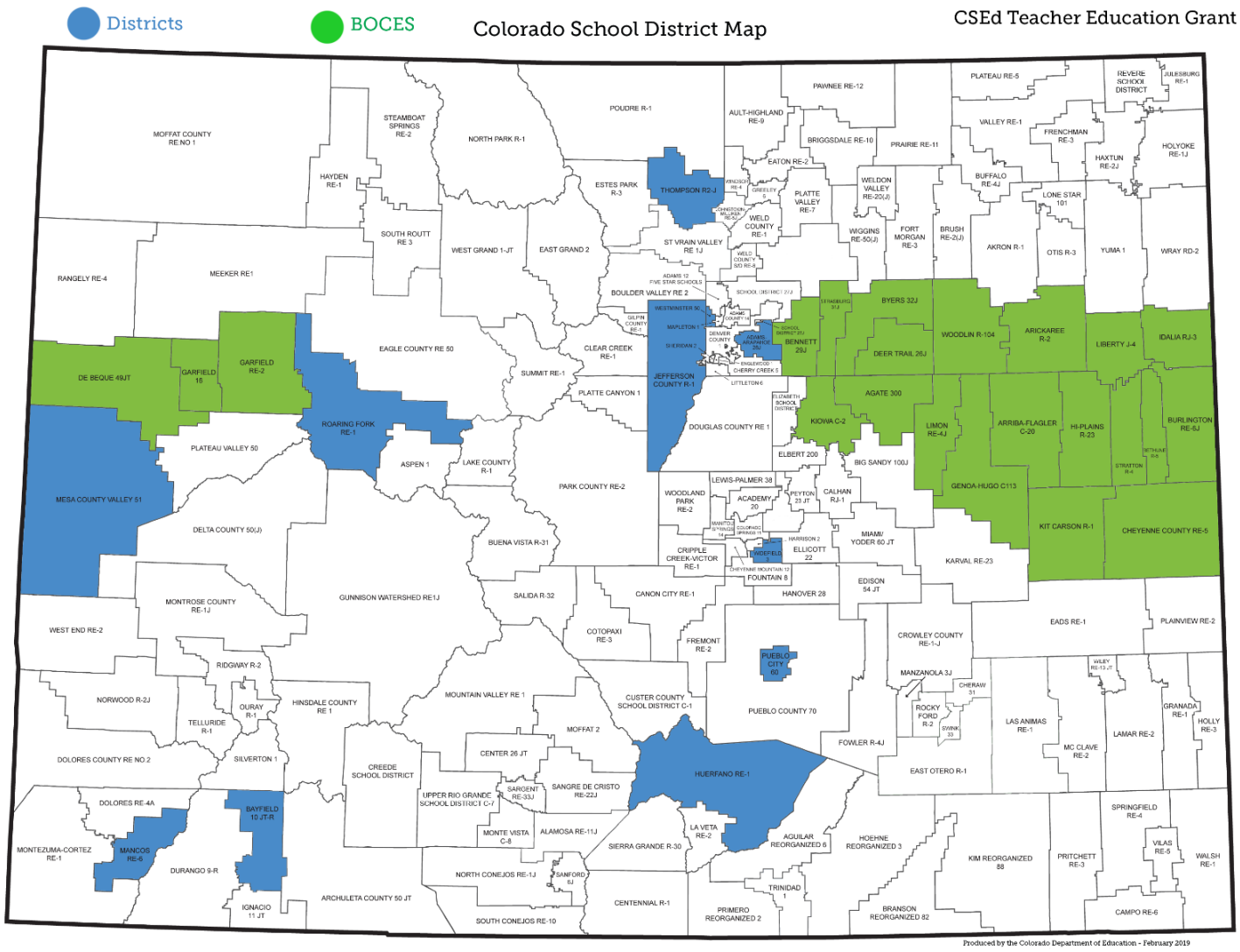


Figure 1. Geographic Location of CSEd Grantees across Colorado.

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. Six out of the seventeen 2021-22 grantees are designated as rural or small rural districts, ten as non-rural, two as rural BOCES, and one as a charter school according to CDE definitions.[1] It is important to note that the BOCES also represent rural districts. In addition, ten grantees have student populations greater than 42 percent (the state average) who are eligible for free or reduced-price lunches and 11 grantees have student populations greater than 46.6 percent (the state average) minority. Figure 2 below provides a summary of the priority areas the grant serves. For a detailed listing of all grantees and the priority area(s) each grantee met, view Appendix B. Twelve percent of the total grant funds went to grantees that met all three priority areas, 47 percent went to grantees meeting two priority areas, 29 percent went to grantees meeting at least one priority area, and 12 percent went to grantees who did not meet any priority criteria.

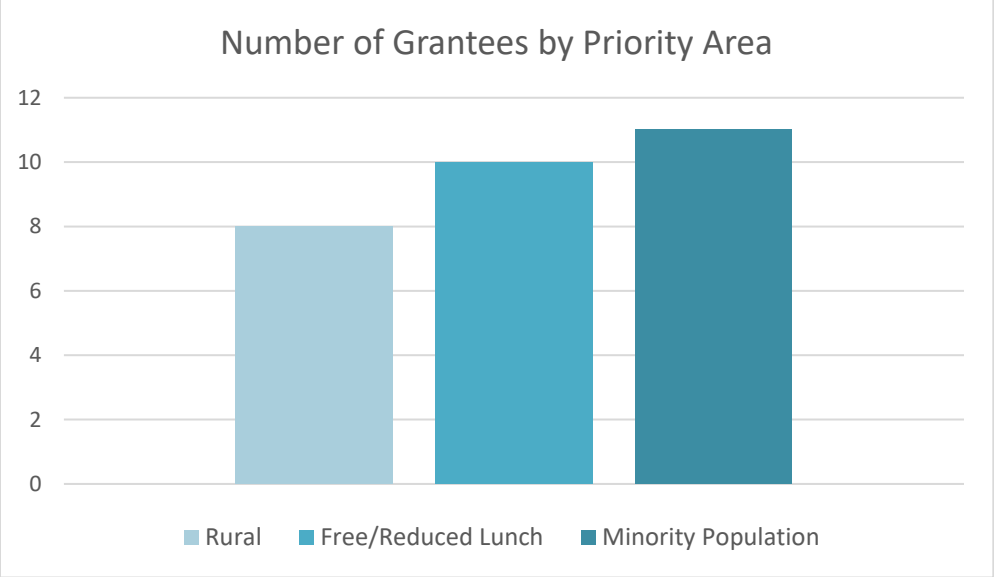


Figure 2. 2021-22 Computer Science Education Grant Awardees by Priority Area.

[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)

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

Most funds allocated to grantees through the K - 12 district determined program ($145,367) were used for professional development/training, which was an increase from the amount allocated during the 2020-21 school year ($113,308). The second largest allocation category was funds for stipends and substitute pay ($97,026), a substantial increase from the 2020-21 school year ($49,443). Figure 3 shows an overall summary of the anticipated allocation of funds. For a detailed listing of the LEAs that were awarded funds and the anticipated use of funds see Appendix C; note that this data is not inclusive of all of grant funds allocated due to LEAs which were provided extensions. For a detailed list of participant numbers by LEA and grade band see Appendix D.

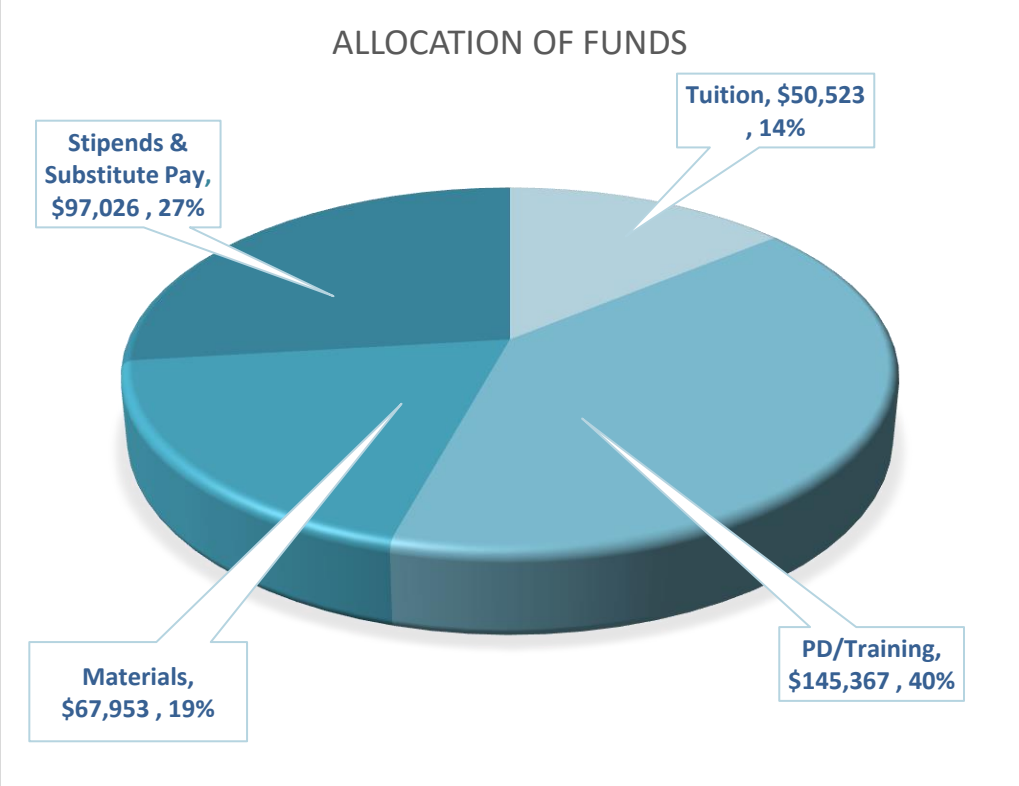


Figure 3. 2021-22 Computer Science Education Grant Allocation of Funds.

Total Grant Award and Designation of Funds: State Sponsored

Most funds allocated to grantees through the state sponsored program were used to cover the total of the selected vendor professional development training fees of $9,900. The remainder of the allocations were used to support teacher participation in the state sponsored training through stipends ($4,950). Table 2 below shows the LEAs who were awarded, and how the funds we allocated for training fees and teacher stipends.

TABLE 2: 2021-22 Local Education Agency Total Grant Award and Use of Funds – State Sponsored

Local Education Agency	Total Teacher Participation	Training	Stipends
Adams-Arapahoe 28J	6	$1,800	$900
Jefferson County R-1	6	$1,800	$900
Pueblo City 60	21	$6,300	$3,150
TOTAL	33	$9,900	$4,950

Program Implementation Activities

Implementation Activities

Using 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. 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 training by various providers. Additionally, grantees can utilize grant funds for university tuition, online courses, and district directed professional development. A detailed list of these activities may be found in Appendices E-G. These tables provide a listing of training programs and courses grantees selected for implementation by grade level.

Computer Science Course Data

Computer Science Courses Offered

The intent of the CSEd program is to increase the opportunities in computer science education in Colorado. The data submitted by grantees show an increase of 53 computer science courses offered by grantee districts. Though each district maintains the ability to determine the curriculum of their courses, through SB17-296 CDE provides a definition of computer science education. Based upon this definition a computer science education course includes the study of computers, algorithmic processes, and computer programming and coding, including their principles, their hardware and software designs, their applications, and their impact on society. Figure 4 illustrates the aggregated total number of courses in middle and high school offered pre- and post-grant within grantee districts. For a detailed listing of the LEAs pre- and post-grant course data, see Appendix H. Note that reporting these data is optional for grantees who use funds to support computer science teacher education within elementary grade bands because elementary schools do not have specific computer science courses and rely on integration of computer science concepts into other subject areas. However, these data are required of grantees who use the grant to support computer science teacher education at the secondary level.

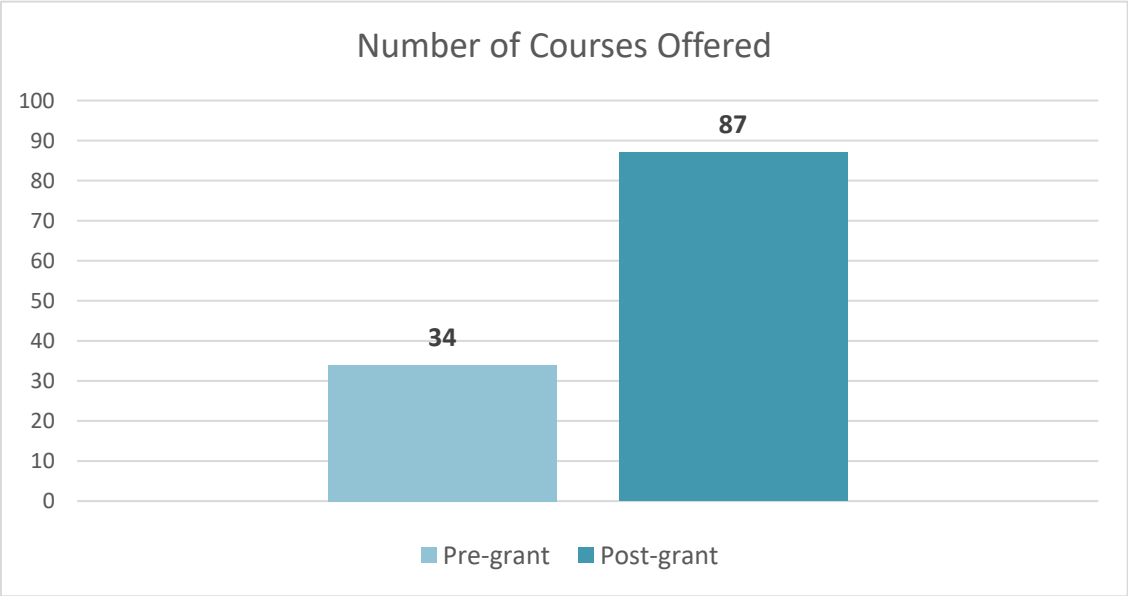


Figure 4. Number of Computer Science Courses Offered in Grantee Districts Pre & Post Grant.

Impact on Teachers and Students

Summary of Impact

Based on information available at the writing of this report, a total of 626 teachers were trained, or have been projected by districts to be trained, through the CSEd grant program. The number of teachers served decreased from 1,166 in the 2018-19 fiscal year to 373 in the 2020-21 fiscal year and has increased to 626 in the 2021-22 fiscal year. The average cost of training is $675 per teacher based upon the $422,516 of grant funds awarded. Based upon data reported by the grantees, the anticipated trained teachers will impact approximately 45,190 K-12 students within Colorado's public school system. Additionally, grantees have reported an increase in teachers working towards a CDE endorsement connected to computer science education and based upon data submitted by LEAs, 5 such endorsements were gained within the 2021-22 fiscal year due to the grant program. Table 3 illustrates the aggregated total number of teachers trained at each grade band and reported total number of K-12 students directly impacted by training.

TABLE 3: Aggregated Totals of Teachers and Students for CSEd Grantees

Total # of Grantees	Total # of Teachers Trained	Total # of K-5 Teachers Trained	Total # of 6-8 Teachers Trained	Total # of 9-12 Teachers Trained	Total # of K-12 Teachers Trained	Total # of Endorsements Gained	Total # of Students Directly or Indirectly Impacted
17	626	434	72	53	67	5	45,190

Student Numbers by Grade Band

Based on information available at the writing of this report, a total of 45,190 students are anticipated to have been impacted through the fiscal year 2021-22 CSEd grant program. Figure 5 illustrates the total number of students impacted across all grantees by grade band.

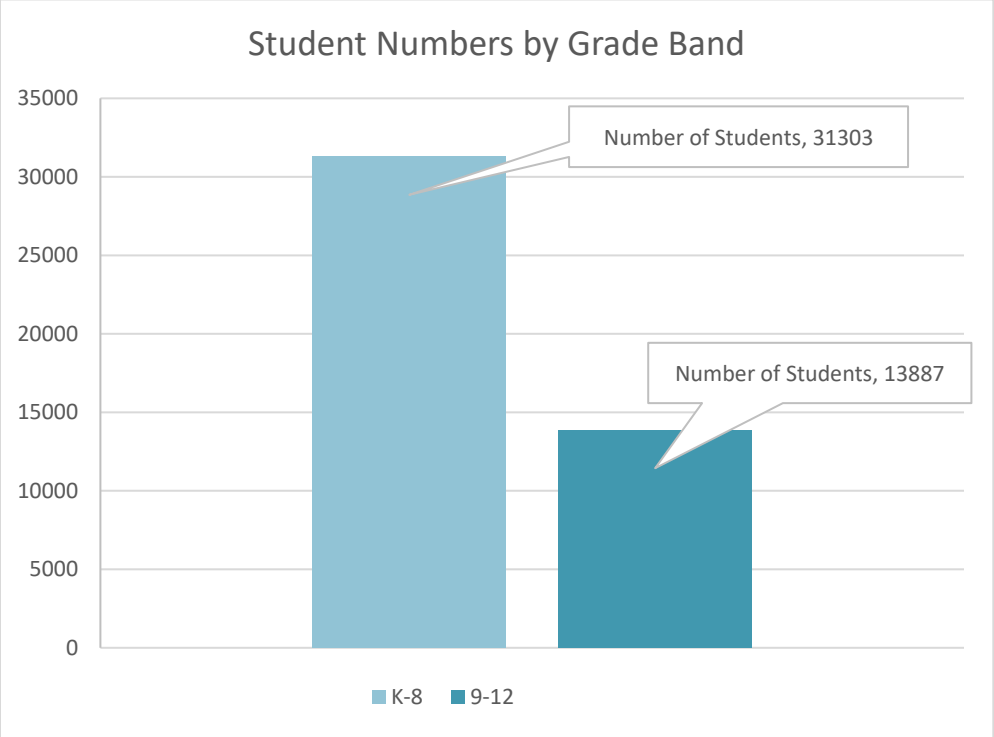


Figure 5. Total Number of Students Impacted by Grade Band.

Conclusion

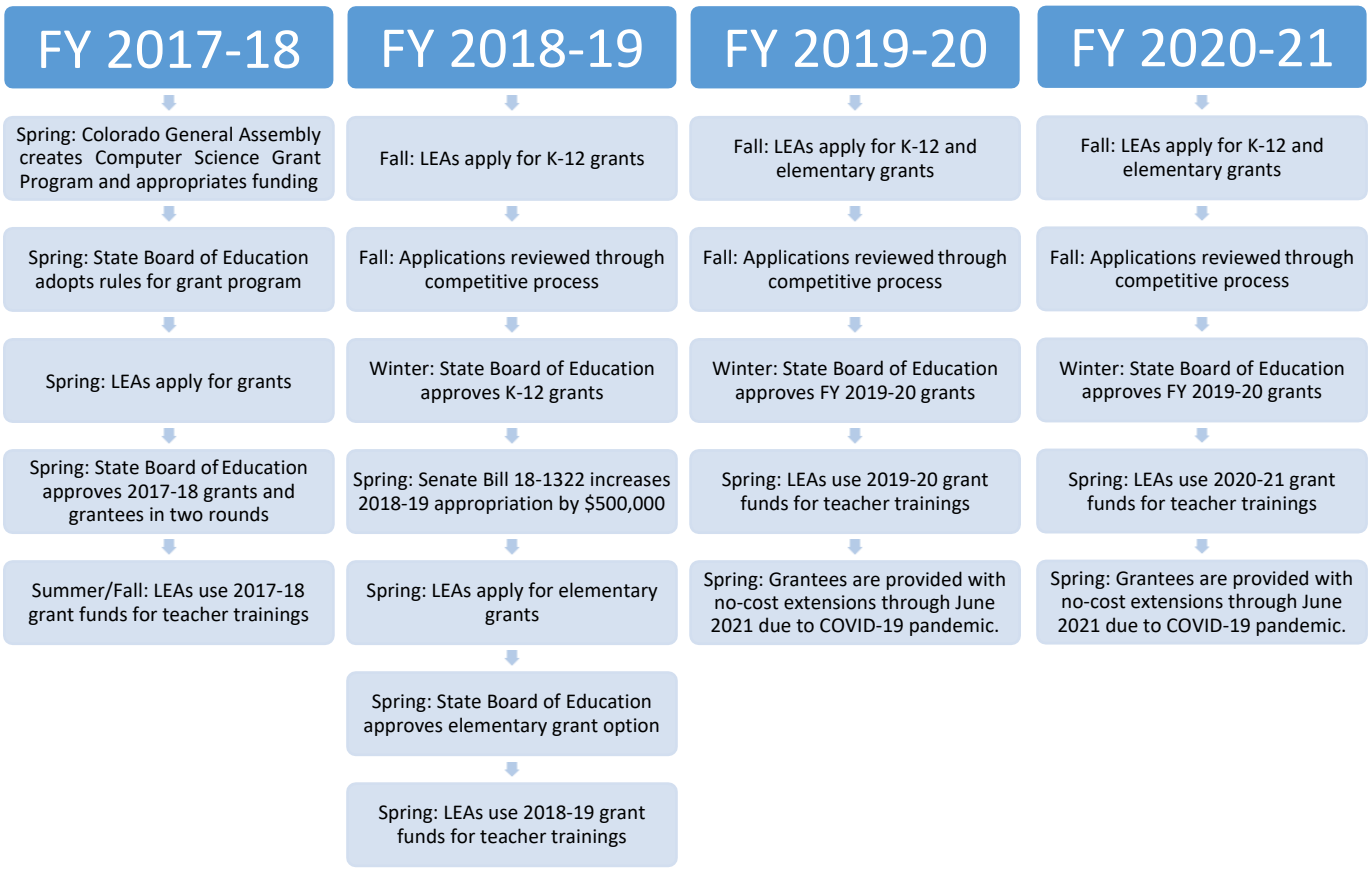
The Colorado Department of Education has continued to administer the CSEd grant with the goal of increasing the number of teachers available to provide computer science education in Colorado. In its fifth year, the CSEd grant program has worked towards this goal by providing access to high quality professional 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 2021-22 fiscal year, the CSEd grant has seen an increased focus on the amount of funding which was allocated towards computer science training providers and educator stipends. Additionally, grantees have reported an increase in teachers working towards a CDE endorsement connected to computer science education and based upon data submitted by LEAs, 5 such endorsements were gained within the 2021-22 fiscal year due to the grant program. 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, to sustain computer science programming, many grantees have started or continued to develop K-12 computer science pathways in their schools as part of their grant application.

Implementation of this grant program was complicated by the COVID-19 pandemic during the 2021-22 fiscal year; however, it has begun to see some return to normal. 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 373 in the 2020-21 fiscal year and has increased to 626 in the 2021-22 fiscal year. Some of this decrease can be attributed to the 50 percent, or $500,000, decrease in the amount of funding in the 2019-20 fiscal year due to COVID-19 related budget reductions. The decrease in teacher participation may also be due to the inconsistency of in person learning, the lack of available substitutes, teacher burnout, or reduced availability of professional development providers which halted the professional development local education providers originally had planned for their teachers.

Appendices

Appendix A: Historic Grant Timelines



Appendix B: 2021-22 Computer Science Education Grant Awardees by Priority Area

Local Education Agency	Rural	BOCES	Charter	>42% Free or Reduced Lunch	>46.6% Minority
Adams-Arapahoe 28J	*	*	*	X	X
Bayfield 10 JT-R	X	*	*	*	*
Charter School Institute-ECA	*	*	X	X	X
Colorado River BOCES	X	X	*	X	X
East Central BOCES	X	X	*	*	*
Huerfano RE-1	X			X	X
Jefferson County R-1	*	*	*	*	*
Mancos RE-6	X			X	*
Mapleton 1	*	*	*	X	X
Mesa County Valley 51	*	*	*	X	*
Pueblo City 60	*	*	*	X	X
Roaring Fork RE-1	X	*	*	X	X
Thompson R2-J	*	*	*	*	X
Widefield 3	*	*	*	X	X
TOTAL	6	2	1	10	9

* Represents a grantee who did not meet the noted priority area.

Appendix C: 2021-22 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-Arapahoe 28J	25,200	-	8,221	14,969	-
Bayfield 10 JT-R	30,000	-	3,400	21,490	2,600
CSI – Early College of Arvada	30,000				
Colorado River BOCES	24,854	-	20,351	-	4,800
East Central BOCES	30,000	2,800	15,800	10,400	1,000
Huerfano RE-1	30,000	-	20,000	-	10,000
Jefferson County R-1	29,989	-	5,511	13,109	183
Mancos RE-6	30,000	10,244	10,000	7,985	11,771
Mapleton 1	29,200	-	7,800	-	18,000
Mesa County Valley 51	22,001	-	16,500	-	13,921
Pueblo City 60	30,000	30,000	-	-	-
Roaring Fork RE-1	16,050	2,000	5,000	-	1,200
Thompson R2-J	30,000	-	30,000	-	-
Widefield 3	29,222	5,479	2,784	-	20,270
TOTAL	$386,516	$50,523*	$145,367*	$67,953*	$83,745*

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

Appendix D: 2021-22 Computer Science Education Grant Participants by Grantee

Local Education Agency	K-2 Teachers	3-5 Teachers	6-8 Teachers	9-12 Teachers	K-12 Teachers
Adams-Arapahoe 28J	5	6	4	-	-
Bayfield 10 JT-R	-	20	-	1	-
CSI – Early College of Arvada	23	-	-	-	-
Colorado River BOCES	-	-	-	9	-
East Central BOCES	25	25	25	25	
Huerfano RE-1	-	-	-	-	4
Jefferson County R-1	126	85	26	7	
Mancos RE-6	0	2	1	1	
Mapleton 1	-	-	-	-	18
Mesa County Valley 51	20	20	10	10	
Pueblo City 60	15	15	-	-	-
Roaring Fork RE-1	-	-	1	-	-
Thompson R2-J	-	-	-	-	45
Widefield 3	5	9	5	-	-
TOTAL	219	182	72	53	67

Appendix E: 2021-22 Higher Education Course Implementation Activities by Grade Level

The below listing of courses are ones teachers participated in to receive training.

High School	Middle School	Elementary School
CS STEMPath (Masters/Endorsement Courses)	CS STEMPath (Masters/Endorsement Courses	CS STEMPath (Masters/Endorsement Courses)
CS@Mines Computer Science Endorsement Program	Computational Thinking Micro-endorsement @ American Institutes for Research	Computational Thinking Micro-endorsement @ American Institutes for Research
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		
Computational Thinking Micro-endorsement @ American Institutes for Research		

Appendix F: 2021-22 Workshop Based Implementation Activities by Grade Level

The below listing of workshops are ones teachers participated in to receive training.

High School	Middle School	Elementary School
Colorado School of Mines CS Summer PD	Code.org CS Discoveries	Code.org CS Fundamentals
Code.org CS Discoveries	Wonder Workshop	Bitsbox
3D Printing & Prototyping	MindSpark CS Deep Dives	BootUp
Bootstrap: Data Science	MindSpark Robotics	MindSpark CS Deep Dives
CSTA Conference	Ozobot Workshop	MindSpark Robotics
AP Institute	Robotics Cue Training	Ozobot Workshop
AP Computer Science Principles	School of Mines CS PD	Robotics Cue Training
Computer Aided Design	3D Printing & Prototyping	MindSpark Design Thinking
Computer Aided Manufacturing		School of Mines CS Summer PD
		3D Printing & Prototyping
		Makey Makey Workshop
		Texas Instruments Teacher Training

Appendix G: 2021-22 District Developed Implementation Activities by Grade Level

The list below are activities created by the districts to support computer science.

High School	Middle School	Elementary School
	District Computer Science Curriculum Group	District Computer Science Curriculum Group
	District Computer Science Leadership Group	District Computer Science Leadership Group

Appendix H: Number of Secondary Computer Science Courses Offered by Local Education Agencies

The data below represents an individual computer science course, or section of a course, which the district has enrolled students. Note: The BOCES represents multiple districts.

Local Education Agency	Pre-Grant	Post-Grant	Net Change
Bayfield 10 JT-R	1	2	+1
Colorado River BOCES	0	15	+15
East Central BOCES	14	40	+26
Mancos RE-6	1	1	0
Pueblo City 60	2	11	+9
Roaring Fork RE-1	8	8	0
Widefield 3	8	10	+2
TOTAL	34	87	+53