2021 Legislative Report

# Computer Science Teacher Education Grant Program

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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 grant program designed to increase the number of teachers able to provide computer science education in Colorado. The program provides funding 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-authorized charter schools, Charter School Institute-authorized charter schools, Boards of Cooperative Education Services (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 the COVID-19 pandemic budget constraints, funding for this grant was reduced by $500,000. As of the 2021-22 fiscal year, the funding has remained at the reduced level. The pandemic also shifted how sections of the grant program operated, such as shifting the state-sponsored training to a virtual format.
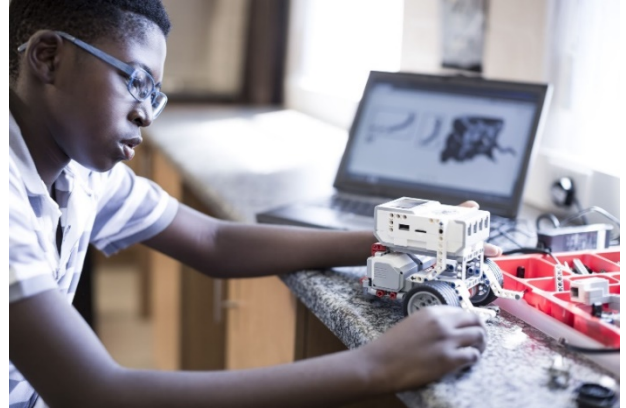
State law requires CDE to submit an annual report to the education committees of the Senate and House of Representatives of the Colorado General Assembly annually by January 1, detailing the following:

- 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 2020-21 Summary

In 2020, the General Assembly appropriated $551,657 to administer the grant program for computer science teacher professional development for the 2020-21 fiscal year. Excluding administrative costs necessary to administer the grant allowed under statute, approximately $434,000 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 pandemic-related budget reduction of $500,000, CDE could only administer two grant programs: (1) a K – 12 district determined program, and (2) a state-sponsored elementary regional program. This decision was made after a review of the grant's original purpose and consideration of the State Board of Education. When created by Senate Bill 17-296, this program focused on addressing computer science teacher

education in kindergarten-12th grades; however, with Senate Bill 18-1322 the state board requested an additional allocation of $500,000 to be focused entirely on elementary level computer science teacher education. It was determined that maintaining the state-sponsored elementary regional program in addition to the original K – 12 district determined program would address the original purpose of the grant program as well as the state board's desire to support elementary computer science education.

Implementation of this grant program was impacted by the continuation of the COVID-19 pandemic during the 2020-21 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 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 through CDE leadership and the Grants Fiscal Office, which allowed grantees to spend fiscal year 2020-21 funds through June 2022. 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.

Timeline

For the 2020-21 fiscal year, the application and distribution of grant funds were completed in fall 2020. Grantees originally had the opportunity to expend funds through September 30, 2021. Figure 1 below illustrates the CSEd grant funding cycle for 2020-21. A detailed diagram depicting the timeline of the grant since its inception can be found in Appendix A.

FY 2020-21

Fall 2020: LEAs apply for K-12 and elementary grants

Fall 2020: CDE leads the review of applications through competitive process

Winter 2021: State Board of Education approves FY 2020-21 grants

Spring 2021: LEAs use 2019-20 grant funds for teacher trainings

Spring 2021: LEAs use 2020-21 grant funds for teacher trainings and CDE provides no-cost extensions through June 2022 due to COVID-19 pandemic

Figure 1. 2020-21 Grant Timeline

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. These funds could 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 stipulated that CDE give priority to LEAs designated as rural and those with high populations of minority and/or low-income students. In additional to prioritizing LEAs with these student populations, CDE provided applying LEAs with assistance in completing the application to aide in meeting their goals for establishing or bolstering their computer science programming. This assistance was provided through online webinars, self-paced video tutorials, and one-to-one support as needed for any district.

Local Education Agency Participation

Grant Applications by Category

CDE received 15 applications across both training options from districts, Charter School Institute schools, and Boards of Cooperative Educational Services (BOCES). For FY 2020-21, applicants requested a total $361,703. Two school districts applied for multiple training options: Jefferson County R-1 and Mesa County Valley 51. After committee reviews, CDE awarded 15 CSEd grants totaling $361,703 and did not reject any applications due to unallowable expenditures or incomplete applications. Of the 15 grantees, 3 were awarded to LEAs not previously served by the grant program. Table 1 illustrates the number of grants, amounts applied for, and the amounts awarded by category. Figure 2 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.

Table 1: 2020-21 Computer Science Education Grant Applications by Category

Grant Option	# of LEAs Applied	Amount Applied For	# of LEAs Approved	Amount Awarded
K-12 District Determined	12	$322,103	12	$322,103
State Sponsored	3	$39,600	3	$39,600
Totals	15	$361,703	15	$361,703

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The training provided me with a great foundation to start to integrate computer science into my regular lessons

9-12 TEACHER
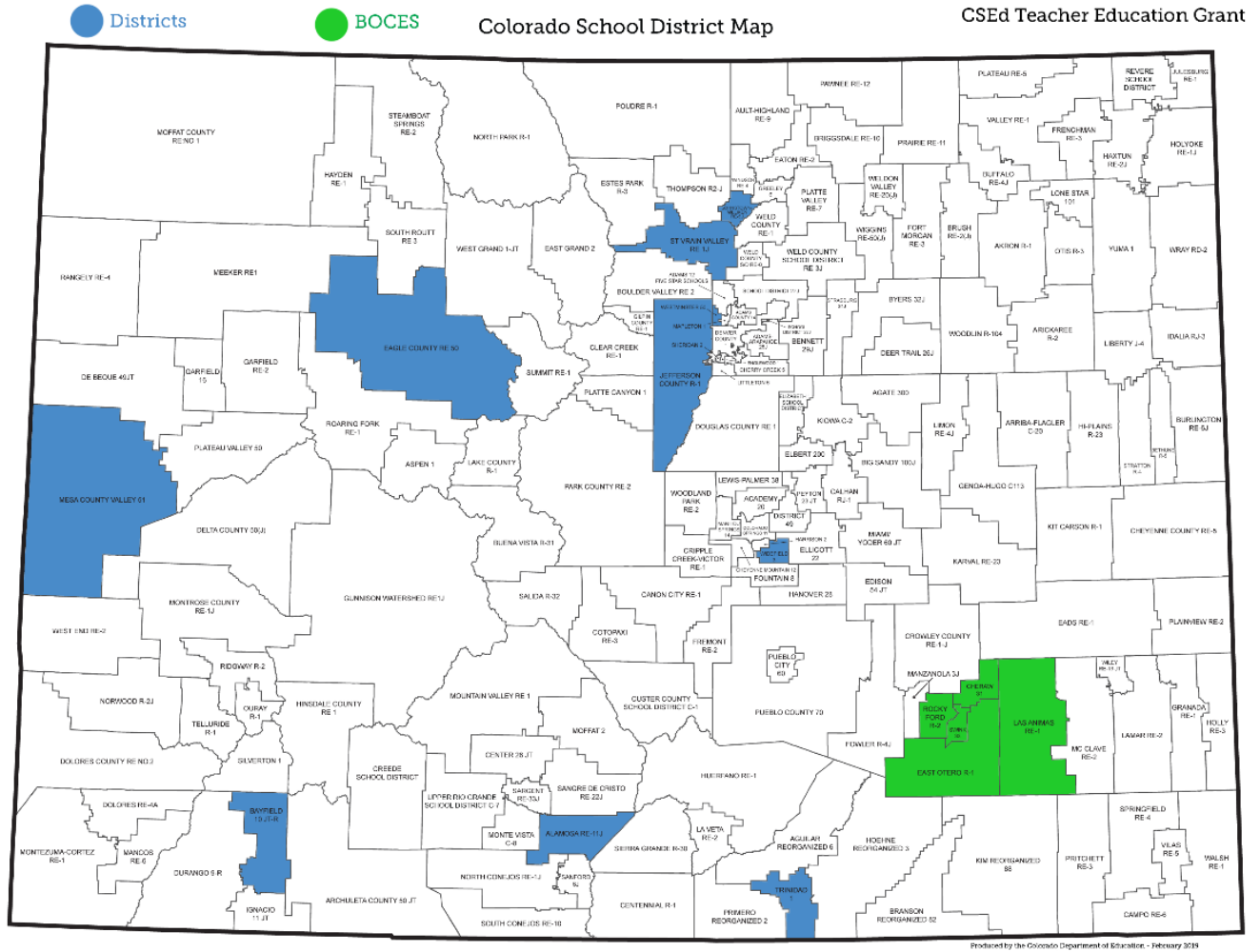
Figure 2. Geographic Location of Grantees across Colorado

> "I definitely feel more confident that I can provide my students with engaging lessons that provide foundational computer science knowledge that continues to deepen based on the Computer Science Standards.

— K-5 TEACHER

Local Education Agency Priority Criteria

As noted previously, the CSEd grant program prioritized LEAs designated as rural and those with high populations of minority and/or low-income students. Six out of the fifteen2020-21 grantees are designated as rural or small rural districts, four as non-rural, one as a BOCES, and one as a charter school according to CDE definitions[1]. It is important to note that the BOCES also represent rural districts of Cheraw 31, East Otero R-1, Las Anima RE-1, Rocky Ford R-2, Swink 33, and Wiley RE-13 JT. In addition, eight grantees have student populations where more than 42 percent of students are eligible for free or reduced-price lunches and seven grantees have student populations where more than 46.6 percent of students are minority. Figure 3 below provides a summary of the priority areas the grant serves. Please note the graph represents all grantees in a priority area, and therefore, some are represented more than once. For a detailed listing of all grantees and the priority area(s) each grantee met, please see Appendix B. Twenty eight percent of the total grant funds went to grantees that met all three priority areas, 36 percent went to grantees meeting two priority areas, 17 percent went to grantees meeting at least one priority area, and 19 percent went to grantees who did not meet priority criteria.
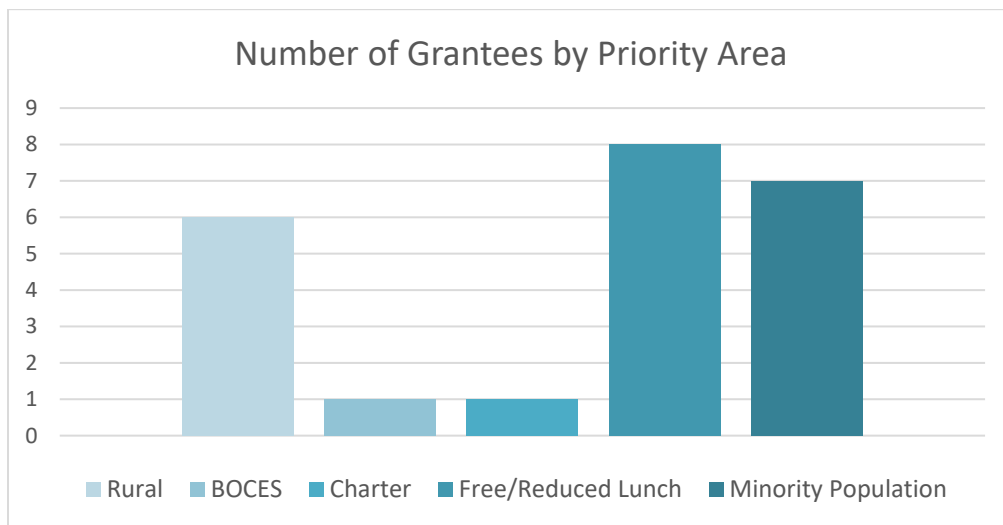
Figure 3: 2020-21 Computer Science Education Grant Awardees by Priority Area

This workshop provided us with a great definition and understanding of what computer science education is, why it is necessary in schools at all age levels, and how best to begin incorporating it.

9-12 TEACHER

Designation of Grantee Funds: K-12 District Determined Program

The majority of funding in FY 2020-21 (44 percent) allocated to grantees through the K - 12 district determined program were used for professional development/training ($113,308). The second largest allocation (25 percent) was used by 6 grantees for tuition or fees towards endorsements or certifications ($64,185). While some LEAs work through the process to amend their grant proposal, due to the no-cost extension and shifts grantees have been required to make due to the COVID-19 pandemic, they have unallocated funds which are not represented within this graph. Figure 3 shows an overall summary of the reported designation use of funds by LEAs. For a detailed listing of the LEAs that were awarded funds and the anticipated use of funds see Appendix C.

ALLOCATION OF CSED GRANT FUNDS

- Stipends & Substitute Pay, $49,443 , 19%
- Tuition/Fees, $64,185 , 25%
- Materials, $30,487 , 12%
- PD/Training, $113,308 , 44%

Figure 4: 2020-21 Computer Science Education Grantee Designation of Funds

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> This workshop advanced our own understanding of computer science by having the opportunity to work with a cohort, review standards, and analyze computer science focused articles that could be applied in the classroom.

9–12 TEACHER

Designation of Grantee 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 of $24,640. The remainder of the allocation ($13,200) was used to support teacher participation in the state sponsored trainings through stipends. Table 2 shows the LEAs who were awarded, and the use of funds for training fees and teacher stipends.

Table 2: Local Education Agency Total Grant Award and Use of Funds – State Sponsored
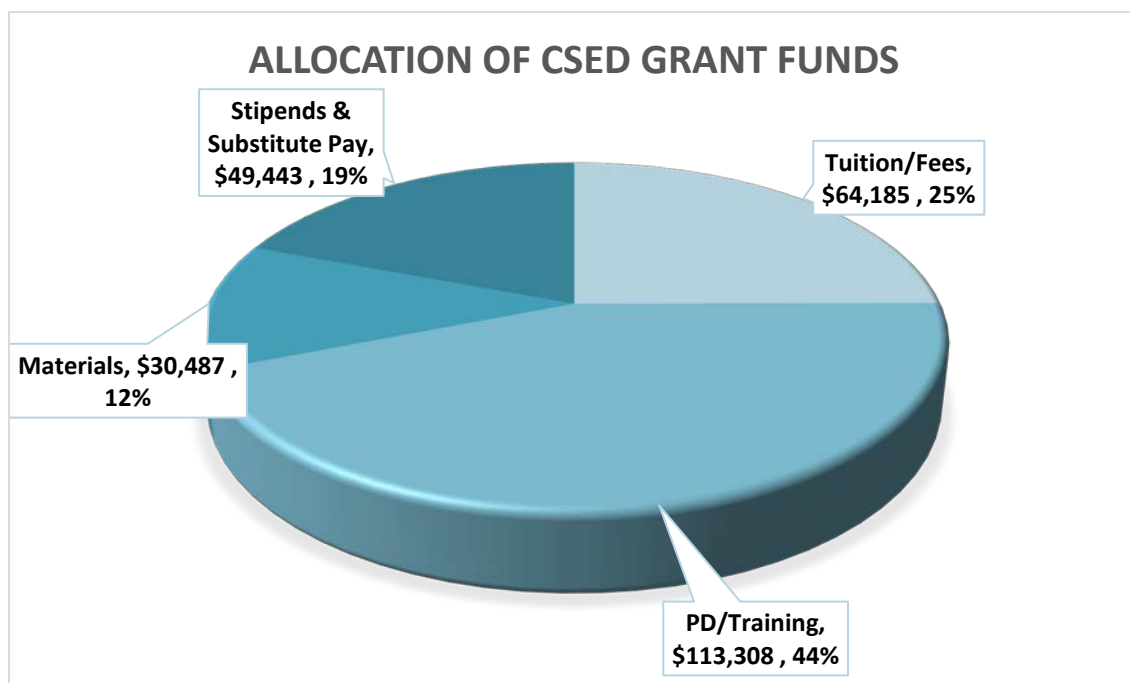
Local Education Agency	Total Teacher Participation	Training Costs	Teacher Stipends
Clear Creek RE-1	8	$2,240	$1,200
Jefferson County R-1	40	$11,200.00	$6,000.00
Mesa County Valley 51	40	$11,200.00	$6,000.00
TOTAL	**88**	**$24,640**	**$13,200**

> "
> I was not confident in computer programming and did not think I could learn to do it. This class has really helped because not only did I learn some necessary skills, I had a lot of fun and want to continue learning more.

K-5 TEACHER

Program Implementation Activities

Implementation Activities

Through the use of the K-12 district-determined and elementary 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 used awarded funds to contract directly with a provider to train their teachers, or grantees designated funds to specific teachers to participate in trainings by various providers. Additionally, grantees have utilized grant funds for university tuition, online courses, and district directed professional development. A detailed list of these activities, along with the types of training grantees selected, and implementation activities by grade level across all grantees may be found in Appendix D.

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 24 computer science courses offered by grantee LEAs from the 2020-21 fiscal year to the 2021-22 fiscal year. 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 course data see Appendix E. Note that reporting these data is optional for grantees who use funds to support computer science teacher education within elementary grade bands due to the way elementary classes are structured. However, these data are required of grantees who use the grant to support computer science teacher education at the secondary level.
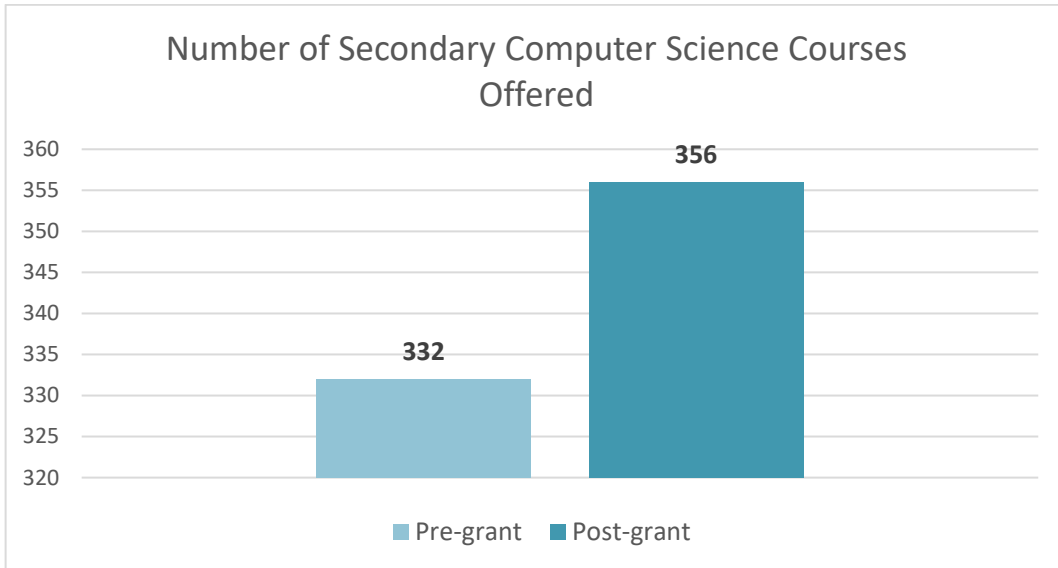
Figure 5: Number of Computer Science Courses Offered Pre & Post Grant

> The most important thing that I learned was how much computational thinking we already incorporate. So many activities that we do include the pillars and I'm excited to continue doing more of this. Computer science is fun!

K-5 TEACHER

Impact on Teachers and Students

Summary of Impact

Based upon data reported by the grantees and information available at the writing of this report, a total of 373 teachers were trained, or have been projected by districts to be trained, through the CSEd grant program during the 2020-21 fiscal year. Of these teachers, 137 are kindergarten-5th grade teachers, 49 are 6th-8th grade teachers, and 187 are high school teachers. This count does include the total projected number of teachers to be trained across the state as additional teachers will receive training through June 2022.

The average cost of training is $970 per teacher based upon the total amount of grant funds awarded ($361,703). The anticipated trained teachers will impact approximately 47,736 kindergarten-12th grade students within Colorado's public school system. The seven rural grantees awarded through the CSEd Grant Program were able to train or anticipate training 53 teachers which will impact approximately 4,900 students. Figure 6 illustrates the aggregated total number of teachers trained at each grade band and the total number of Kindergarten-12th grade students directly or indirectly impacted by training. Appendix F contains the total number of students impacted across all grantees reported by both rural and urban areas.

> " I love the extensive thinking that students will need to use to solve the problems. Not only will this help with computer science tasks, but for other subjects as well.
>
> K-5 TEACHER

Figure 6. Total Number of Anticipated Teachers Trained and Students Impacted by Grade Band

Conclusion
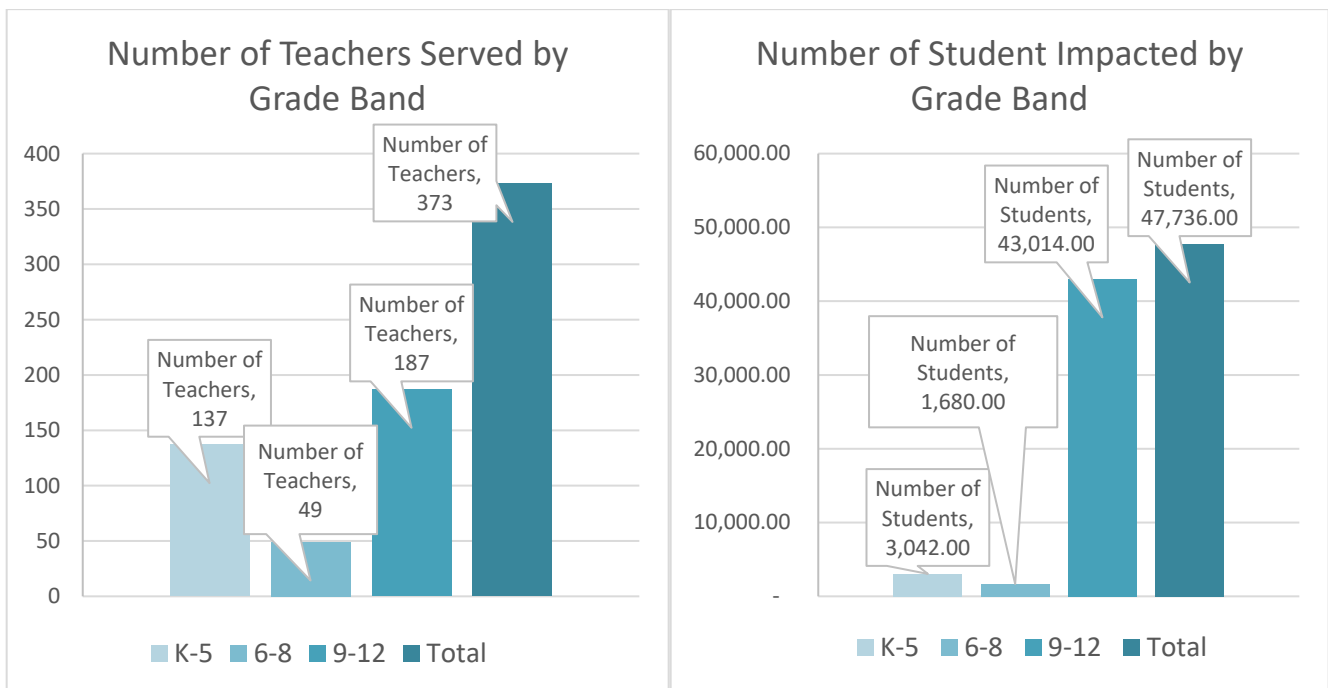
The Colorado Department of Education has continued to administer the CSEd grant with the goal of increasing the number of teachers available to provide computer science education in Colorado. In its third year, the CSEd grant program worked toward this goal by providing access to high quality professional 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 2020-21 fiscal year, the CSEd grant has seen an increased focus on the amount of funding which was allocated towards higher education computer science courses and awarded grants to numerous communities previously unreached. 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, eight such endorsements were gained within the 2020-21 fiscal year due to the grant program. This, in addition to the continued use of a large percentage of grant funds towards tuition, shows a continued focus on seeking computer science education through higher education pathways. In self-reported data, grantees experienced a net increase in computer science courses offered. Although there may be other variables at play when determining whether the grant funding has led to an increase in course offerings, we do know that increasing the number of 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 developing or modifying kindergarten-12th grade computer science pathways in their schools as part of their grant application.

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> There are many benefits for students to learn computer science concepts. Students benefit from learning creative problem-solving and critical-thinking skills, as well as, promoting collaborative group skills.
>
> K-5 TEACHER

The impact of the COVID-19 pandemic was 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. Some of this decrease can be attributed to the 50 percent, or $500,000, decrease in the amount of funding due to pandemic -related budget reductions (Appendix G) which includes comparisons of grant funding and the corresponding teacher and student impact from the program's creation to date. 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.

Appendix A: Historic Grant Timeline

FY 2017-18

Spring 2018: Colorado General Assembly approves Computer Science Grant Program and

Spring 2018: State Board of Education adopts rules for grant program

Spring 2018: LEAs apply for grants

Spring 2018: State Board of Education approves 2017-18 grants and grantees in two rounds

Summer/Fall 2018: LEAs use 2017-18 grant funds for teacher trainings

FY 2018-19

Fall 2018: LEAs apply for K-12 grants

Fall 2018: Applications reviewed through competitive process

Winter 2018: State Board of Education approves K-12 grants

Spring 2019: Senate Bill 18-1322 increases 2018-19 appropriation by $500,000

Spring 2019: LEAs apply for elementary grants

Spring 2019: State Board of Education approves elementary grant option

Spring 2019: LEAs use 2018-19 grant funds for teacher trainings

FY 2019-20

Fall 2019: LEAs apply for K-12 and elementary grants

Fall 2019: Applications reviewed through competitive process

Winter 2019: State Board of Education approves FY 2019-20 grants

Spring 2020: LEAs use 2019-20 grant

Spring 2020: Grantees are provided with no-cost extensions through June 2021 due to COVID-19 pandemic.

Appendix B: Grant Awardees by Priority Area

Local Education Agency	Rural	BOCES	Charter	>42% Free or Reduced Lunch	>46.6% Minority
Alamosa Re-11j	X			X	X
Bayfield 10 JT-R	X				
Clear Creek RE1	X				
The Early College of Arvada (CSI)			X	X	X
Eagle County Re 50				X	X
Jefferson County R-1					
Johnstown-Milliken RE-5J	X				
Mesa County Valley 51	X			X	
Santa Fe Trail BOCES	X	X		X	X
St Vrain Valley Re 1J					
Trinidad 1	X			X	X
Westminster 50				X	X
Widefield 3				X	X
TOTAL	**7**	**1**	**1**	**8**	**7**

Appendix C: Designation of Funds- K-12 District Determined Program

Local Education Agency	Total Grant Award	Tuition/Fees	PD/Training	Materials	Stipends & Substitute Pay	Remaining Funds
Alamosa Re-11j	$30,000	$5,757	$2,000	-	-	$22,243
Bayfield 10 JT-R	$28,500	$12,600	-	$14,000	$1,200	$700
The Early College of Arvada	$30,000	-	$30,000	-		-
Eagle County Re 50	$4,800	$4,800	-	-	-	-
Jefferson County R-1	$29,903	-	$10,200	$3,557	$16,146	-
Johnstown-Milliken RE-5J	$26,968	-	$23,568	-	$3,400	-
Mesa County Valley 51	$23,514	-	$5,000	-	$4,255	$14,259
Santa Fe Trail BOCES	$30,000	$7,190	$15,690	$4,970	$2,150	-
St Vrain Valley Re 1J	$29,960	-	$10,850	$1,223	-	$17,887
Trinidad 1	$30,000	-	$12,000	$5,410	$3,000	$9,590
Westminster 50	$30,000	$30,000	-	-	-	-
Widefield 3	$28,458	$3,838	$4,000	$1,327	$19,292	-
TOTAL	**$322,103**	**$64,185**	**$113,308**	**$30,487**	**$49,443**	**$64,679**

*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. The discrepancy is shown in the "Remaining Funds" column.

Appendix D: Grantee Implementation Activities

Table 1: Higher Education Course Implementation Activities by Grade Level

High School	Middle School	Elementary School
Computer Science Education Graduate Certificate @ College of St. Scholastica	CS STEMPath (Masters/Endorsement Courses)	CS STEMPath (Masters/Endorsement Courses)
Cryptography Course @ Colorado School of Mines		
CS STEMPath (Masters/Endorsement Courses)		
CS@Mines Computer Science Endorsement Program		
Data Science Course @ Colorado School of Mines		
Java Programming Course @ Colorado School of Mines		
Python Programming Course @ Colorado School of Mines		
Web Programming Course @ Colorado School of Mines		

Table 2: Workshop Based Implementation Activities by Grade Level

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

Table 3: District Developed Implementation Activities by Grade Level

High School	Middle School	Elementary School
	District CS Curriculum Group	District CS Curriculum Group
	District CS Leadership Group	District CS Leadership Group

Appendix E: Grantee Computer Science Course Data

Number of Computer Science Courses Offered by Local Education Agencies

Local Education Agency	Pre-grant	Post-grant	Net Change
Bayfield 10 JT-R	5	5	0
Mesa County Valley 51	3	26	23
Santa Fe Trail BOCES	0	3	3
St Vrain Valley Re 1J	319	314	-5
Trinidad 1	1	2	1
Westminster 50	4	6	2
TOTAL	**332**	**356**	**+24**

Appendix F: Aggregated Totals of Teachers Trained and Students Impacted

Table 1: Aggregated Totals for All Grantees in 2020-21

Grantees	Teachers Trained*	Endorsements Gained	Grades K-5 Teachers Trained	Grades 6-8 Teachers Trained	Grades 9-12 Teachers Trained	Students Impacted
15	373	8	137	49	187	47,736

Table 2: Aggregated Totals for Rural Grantees in 2020-21

Grantees	Teachers Trained*	Endorsements Gained	Grades K-5 Teachers Trained	Grades 6-8 Teachers Trained	Grades 9-12 Teachers Trained	Students Impacted
7	53	0	24	0	29	4,918

Table 3: Aggregated Totals for Urban Grantees in 2020-21
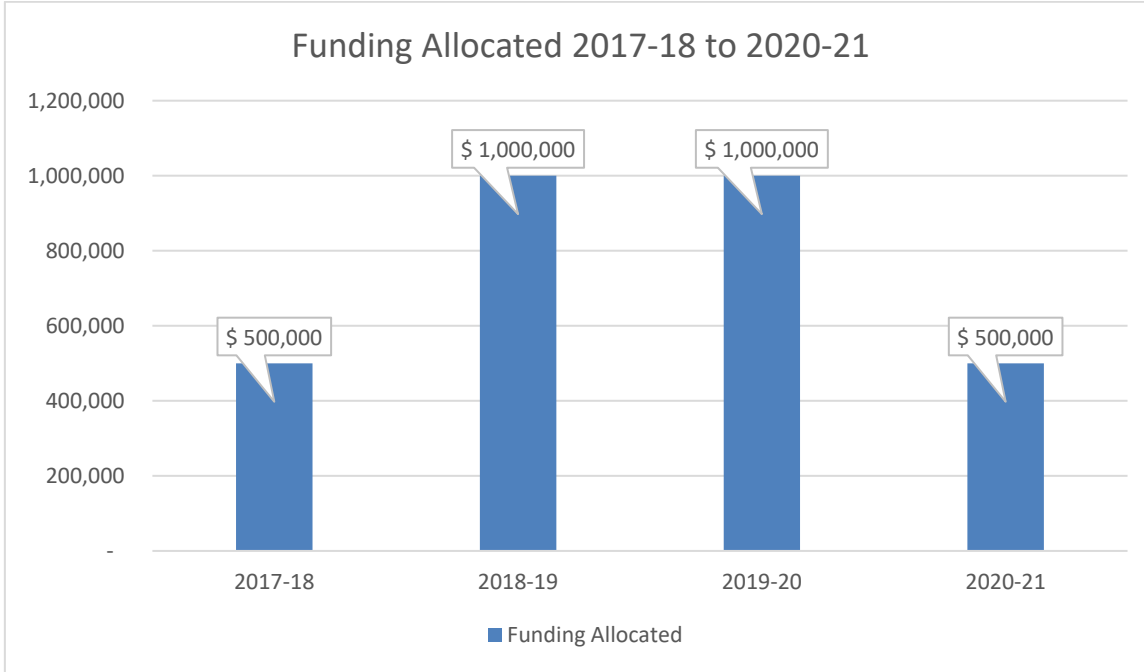
Grantees	Teachers Trained*	Endorsements Gained	Grades K-5 Teachers Trained	Grades 6-8 Teachers Trained	Grades 9-12 Teachers Trained	Students Impacted
8	320	8	113	49	158	42,818

*Anticipated

Appendix G: Grant Impacts by Fiscal Year
Figure 1: Total Grant Allocation 2017-18 to 2020-21
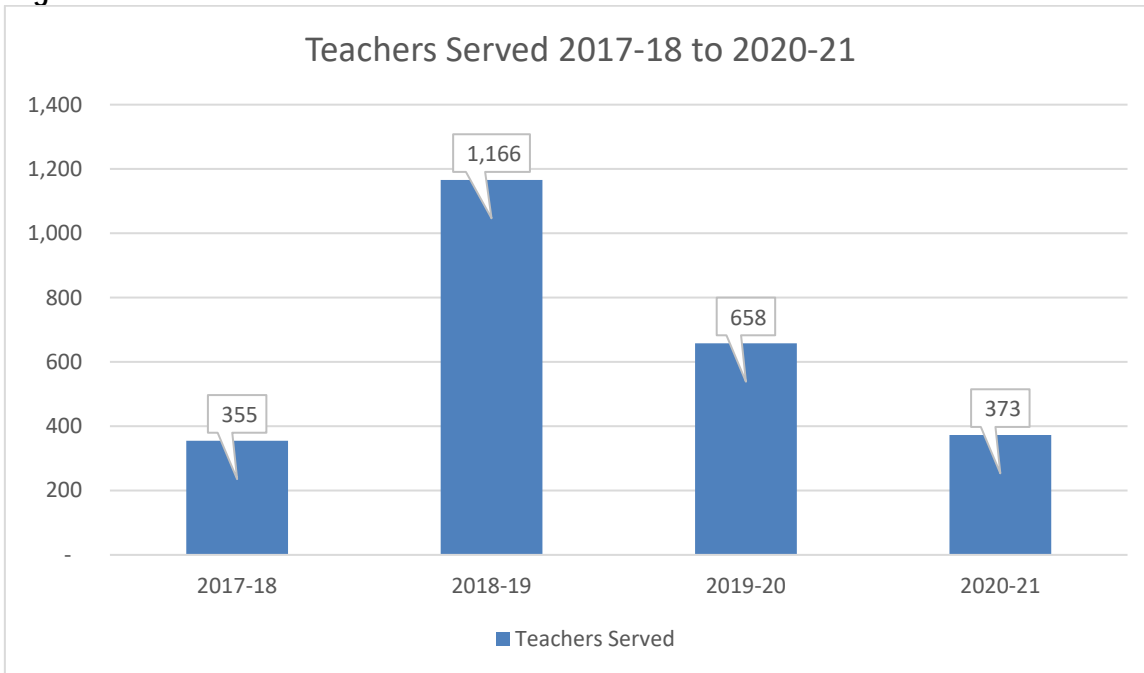

Funding Allocated 2017-18 to 2020-21

Figure 2: Total Teachers Served 2017-18 to 2020-21

Teachers Served 2017-18 to 2020-21

Figure 3: Total Student Impact 2017-18 to 2020-21

Students Impacted 2017-18 to 2020-21

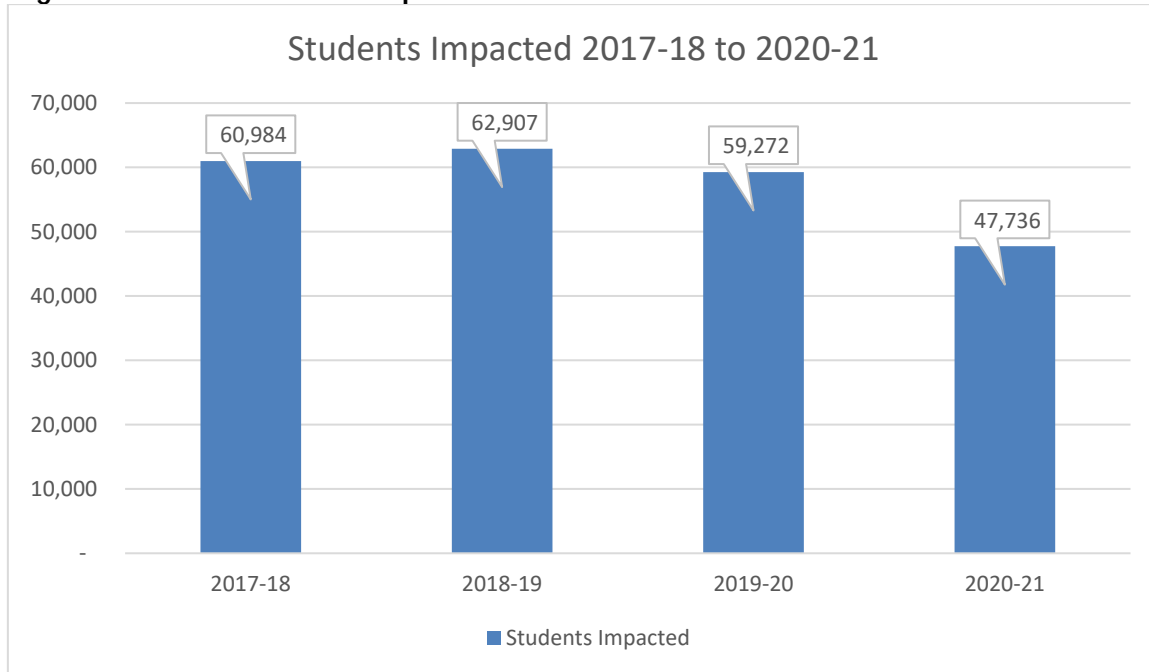| Year	Students Impacted
2017-18	60,984
2018-19	62,907
2019-20	59,272
2020-21	47,736

Figure 4: Geographic Location of Grantees 2017-18 to 2020-21

Districts Awarded   BOCES Awarded   Colorado School District Map   Creation - To date