

Date of Hearing: April 6, 2022

ASSEMBLY COMMITTEE ON EDUCATION
Patrick O'Donnell, Chair
AB 1853 (Berman) – As Amended March 17, 2022

SUBJECT: Teacher credentialing: the Computer Science Preservice Teacher Grant Program

SUMMARY: Establishes the Computer Science Preservice Teacher Grant Program, administered by the Commission on Teacher Credentialing (CTC) to award competitive grants to institutions of higher education (IHEs) to develop or expand K–12 computer science and computational thinking coursework for individuals seeking specified teaching credentials. Specifically, **this bill:**

- 1) Requires the CTC to develop and implement the Computer Science Preservice Teacher Grant Program, to award competitive grants to IHEs that offer CTC-approved teacher preparation programs to develop or expand K–12 computer and computational thinking coursework for individuals seeking any of the following:
 - a) A single subject credential with supplementary authorization in computer science;
 - b) A multiple subject credential with supplementary authorization in computer science;
 - c) A single subject credential; and
 - d) A multiple subject credential.
- 2) Establishes the following purposes of the grant program:
 - a) To provide incentives for CTC-approved teacher preparation programs to update curricula and develop preservice programs to teach computer science in K–12 public schools; and
 - b) To enhance equity and increase access to computer science coursework for preservice teachers from underrepresented groups.
- 3) Requires an IHE receiving grant funds under the program to use the funds for any of the following purposes:
 - a) To create or expand programs designed to meet the requirements needed to obtain a supplementary authorization in computer science for preservice teachers concurrently taking coursework to obtain a single subject or multiple subject teaching credential from CTC-approved teacher preparation programs;
 - b) To integrate or update computer science curricula and pedagogy into CTC-approved teacher preparation programs;
 - c) To update the IHE's existing technology credit requirements to include computer science coursework; and

- d) To introduce preservice teachers to computer science coursework and pedagogy, including foundational computer science concepts, computational thinking, and the impacts of technology and computing in society.
- 4) Requires the CTC, in awarding grants under this program, to give priority to proposals that create or expand programs designed to meet the requirements needed to obtain a supplementary authorization in computer science for preservice teachers concurrently taking coursework to obtain a single subject or multiple subject teaching credential from CTC-approved teacher preparation programs.
- 5) Requires IHEs, as a condition of the receipt of a grant, to provide to the CTC program and outcome data information for at least three years after receiving the grant. Requires this data to include:
 - a) Program design and features;
 - b) The number of graduates;
 - c) The number and types of credentials earned;
 - d) The time taken to earn a degree and credential; and
 - e) Any other information the CTC may require for purposes of documenting the effect of the grant and identifying effective practices in program design and implementation.

EXISTING LAW:

- 1) Authorizes the CTC to issue single subject teaching credentials in agriculture, art, biological sciences, business, chemistry, dance, English, geosciences, health science, home economics, industrial and technology education (ITE), mathematics, music, physics, physical education, science (various subjects), social science, theater, and world languages (English language development and languages other than English).
- 2) Through regulation, authorizes holders of credentials in mathematics, business, and ITE, as well as holders of supplementary authorizations in computer science, to teach computer science.
- 3) Authorizes the CTC to issue a multiple or single subject teaching credential with a specified concentration in a particular subject based upon the depth of an applicant's preparation in an important subject of the school curriculum in order to ensure excellence in teaching in specific subjects.
- 4) Authorizes the CTC to issue credentials for teaching specialties, including bilingual education, early childhood education, and special education (education specialist). Requires education specialist teaching credentials to be based upon a baccalaureate degree from an accredited institution, completion of a program of professional preparation, and standards that the CTC may establish.

- 5) Requires the Superintendent of Public Instruction (SPI) to convene a computer science strategic implementation advisory panel (panel) to develop recommendations for a computer science strategic implementation plan, and requires the panel to submit recommendations for a strategic plan to the State Board of Education (SBE) by January 15, 2019.
- 6) Requires the plan to include, at a minimum, recommendations on all of the following:
 - a) Broadening the pool of teachers to teach computer science;
 - b) Defining computer science education principles that meet the needs of students in all grades; and
 - c) Ensuring that all students have access to quality computer science courses.
- 7) Requires the Instructional Quality Commission (IQC) to consider developing and recommending to the SBE, on or before July 31, 2019, computer science content standards for kindergarten and grades 1 to 12 pursuant to recommendations developed by a group of computer science experts.
- 8) States that if a school district requires more than two courses in mathematics for graduation from high school, the district may award a student up to one mathematics course credit for successfully completing a “category C” approved computer science course. (EC 51225.35)
- 9) Requires the California State University (CSU), and requests the University of California (UC), to develop guidelines for high school computer science courses that may be approved for the purposes of recognition for admission. (EC 66205.5)
- 10) Establishes the Computer Science Supplementary Authorization Incentive Grant Program for the purpose of providing one-time grants to local educational agencies (LEAs) to support the preparation of credentialed teachers to earn a supplementary authorization in computer science and provide instruction in computer science coursework.
- 11) States that participating teachers are eligible to receive an award of up \$2,500 through the program.
- 12) Authorizes LEAs to use grant funding for the purpose of paying the teacher costs of coursework, books, fees, and tuition, as applicable.
- 13) Requires applicants for the program to provide a 100% match of grant funding, which may be in the form of release time or substitute teacher costs.

FISCAL EFFECT: Unknown

COMMENTS:

Need for the bill. According to the author, “Our society has witnessed profound changes in the ways we live and work due to advances in computing. Computer science is transforming industry, bolstering productivity in established economic sectors, and driving job creation and innovation throughout California’s economy. Introducing computer science at a young age has the potential to close the equity gap in computer science fields and provide the workforce needed

for California to remain competitive in the global economy. However, despite growing recognition of the importance of computer science education, the majority of high schools in California do not offer any computer science courses. Data shows that computer science courses are only taught in 41 percent of California’s high schools. Even when courses are available, too few students are enrolled in these critical courses—just 3 percent of the 1.9 million high school students in California. To bridge this gap and make certain that all students have the access to computer science education, there is a need to broaden the pool of computer science teachers. AB 1853 would take this first step by creating the Computer Science Preservice Teacher Grant program to incentivize institutions of higher education to train and prepare future teachers to teach computer science in K-12 schools.”

Computer Science Strategic Implementation Panel recommends that the state support teacher professional development and increase the number of supplementary authorizations in computer science. Current law requires the SPI to convene a computer science strategic implementation advisory panel to develop recommendations for a computer science strategic implementation plan, and requires the panel to submit recommendations for a strategic plan to the SBE by January 15, 2019. In September, 2018, the panel submitted a draft strategic plan (draft plan) to the SBE for consideration, and the SBE adopted the California Computer Science Strategic Implementation Plan in May, 2019, which establishes a vision statement: “California’s vision is to ensure that all students develop foundational knowledge and skills in computer science to prepare them for college, careers, and civic engagement.”

The plan states that “to grow K–12 computer science education in California, the state will need to increase the number of teachers qualified to teach computer science. Supporting more educators to teach computer science would involve a multi-pronged approach that attends to credentialing, new teacher recruitment, professional learning for teachers, administrators, and counselors regarding the California computer science standards, and institutional and financial support.” The plan outlines several strategies for improving the availability of computer science instruction:

- A grant program could be established to support teachers to complete course work for the computer science supplementary authorization, with additional incentives for teachers who work in low-income and underserved school districts and rural and urban school districts.
- The state could consider offering incentives for IHEs to offer credit-bearing courses or teacher preparation programs that satisfy the computer science supplementary authorization and future computer science teaching credentials to help teachers learn how to teach concepts and practices aligned to the California computer science standards and differentiated for grade and skill levels. IHEs could work with CTC to establish course articulation agreements with CTC-approved teacher preparation programs.
- While the draft plan suggested that the state consider providing “professional development programs for in-service teachers to learn how to teach concepts and practices aligned to the California computer science standards, differentiated for grade and skill levels,” the final plan identifies establishing a University of California Subject Matter Project in computer science as a means of providing in-service training opportunities.

Who is authorized to teach computer science in California? California has three single subject teaching credentials (mathematics, business, and ITE) which authorize teachers to provide instruction in computer science. The CTC issues supplementary authorizations in computer science which also authorize a teacher holding another credential to teach computer science.

In 2016 the CTC modified their Computer Concepts and Applications authorization to reflect a change in focus from teaching basic computer use, keyboarding, and software application to broader preparation in computer science education. The CTC also changed the name of the authorization to “Computer Science.”

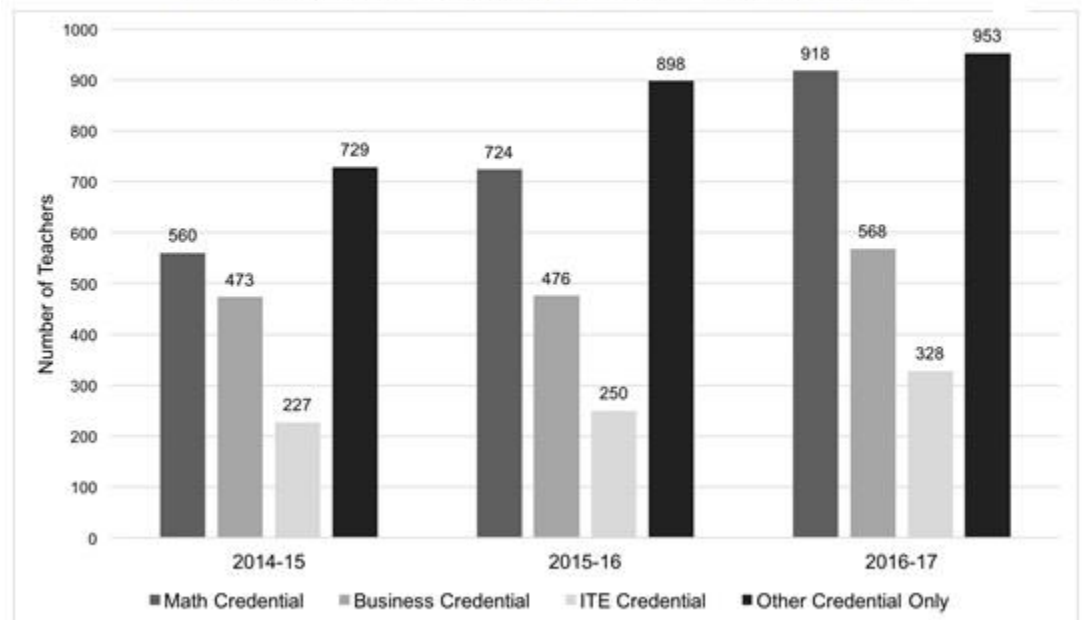
To obtain a supplementary authorization in computer science, teachers must complete 20 semester units or 10 upper division semester units, or the equivalent quarter units, of non-remedial course work in computer science. They may also qualify by holding a collegiate major from a regionally accredited college or university in a subject directly related to the subject to be listed on the credential. The coursework must cover the following content areas:

- Computer Programming
- Data structures and algorithms
- Digital devices, systems and networks:
- Software design
- Impacts of computing
- The balance of the units may be in any course that falls within the academic department for that subject category.

Who currently teaches computer science in California? According to the draft computer science strategic implementation plan, in the 2016-2017 academic year, approximately 2,273 teachers in California taught core academic computer science courses. This number grew steadily from 1,609 teachers in 2014-15 and 1,996 teachers in 2015-16.

As shown in the table on this page, most teachers teaching computer science courses are credentialed in subjects other than mathematics, business, or ITE and hold a supplementary authorization to teach computer science. Teachers credentialed in mathematics

Teachers of computer science courses, by authorizing credential, 2016-17 (Source: CS Strategic Implementation Panel)



comprise the largest number of those authorized with a single subject credential to teach computer science.

The table below shows the issuance of supplementary authorizations in computer science issued by the CTC. The annual number issued has declined since the changes made to the authorization. The CTC notes that these figures represent authorizations, not individuals, so is not an unduplicated count.

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Computer Concepts and Applications	177	229	158	111	100	120	109				
Computer Science & Introductory Computer Science	-	-	-	-	-	-	11	35	40	61	88

No preservice credential programs in computer science in California. The draft plan noted that there are no pre-service computer science teacher preparation programs in California. This is not surprising, since there is no computer science credential to earn through such a program. Some content on computational thinking and computer science have been added to some preparation programs in other disciplines, such as math and science. Some universities have created programs for in-service teachers to satisfy the course requirements for the supplementary authorization in computer science. The plan noted that there are programs at UC, Irvine and UC, Riverside.

Teachers currently authorized to teach computer science receive no training in computer science in their preparation programs. The draft computer science strategic implementation plan notes that “A major weakness of the existing situation is that single-subject credentialed teachers authorized to teach computer science (i.e., Math, Business, or ITE) do not have subject matter requirements that cover basic computer science content. Furthermore, they are not trained in pedagogical knowledge relevant to computer science, which is different from their core subject. The supplementary authorizations in computer science, on the other hand, do require courses that cover computer science content knowledge. Yet, there are very few opportunities for credentialed teachers to enroll in such programs and these teachers will not necessarily have had practice teaching in a computer science classroom.”

What is the subject of computer science in grades K-12? Computer Science is a new field of study for K-12 education. The Computer Science Strategic Implementation Panel’s draft report notes that there is some confusion over what constitutes computer science instruction in K-12 schools: “computer science is often misconstrued with other technological terminology such as computer literacy, educational technology, digital citizenship, and information technology. These areas focus more on the use of computing systems (e.g., learning to use word processing software). In contrast, computer science calls upon students to understand why and how

computing technologies work, and then to build upon that conceptual knowledge by creating computational artifacts.”

The state’s new computer science standards define computer science education as “the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society.” The core concepts in computer science instruction are:

- Computing systems (computer science)
- Networks and Information systems (NI)
- Data and Analysis (DA)
- Algorithms and Programming (AP)
- Impacts of Computing (IC)

According to the International Society for Technology in Education’s report, *ISTE Standards for Computer Science Education*, the field of computer science will continue to rapidly evolve in sometimes unpredictable ways, and as such, plans for teaching computer science will also need the flexibility to continuously adapt.

State’s first computer science content standards adopted in 2018. Current law requires the IQC to consider developing and recommending computer science content standards to the SBE. In 2018, the SBE adopted California’s first set of computer science standards for grades K-12.

The standards are based on the five computer science core concepts and seven core practices:

Core Concepts	Core Practices
Computing systems	Fostering an inclusive computing culture
Networks and the internet	Collaborating around computing
Data and analysis	Recognizing and defining computational problems
Algorithms and programming	Developing and using abstractions
Impacts of computing	Creating computational artifacts
	Testing and refining computational artifacts
	Communicating about computing

Each standard includes a descriptive statement as well as examples for classroom application. As students progress through the standards from grades K–12, the standards call for students to build conceptual knowledge through active engagement in creative problem solving activities with an awareness of cultural and societal contexts. Computer science core concepts and practices in the standards are vertically aligned, coherent across grades, and designed in developmentally appropriate grade spans. The 9–12 grade span also includes an additional set of standards, referred to as 9–12 Specialty, which provides options for extending a pathway in computer science with content containing increased complexity and depth, and which may be used to create electives that are outside an introductory course.

In addition, the standards contain significant themes of equity, “powerful ideas,” computational thinking, and breadth of application.

Access to computer science education in California schools. Access to, and enrollment disparities in, coursework in computer science has been a longstanding concern. Data on some computer science offerings in secondary schools is shown below for the 2018-19 school year.

Course Name	Number of Schools	Courses Taught	Number of UC/CSU Courses	Female Enrollment	Male Enrollment	Total Enrollment
AP Computer science A	199	329	302	2,324	5,508	7,832
AP Computer science AB	35	62	61	607	1,090	1,697
AP Computer Science Principles	152	265	249	2,123	4,527	6,650
Computer programming	194	468	80	2,865	5,315	8,180
Computer science	351	806	289	6,244	11,932	18,176
Exploring Computer Science	16	31	11	212	514	726
IB Computer science	7	18	16	102	328	430
Total	954	1,979	1,008	14,477	29,214	43,691

Source: CDE

As shown above, disparities in enrollment by gender remain significant, with roughly half as many female as male students enrolled in many computer science courses.

According to a 2021 report by Code.org, the Computer Science Teachers Association, and the Expanding Computing Education Pathways Alliance, *2021 State of computer science education*:

- In 2018-19, 41% of California high schools offered a foundational computer science course;
- 75% of California high school students attend a school that offers computer science;
- Of 32,263 total Advanced Placement (AP) computer science exams taken in California last year, 32% identified as female;
- Black/African American students and Native Hawaiian/ Pacific Islander students are both four times less likely than their white and Asian peers to take an AP computer science exam; and
- Hispanic students are three times less likely to take an AP computer science exam than their white and Asian peers.

Arguments in support. CSforCA writes, “The Grant Program created by AB 1853 will help to bolster pre-existing and prospective IHEs teacher preparation programs by incentivizing these programs to provide more opportunities and clearer pathways for preservice teachers to be qualified and prepared to teach computer science. Teacher professional development in computer

science is an essential component of the State Board of Education adopted CA computer science Strategic Implementation Plan...AB 1853 is key to increasing the number of teachers coming out of IHEs who are trained to provide computer science education. In today's digitally driven world, technology is woven into the fabric of every company and every job. Providing more access to computer science education is a critical step for ensuring that California remains competitive in the global economy."

Recommended Committee amendments. Staff recommends that the bill be amended to:

- 1) Add to the list of credentials in subdivision (a) to include (changed shown in underline):
 - a. A single subject credential which authorizes the teaching of computer science;
 - b. A single subject credential for individuals who may be interested in teaching computer science; and
 - c. A multiple subject credential for individuals who may be interested in teaching computer science within the scope of their credential.
- 2) Add to the authorized uses of the grant, "To integrate or update computer science curricula and pedagogy into CTC-approved teacher preparation programs which serve candidates for the credentials identified in subdivision (a).
- 3) Add to the authorized uses of the grant: To update the IHE's existing technology credit requirements for the purpose of fulfilling the requirements of section 44259(3)(B)(iii), to include computer science coursework.
- 4) Add a priority for applications which include plans to increase access to computer science coursework for preservice teachers from underrepresented groups.
- 5) Add a requirement that applicants for the grant provide 1) a plan for the uses of the funds, including the number of individuals who will benefit, including the number of supplementary authorizations in computer science expected to be earned, the number of IHE students that are expected to enroll in courses that include computer science or computational thinking coursework, and 2) demonstration of the institution's commitment to expanding enrollment in, and access to, teacher preparation programs, including enrollment in preparation programs leading to the authorization and/or ability to teach computer science.
- 6) Add to the information required to be reported to the CTC: the number of supplementary authorizations in computer science earned, the number of IHE students enrolled in courses which included computer science or computational thinking as a result of the grant, and the demographics of participants.
- 7) Limit IHE indirect costs for administration of the grant to 5%.
- 8) Add a requirement that the CTC report, annually until the funds are fully expended, to the appropriate fiscal and policy Committees of the Legislature on the grants awarded, the number of graduates and the number and types of credentials and supplementary authorizations earned, the time taken to earn a degree and credential or authorization, the

number of IHE students enrolled in coursework in computer science or computational thinking as a result of the grant, and demographic information about participants.

Related legislation. AB 2187 (Luz Rivas) of the 2021-22 Session would establish a UC Subject Matter Project in computer science.

AB 130 (Committee on Budget), Chapter 44, Statutes of 2021, established the Computer Science Supplementary Authorization Incentive Grant Program for the purpose of providing one-time grants to LEAs to support the preparation of credentialed teachers to earn a supplementary authorization in computer science and provide instruction in computer science coursework.

AB 128 (Committee on Budget), Chapter 21, Statutes of 2021, appropriated \$5 million on a one-time basis to establish the Educator Workforce Investment Grant: Computer Science, and required the CDE to select an IHE or nonprofit organizations to provide professional learning for teachers and paraprofessionals statewide in strategies for providing high-quality instruction and computer science learning experiences aligned to the computer science content standards.

AB 498 (Quirk Silva) of the 2021-22 Session was substantially similar to AB 1932 of the 2019-20 Session. This bill was amended into a different jurisdiction and held in the Senate Appropriations Committee.

AB 1410 (Quirk Silva) of the 2019-2020 Session was substantially similar to AB 1932 of the 2019-20 Session. It was held in the Senate Appropriations Committee.

AB 1932 (Quirk-Silva) of the 2019-20 Session would have established the Computer Science Access Initiative, to improve students' access to instruction in computer science by increasing the number of teachers who are authorized and trained to provide computer science instruction in California public schools. This bill was held in the Assembly Education Committee.

AB 2309 (Berman) of the 2019-20 Session would have required the CTC to develop and implement a program to award competitive grants to postsecondary educational institutions for the development of preservice credential programs for individuals seeking a teaching credential, and the expansion of programs of study for single subject or multiple subject credentialed teachers seeking a supplementary authorization in computer science. This bill was held in the Assembly Education Committee.

AB 2274 (Berman) of the 2019-20 Session would have required the CDE to annually compile and post on its website a report on computer science courses, course enrollment, and teachers of computer science courses, for the 2019-20 school year and each subsequent school year. This bill was held in the Assembly Education Committee.

AB 1967 (Luz Rivas) of the 2019-20 Session would have established a UC Subject Matter Project in Computer Science. This bill was held in the Assembly Higher Education Committee.

AB 20 (Berman) of the 2019-20 Session would have established a Computer Science Coordinator position at the CDE. This bill was held in the Assembly Appropriations Committee.

AB 52 (Berman) of the 2019-20 Session would have required the computer science strategic implementation plan to be regularly updated. This bill was held in the Assembly Appropriations Committee.

AB 182 (Luz Rivas) of the 2019-20 Session would have created a single subject credential in computer science. This bill was held in the Assembly Appropriations Committee.

AB 1410 (Quirk-Silva and O'Donnell) of the 2019-20 Session would have established the Computer Science Access Initiative, to provide grants to LEAs for the purpose of increasing the number of teachers authorized and trained to instruct students in computer science. This bill was held in the Assembly Appropriations Committee.

SB 675 (Chang) of the 2019-20 Session would have enacted the Computer Occupations and Developing Education (CODE) Act, pursuant to which the SBE would administer a grant program promoting the teaching of computer science courses in the public secondary schools. This bill was held in the Senate Governmental Organization Committee.

AB 2329 (Bonilla), Chapter 693, Statutes of 2016, requires the SPI to convene a computer science strategic implementation advisory panel to develop recommendations for a computer science strategic implementation plan.

AB 2275 (Dababneh) of the 2015-16 Session would have authorized a person who holds a single subject teaching credential in business, industrial and technology education, mathematics, or science or a designated subjects career technical education teaching credential to teach courses in computer science to all students. This bill was held in the Assembly Education Committee.

AB 1539 (Hagman, 2014), Chapter 876, Statutes of 2014, requires the IQC to consider developing and recommending to the SBE, on or before July 31, 2019, computer science content standards for kindergarten and grades 1 to 12, pursuant to recommendations developed by a group of computer science experts.

AB 1764 (Olsen), Chapter 888, Statutes of 2014, states that if a school district requires more than two courses in mathematics for graduation from high school, the district may award a student up to one mathematics course credit.

REGISTERED SUPPORT / OPPOSITION:

Support

Code.org (sponsor)
Amazon
California Chamber of Commerce
The College Board
Council for a Strong America
CSforCA
Elementary Computing for All
Fight Crime: Invest in Kids
Microsoft Corporation
Mission: Readiness
Project Lead the Way INC.
Readynation
SNAP INC.

Technet-technology Network
Valley Industry and Commerce Association

Opposition

None on file

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