Date of Hearing: March 13, 2019

ASSEMBLY COMMITTEE ON EDUCATION
Patrick O'Donnell, Chair
AB 52 (Berman) – As Introduced December 3, 2018

SUBJECT: Computer science strategic implementation plan

SUMMARY: Requires that the Computer Science Strategic Implementation Plan be updated after an unspecified number of years. Specifically, **this bill**:

1) Requires that the Computer Science Strategic Implementation Plan be updated after an unspecified number of years in order to remain relevant and reflect technological advancements.

2) Repeals the sunset of the requirement to create a Computer Science Strategic Implementation Panel.

EXISTING LAW:

1) 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.

2) Requires the panel, by January 15, 2019, to submit recommendations for a computer science strategic implementation plan to the SPI, the SBE, and the Legislature that includes, 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 pupils in all grades

   c) ensuring that all pupils have access to quality computer science courses

3) 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.

4) 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 a course in computer science. (EC 51225.35)

5) Requires the California State University, and requests the University of California, to develop guidelines for high school computer science courses that may be approved for the purposes of recognition for admission. (EC 66205.5)

FISCAL EFFECT: Unknown

COMMENTS:

Need for the bill. According to the author: "Introducing computer science courses 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. Statistics indicate that young women who take an Advanced Placement computer science course in high school are 10 times as likely to major in computer science in college. African American and Latino students are over seven times more likely. Despite growing recognition of the importance of computer science education, as discussed previously, the majority of high schools in California do not offer any computer science courses. In fact, some of the largest districts in the state do not offer computer science courses.

To bridge this gap and ensure that all students have the choice and encouragement to study computer science, the Legislature passed and the Governor signed AB 2329 (Bonilla, 2016) into law. AB 2329 required the Superintendent of Public Instruction to convene a computer science strategic implementation advisory panel to develop recommendations for a computer science strategic implementation plan. The plan would address broadening the pool of computer science teachers, defining computer science education principles that meet the needs of K-12 students, and ensuring that all students have access to quality computer science courses.

The advisory panel convened during 2018, and their recommendations were presented to the State Board of Education in September of that year. Also in September 2018, the State Board of Education adopted the state's first-ever Computer Science Standards. The State Board of Education is required to consider adopting the plan on or before July 15, 2019 and, if adopted, the State Superintendent is required to submit the plan to the Legislature.

Therefore, AB 52 would require the computer science strategic implementation plan to be regularly updated to remain relevant and reflect technological advancements."

Computer Science Strategic Implementation Advisory Panel recommends periodic updating of strategic plan. 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 to the SBE for consideration, and the SBE is expected to act on the plan this spring.

The draft plan identifies a vision for CS instruction in California, in which "all students develop foundational knowledge and skills in computer science to prepare them for college, careers, and civic engagement." The draft plan identifies a mission statement with two goals: "All schools offer rigorous and relevant computer science education equitably and sustainably throughout grades K-12, and "All teachers are adequately prepared to teach rigorous and relevant computer science aligned with California's K-12 computer science.

This bill requires that the plan be updated after an unspecified number of years. The author states that "As innovations occur, the field of computer science is likely to change and evolve. Therefore, California's computer science strategic implementation plan cannot be a static document, but needs to be updated at appropriate intervals to remain useful, relevant, and reflect technological advancements. This will aid California in closing the equity gap in computer

science fields and provide the workforce needed for California to remain competitive in the global economy." The draft strategic plan also recommends that CDE convene stakeholders to review the CS standards every seven years to evaluate whether they should be refreshed, and if so, pursue legislative authority to do so.

Recommended amendment. Staff recommends that this bill be amended to specify a timeframe of seven years for revision and updating of the plan. This is sufficient time to identify progress in meeting the mission of the plan and identify necessary modifications. Curriculum frameworks are updated on an eight year cycle, and while there will be no CS framework to accompany the standards, this timeframe will allow the state to determine whether revisions to the CS standards are necessary.

What is the subject of computer science in grades K-12? Computer science is a new field of study in K-12 education. The draft strategic plan notes that there is some confusion over what constitutes computer science instruction in K-12 schools: "CS 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 CS standards define CS 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: People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form. An understanding of hardware and software is useful when troubleshooting a computing system that does not work as intended.

Networks and Information systems: Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world by providing fast, secure communication and facilitating innovation.

Data and Analysis: Computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions.

Algorithms and Programming: An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems. The development process to create meaningful and efficient programs involves choosing which information to use and how to process and store it, breaking apart

large problems into smaller ones, recombining existing solutions, and analyzing different solutions.

Impacts of Computing: Computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and in turn, computing influences new cultural practices. An informed and responsible person should understand the social implications of the digital world, including equity and access to computing.

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. 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.

California High Schools Offering CS Courses, 2016-17

Course Name	% of Schools offering course
Exploring Computer Science	12%
Computer Science	12%
AP Computer Science Principles	3%
AP Computer Science A	10%
Robotic Technologies	13%

Source: Draft CS Strategic Implementation Plan, 2018

Access to computer science education in California schools. The draft Computer Science Strategic Implementation Plan notes that

California students face significant problems of access in the study computer science, noting that at the secondary level, very few high schools offer CS courses, as shown in the adjacent table.

The draft strategic plan includes data from The College Board showing that, compared to other disciplines, the number of California students who take Advanced Placement (AP) CS exams is extremely low. In 2017, 8,679 California public school students took the AP CS A exam and 7,636 California public school students took the AP CS Principles exam. These numbers are far less than the number of students who took exams for AP Biology (34,984), AP Calculus AB (48,473), AP Chemistry (20,008), AP Statistics (30,196), AP English Language & Composition (84,960), and AP US History (69,729).

Race, gender, and income disparities in CS course access. According to a 2015 report by the Level Playing Field Institute titled, *Path Not Found: Disparities in Access to Computer Science Courses in California High Schools*, access to computer science courses varies considerably. The report found that in California public high schools:

- Of the more than half a million high school students in the largest 20 districts, just 1% are enrolled in any computer science course.
- Nearly 75% of schools with the highest percentage of underrepresented students of color offer no computer sciences courses.
- African-American and Latino students make up 59% of California high school public school students but were just 11% of the 2014 AP Computer Science test takers.
- Only 4% of schools with the highest percentage of low-income students offer AP Computer Science courses.
- Only 8% of schools with the highest percentage of English Learners offered AP Computer Science courses.
- Of the high school students who took the AP computer science exam in 2015, only 26 percent were female, 973 were Latino, and 148 were African American.

The draft strategic plan also notes that female enrollment in CS courses, from the introductory level through advanced courses, is roughly half that of male enrollment, as shown below.

Course Name	% of Total high school enrollment	% Male Enrollment	% Female Enrollment
Exploring Computer Science	1.0%	69%	31%
Computer Science	0.8%	64%	36%
AP Computer Science Principles	0.2%	70%	30%
AP Computer Science A	0.5%	72%	29%
Robotic Technologies	0.7%	71%	29%

Source: Draft CS Strategic Implementation Plan

Prior and related legislation. AB 20 (Berman) of this Session would establish a Computer Science Coordinator position at the CDE.

AB 182 (Luz Rivas, 2019) of this Session would create a single subject credential in computer science.

AB 1410 (Quirk-Silva and O'Donnell) of this Session would establish the Computer Science Access Initiative, to provide grants to LEAs for the purpose of increasing the number of teachers authorized and trained to instruct pupils in computer science.

AB 2329 (Bonilla, 2016), 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.

SB 675 (Chang, 2019) of this Session would enact the Computer Occupations and Developing Education (CODE) Act, pursuant to which the State Board of Education would administer a grant program promoting the teaching of computer science courses in the public secondary schools.

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 pupils. 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

CalChamber (co-sponsor)
Computing Technology Industry Association (co-sponsor)
The Internet Association (co-sponsor)
TechNet (co-sponsor)
Alliance For California Computing Education for Students and Schools
Code.Org
Computer Science Teachers Association
Council for a Strong America
Entertainment Software Association
Microsoft Corporation

Mission: Readiness
ReadyNation
Postmates Inc.
Valley Industry and Commerce Association

Opposition

None on file

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