

California Department of Education

Executive Office

SBE-003 (REV. 11/2017)

tlsb-eeed-sep18item01

# California State Board of Education September 2018 Agenda Item #08

## Subject

Recommendations of the California Computer Science Strategic Implementation Plan Panel.

## Type of Action

Information

## Summary of the Issue(s)

California *Education Code* (*EC)* Section 53310 (a) requires the State Superintendent of Public Instruction (SSPI) to convene a computer science strategic implementation advisory panel to develop recommendations for a computer science strategic implementation plan. *EC* Section 53311 (a) requires that the panel submit its recommendations to the SSPI, the State Board of Education (SBE), and the Legislature on or before January 15, 2019. *EC* Section 53313 requires the SSPI to develop, and the SBE to consider adopting, a computer science strategic implementation plan on or before July 15, 2019.

Beginning in March 2018, the California Department of Education (CDE) convened the Computer Science Strategic Implementation Plan Panel (CSSIPP) for three public meetings. In July 2018, the CSSIPP completed the recommendations development process. The panel’s recommendations are being presented to the SBE for information and to partially fulfill the requirements of *EC* Section 53311 (a).

## Recommendation

No specific action is recommended at this time.

## Brief History of Key Issues

*EC* Section 53311 requires the CSSIPP to develop a set of recommendations for a computer science strategic implementation plan that addresses, at minimum, the following topics:

* Broadening the pool of teachers to teach computer science
* Defining computer science education principles that meet the needs of pupils in kindergarten and grades one to twelve, inclusive
* Ensuring that all pupils have access to quality computer science courses

The CDE convened public meetings of the CSSIPP in Sacramento on the following dates:

* March 1–2, 2018
* April 9–10, 2018
* June 25–26, 2018

The panel was comprised of teachers, administrators, faculty from institutions of higher education, and representatives from private industry. The CSSIPP also included a public school student, a representative from a parent organization, and representatives from the California Commission on Teacher Credentialing and the Instructional Quality Commission (IQC). Members were appointed by the Governor, the SBE President, the Senate Committee on Rules, the Speaker of the Assembly, and the SSPI as required by *EC* Section 53310 (b) and were selected based on their expertise in computer science education.

To inform the work of the panel, the CDE secured experts to provide presentations on various topics, including: (1) the draft *Computer Science Standards for California Public Schools, Kindergarten Through Grade Twelve*, (2) the status of credentialing requirements for computer science educators, and (3) an example of district-wide implementation of computer science education. The CDE and CSSIPP provided opportunities on each meeting day for public comment.

The CSSIPP recommendations are provided in Attachment 1.

The CDE will present a draft plan based on the CSSIPP recommendations to the IQC Education Technology Committee in September 2018 and encourage the public to participate in a 30-day public review of the draft plan in October and November 2018. The CDE plans to present the Computer Science Strategic Implementation Plan to the SBE for potential adoption in March 2019. The SSPI shall submit the plan, if adopted by the SBE, to the Legislature in conformance with Section 9795 of the *Government Code* on or before July 15, 2019.

More information regarding the Computer Science Strategic Implementation Plan development process, including CSSIPP meeting agendas and a schedule of significant events, is available on the CDE Computer Science Strategic Implementation Plan web page at <https://www.cde.ca.gov/pd/ca/sc/cssip.asp>.

## Summary of Previous State Board of Education Discussion and Action

There has been no previous SBE discussion and action on the development of the California Computer Science Strategic Implementation Plan.

## Fiscal Analysis (as appropriate)

The estimated cost of developing the Computer Science Strategic Implementation Plan is $261,954. This estimate includes the costs for the contracted writers, travel for the CSSIPP members, production of materials for CSSIPP meetings, technology services, and CDE staff costs.

## Attachment(s)

* Attachment 1: Recommendations of the California Computer Science Strategic Implementation Plan Panel (31 Pages)

# **Attachment 1: Recommendations of the California Computer Science Strategic Implementation Plan**

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## Introduction

California *Education Code (EC)* Section 53310 (a) requires the State Superintendent of Public Instruction (SSPI) to convene a computer science strategic implementation advisory panel to develop recommendations for a Computer Science Strategic Implementation Plan. *EC* Section 53311 (a) requires that the panel submit its recommendations to the SSPI, the State Board of Education (SBE), and the Legislature on or before January 15, 2019. *EC* Section 53313 requires the SSPI to develop, and the SBE to consider adopting, a computer science strategic implementation plan on or before July 15, 2019.

Per the requirements of California *EC* Section 53310 (b), the Governor, the SBE President, the Senate Committee on Rules, the Speaker of the Assembly, and the SSPI appointed 23 Computer Science Strategic Implementation Plan Panel (CSSIPP) members (see Table 1 below). Members of the CSSIPP were selected based on their expertise in computer science education, specifically in the following areas:

* Standards-based interdisciplinary instructional experience
* Differentiated instruction for a diverse student population
* Areas of expertise and leadership
* Previous committee experience

Table 1. California Computer Science Strategic Implementation Plan Panel Members

| Name | Employer | Position |
| --- | --- | --- |
| Susan Bonilla | Council for a Strong America | State Director (Former) California Assembly Member |
| Yun “Jenny” Tzu Chien | Vista Unified School District | Teacher |
| Andrea Deveau | TechNet | Vice President for State Policy and Politics |
| Shirley Diaz | Glenn County Office of Education | Assistant Superintendent |
| Julie Flapan | Center X, University of California, Los Angeles | Executive Director, ACCESS and Director, Computer Science Project |
| Jose Gonzalez | Planada Elementary School District | Superintendent |
| Shauna Hawes | Valley View Middle School | Teacher |
| Deanna Heimbigner | Richmond Elementary School | Teacher |
| Rishi Kumar | Solix Technologies Inc. | Vice President Vertical Business Strategy/City Council Member, City of Saratoga, California |
| Janell Miller | Sanger Unified School District | Teacher |
| Shirley Miranda | San Diego Unified School District | Teacher |
| David Miyashiro  (Co-Chair) | Cajon Valley Unified School District | Superintendent |
| Sathya Narayanan | California State University, Monterey Bay | Professor of Computer Science |
| Gayle Nicholls-Ali | La Cañada High School | Teacher |
| Agodi Onyeador | N/A | Student |
| Michael Pazzani | University of California, Riverside | Vice Chancellor of Research and Economic Development/ Professor for Computer Science and Engineering |
| Dean Reese | Tracy Unified School District | Teacher |
| Debra Richardson  (Co-Chair) | University of California, Irvine | Professor of Informatics, Founding Dean Bren School of Information and Computer Science |
| Solomon Russell | El Camino College | Assistant Professor |
| Mehran Sahami | Stanford University | Professor of Computer Science |
| Claire Shorall | Life Academy High School of Health and Bioscience | Teacher |
| Vandana Sikka | Learnee Inc. | Founder and Chief Executive Officer |
| Bryan Twarek | San Francisco Unified School District | Computer Science Program Administrator |

*EC* Section 53311 requires the CSSIPP to develop a set of recommendations for a Computer Science Strategic Implementation Plan that addresses, at minimum, the following topics:

* Broadening the pool of teachers to teach computer science
* Defining computer science education principles that meet the needs of pupils in kindergarten and grades one to twelve, inclusive
* Ensuring that all pupils have access to quality computer science courses

The California Department of Education (CDE) convened public meetings of the CSSIPP in Sacramento on the following dates:

* March 1–2, 2018
* April 9–10, 2018
* June 25–26, 2018

During these meetings, the panel participated in small and whole group discussions to determine the most appropriate recommendations that met the requirements in *EC* Section 53311. The panel was also tasked with defining computer science education principles that meet the needs of pupils in kindergarten and grades one to twelve. Additionally, the CSSIPP created mission and vision statements to guide computer science education in California. These elements precede the panel’s recommendations as part of this document.

The panel’s final recommendations are provided in chart form starting on page nine of this document. Each recommendation includes the entity responsible for implementing the recommendation, a strategy for meeting the recommendation, and evidence of successful implementation. In addition, a suggested timeframe for each strategy is provided. At its final meeting in June 2018, the CSSIPP voted to move the recommendations forward to the SBE.

The panel’s recommendations are organized and labeled according to the requirements in *EC* and are divided into three categories:

* Ensuring Access and Equity for All Students in California Schools (Access and Equity)
* Ensuring Appropriate Support for California Teachers and Administrators (Educator Support)
* Scaling Up K–12 Computer Science Education in California (Standards Implementation)

The “access and equity” recommendations focus on creating more robust computer science education offerings statewide in grades K–8 so that students are prepared for additional coursework in high school; ensuring that California students have access to computer science in both college and career pathways; ensuring that California school districts have the infrastructure, hardware, and software necessary to implement computer science courses; removing local policy and regulatory barriers that local educational agencies (LEAs) face when implementing computer science education; and increasing the participation of traditionally underrepresented pupils in computer science courses.

The “educator support” recommendations focus on providing computer science professional development for current and future teachers and administrators, creating a teacher certification pathway for computer science in California, and expanding scholarship eligibility and loan forgiveness programs for computer science teachers in rural and urban low-income and underserved school districts.

Finally, the “standards implementation” recommendations call for statewide support as LEAs move forward in implementing California’s computer science standards. This includes identifying early implementers and sharing best practices, providing guidance regarding instructional materials for computer science courses; and providing funding for LEAs for an initial implementation period.

The CDE will present a draft plan based on the CSSIPP recommendations to the Instructional Quality Commission (IQC) Education Technology Committee in September 2018 and encourage the public to participate in a 30-day public review of the draft plan in October and November 2018. The CDE plans to present the Computer Science Strategic Implementation Plan to the SBE for potential adoption in March 2019. The SSPI shall submit the plan, if adopted by the SBE, to the Legislature in conformance with Section 9795 of the *Government Code* on or before July 15, 2019.

Additional information regarding the Computer Science Strategic Implementation Plan development process, including CSSIPP meeting agendas and a schedule of significant events, is available on the CDE Computer Science Strategic Implementation Plan web page at <https://www.cde.ca.gov/pd/ca/sc/cssip.asp>.

## Computer Science Education Vision

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.

### Mission

All schools offer rigorous and relevant computer science education equitably and sustainably throughout grades K–12.

All teachers are adequately prepared to teach rigorous and relevant computer science aligned with California’s K–12 computer science standards.

## Computer Science Education Principles

These principles apply to all California schools (K–12) and the students they serve.

1. Every student and every teacher is capable of learning computer science. Access to, and achievement in, computer science should not be predicated on the basis of race, ethnicity, gender identity, socioeconomic status, language, religion, sexual orientation, cultural affiliation, learning differences, or special needs.
2. Every student in California should have equitable access to high-quality computer science curriculum and instruction aligned to California’s K–12 computer science standards.
3. Every student should have continuous opportunities and multiple entry points to engage in computer science education, including articulated pathways toward college, careers, and community engagement.
4. Computer science instruction should involve real-world, engaging, meaningful, and personally relevant activities for students that focus on problem-solving, critical thinking, and creativity while emphasizing the ethical impacts of computing.
5. Computer science should align with California’s K–12 Computer Science Standards and be integrated, as appropriate, into other subject areas in grade bands K–2, 3–5, 6–8, and 9–12; computer science should be offered as standalone courses, from introductory to more advanced, in middle and high school.
6. All California schools should have the infrastructure to support computer science education (including hardware, software, and personnel).
7. Computer science content knowledge and relevant pedagogical practices should be included in all California teacher preparation programs, differentiated by multiple subject and single subject teaching credentials The state budget should allocate funding for teachers to participate in ongoing, high-quality, and differentiated professional learning and support to assist them in implementing and integrating computer science education in their classrooms.
8. California should engage stakeholders including, but not limited to, members from K–12 education, higher education, industry, local communities, parent organizations, and policy makers, to implement computer science statewide.

## California Computer Science Strategic Implementation Plan Panel Recommendations

### Ensuring Access and Equity for All Students in California Schools

1. **Scaling up computer science education coursework so that all high schools teach at least one computer science course *[EC* 53311.3a]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.A1 | Districts and/or County Offices of Education (COEs) | Identify existing opportunities for computer science education in grades K–8 and align them with the California computer science standards.  K–8 pathways are developed to prepare students for high school coursework in computer science. | All students have opportunities at each grade band (K–2, 3–5, and 6–8) to learn concepts and practices aligned to the California K–12 computer science standards.  Increased number of incoming ninth graders request high school computer science courses. | Within 4 years |
| AE.A2 | Districts and/or COEs | Educators are provided professional development that explores the content knowledge and pedagogical practices in the California computer science standards. | Increase in teacher efficacy in delivering content aligned to the California computer science standards | Within 4 years |
| AE.A3 | Districts | Adopt a high school graduation requirement for computer science, aligned to the 9–12 core computer science standards that can be satisfied through a variety of ways: standalone computer science courses, interdisciplinary courses, or a portfolio of computational artifacts. | Participating districts offer standards-based computer science to all students which can be satisfied through tests, coursework, portfolio(s), or other demonstrations of skills to all high school students. | Within 6 years |
| AE.A4 | University of California (UC) and California State University (CSU) Systems | Incentivize students to take computer science courses by counting it towards college admission eligibility. | Board of Admissions and Relations with Schools designates computer science courses other than in area G—college preparatory electives. | Within 1 year |

1. **Providing access to computer science in both college and career pathways [*EC* 53311.3b]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.B1 | Districts and/or COEs | High schools offer “A–G” approved computer science course sequences that begin with an introductory level course and includes an Advanced Placement or college-level course. | All high schools offer a sequence of  “A–G” approved computer science courses. | Within 5 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.B2 | CDE | CDE should ensure that the primary computer science courses expected to be offered statewide have options for both core academic/general education and Career Technical Education (CTE) course codes in the California Longitudinal Pupil Data Achievement System.  The current, broader CTE course codes (specifically for Information and Communication Technology [ICT] courses) cover the primary computer science courses.  This dual-coding option should be communicated to LEAs, along with where the primary computer science courses fit. | Computer science courses are dual-coded in both general education and CTE. | Within 1 year |
| AE.B3 | CDE | California should review Perkins eligibility to follow the course content rather than a teacher’s credential. | All computer science courses receive Perkins funding regardless of the assigned teacher’s credential. | Within 3 years |

1. **Ensuring school districts have adequate broadband connectivity and infrastructure and access to hardware and software [*EC* 53311.3c]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.C1 | Districts and/or COEs | Define standards for networking, hardware, and software to ensure consistency across a district. Identify current hardware and software needs for computer science education, including identifying areas where bandwidth and/or Wi-Fi may need to be upgraded. | Standards for networking, hardware, and software are defined.  Every student has a working environment at school (hardware/cloud, software, and infrastructure/network). | Within 3 years |
| AE.C2 | Districts and/or COEs | Define standards for the number and qualifications of Information Technology (IT) personnel for each district to ensure adequate maintenance for hardware and software. Develop a multi-tiered support plan that includes dedicated IT staff to address advanced issues. | There is sufficient dedicated IT staff to resolve technical issues in a timely manner. | Within 3 years |

1. **Removing local policy and regulatory barriers that local educational agencies face when implementing computer science education [*EC* 53311.3d]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.D1 | CDE | Prepare California computer science standards awareness roll-out presentations and workshops for administrators and teachers. These presentations and workshops should improve administrators’ understanding of what computer science is, the importance of computer science, and alignment between computer science and other content standards or graduation/university admission requirements. | In-person and virtual presentations and workshops held multiple times at various locations throughout the state to ensure every district/county has access to attend. All training opportunities are listed on a timeline on the CDE website. | Within 2 years |
| AE.D2 | CDE and COEs | Create a new Curriculum and Instruction Steering Committee (CISC) sub-committee specific to computer science. | New CISC subcommittee is created and works with CDE to support priorities within the computer science implementation plan. | Within 2 years |

1. **Increasing the participation of pupils traditionally underrepresented in computer science education   
   [*EC* 53311.3e]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.E1 | Districts and CDE | Plan outreach events and develop and update materials to create awareness and advocacy for computer science education, especially with traditionally underrepresented groups.  Engage parents, families, community members, and other stakeholders to create awareness and advocate for computer science education in their schools. | Events and materials should be differentiated for families of underrepresented students and community organizations that serve these students (i.e., after school clubs).  Outreach materials are created, such as a computer science community outreach toolkit.  Materials have been translated into multiple languages to engage parents of different communities. | Within 3 years |
| AE.E2 | Districts or COEs | Identify community organizations that may partner with districts to create expanded learning opportunities or to develop scholarship, internship, and/or mentorship opportunities for students in underrepresented groups. | Partnerships and their roles in the district/local schools are described in the district's technology plan.  Underrepresented students participate in opportunities of expanded learning, scholarships, internships and/or mentorships, as evidenced by data of student participation in computer science community partnerships. | Within 3 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.E3 | Districts or COEs | Identify teachers and teacher leaders committed to improving access and equity in computer science education.  Develop training materials and provide evidence-based professional development that prioritizes equity, engages diverse learners, and utilizes project-based activities with strong computer science content, collaborative learning, inquiry-based pedagogy, and culturally responsive teaching. | Teachers and teacher leaders committed to improving access and equity in computer science are identified.  Training material addressing varied pedagogical techniques to engage diverse students that are culturally responsive are available to all teachers.  Districts train and provide continued support to teachers and teacher leaders at district and site levels.  Materials for access and equity in computer science are made available on the CDE web site. | Within 3 years |
| AE.E4 | Districts and COEs | Provide access to resources and professional development for school counselors to help guide underrepresented students into various computer science pathways. | Training materials are developed for awareness of computer science standards and pathways to assist counselors in identifying and eliminating potential bias of guiding students into different computer science pathways. | Within 3 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| AE.F1 | CDE | Computer science will be included into a future state system for collecting data on enrollment and achievement in education. | A body of stakeholders come together to determine data collection options and collection methods.  Districts and COEs data reported to the state accurately. | Within 1 year |
| AE.F2 | CDE | Add computer science education as a college and career readiness indicator on the Local Control Accountability Plan (LCAP). | Inclusion in the college and career readiness indicator on the LCAP. | Within 1 year |

### Ensuring Appropriate Support for California Teachers and Administrators

1. **Providing training and professional development for education in computer science [*EC* 53311.1a]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A1 | Districts and COEs | Provide professional development to current CTE/ICT teachers to teach rigorous and relevant computer science. | Existing CTE teachers are identified and contacted through district coordinators.  Increasing number of CTE teachers who teach computer science. | 4 years |
| ES.A2 | State, Legislature, and Institutions of Higher Education (IHEs) | Establish partnerships with IHEs to recruit college students and new teachers to pursue credentials to teach computer science.  State should incentivize teacher preparation programs to integrate computer science aligned to the standards. | Increasing numbers of pre-service teachers who are student teaching in computer science classes, or integrating computer science into other classes. | 4 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A3 | Districts and COEs | Create Communities of Practice (COPs) with computer science teachers and other teachers aiming to integrate computer science into their discipline.  County offices create a COP for small districts to ensure they have colleagues with whom to share.  All schools offer regular collaboration time during the year to share practices on integrating computer science, especially at the elementary level. | Computer science teachers and teachers interested in integrating computer science into their discipline connect with professional colleagues with whom they can share information and experiences and learn from each other.  Computer science teachers and other teachers integrating computer science into their discipline actively participate in the COPs. | 2–4 years |
| ES.A4 | Districts and COEs | Engage teachers in excitement-generating, hands on experiences so they can see examples of activities they may want to do with students. Provide places and opportunities on sites or central locations for borrowing computer science materials. | Increased funding for computer science materials and professional development.  Central locations for borrowing computer science materials are created and maintained. | 2–4 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A5 | Districts and COEs | Instructional leaders are well-prepared to offer equity-minded professional development to increase knowledge and confidence in teaching and/or integrating computer science and models of what this looks like in classrooms and provide the pedagogy so teachers can implement computer science confidently and effectively. | Increasing numbers of teachers attending professional learning opportunities.  Self-efficacy surveys and/or administrator/peer observation to determine teachers’ implementation of and confidence with teaching computer science. | 2–5 years |
| ES.A6 | Districts and COEs | Provide 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. | Teachers regularly integrate the California computer science standards in their classes as evidenced by student-developed artifacts or administrator/peer observations. | 2–5 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A7 | Districts, Schools, and COEs | Provide ongoing professional development for site and central office administrators and counselors to boost knowledge of what computer science is, why it is important, career and workforce demand, what effective computer science instruction involves, teacher certification requirements for computer science, equitable implementation practices, and ways they can support computer science education.  Site, district, county administrators and counselors communicate career opportunities and labor demands requiring or integrating computer science to staff, students, and parents. | Site district, county office administrators and counselors attend relevant computer science professional development to gain necessary knowledge to create and support effective computer science classes. Site administrators are knowledgeable of credential and authorization requirements for teaching computer science.  Demonstrated distribution of information about career demands and labor opportunities related to computer science. | 2–5 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A8 | CDE or COEs | Develop computer science foundation toolkits for teachers in each grade band (i.e., K–2, 3–5, 6–­­­8, 9–12) describing the California computer science standards and principles and how they can integrate computer science by adapting current practice (adding onto or repackaging things they already do) to encourage implementation. | Computer science foundation toolkits are distributed to teachers and use is reported. | 2–4 years |
| ES.A9 | Community Colleges | Offer credit-bearing computer science courses for teachers (content and/or pedagogy), particularly through community colleges. Community colleges establish memoranda of understanding for course articulation with California Commission on Teacher Credentialing (CCTC)-approved teacher preparation programs. | Increasing number of community colleges offering credit-bearing computer science courses to teachers. | 3–5 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A10 | IHEs | Create and/or curate professional development programs that result in college credit that could be applied towards meeting the supplementary authorization in computer science. | Growth in participation of programs throughout the state, including at community colleges, CSUs, UCs, and other IHEs.  Emergence of new computer science teacher preparation programs.  Computer science classes for professional programs will transfer for lower division computer science courses. | 1–5 years |
| ES.A11 | CCTC | The CCTC provides a directory of IHEs that self-report coursework fulfilling the requirements for the computer science supplementary authorization. | Teachers can easily identify which institutions provide programs that fulfill requirements leading to a computer science supplementary authorization. | 1–5 years |
| ES.A12 | IHEs, Districts, COEs, and the CDE | Develop face-to-face professional development opportunities including computer science content and pedagogy for teachers.  Develop statewide online modules to increase access to computer science content and pedagogy for teachers when face-to-face programs are not accessible. | All teachers who want to learn computational thinking and computer science content and pedagogy have access to either face-to-face or online professional development opportunities.  Modules and professional development opportunities are made available to teachers. IHEs share with districts/COEs to disseminate the opportunities to teachers. | 2–3 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.A13 | Industry, Districts, and COEs | Industry develops or establishes stronger partnerships with schools and teacher preparation programs with the purpose of students gaining career exposure, industry becoming invested stakeholders in developing their future workforce, and building awareness of computer science teacher shortage to create sustainable teacher capacity.  Expand upon current industry programs that place professionals to support computer science teachers. | Increased number of experiences in which industry interacts with students and teachers.  Increased experiences for students to gain awareness of computer science applications in careers. | 2–5 years |
| ES.A14 | Legislature/ UCs | Fund the University of California, Office of the President to expand the California subject matter projects with the addition of a new computer science subject matter project. | Computer science subject matter project exists. | Within 3 years |
| ES.A15 | Legislature/ CDE | Fund the CDE to ensure adequate staff support for computer science implementation and to provide technical assistance LEAs. | CDE staff person with computer science expertise is in place. | 1–2 years |

1. **Creating a teacher certification pathway in computer science [*EC* 53311.1b]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.B1 | CCTC | The CCTC should develop a transition plan to increase access to a computer science supplementary authorization. As we build capacity to meet demand over the next seven years, the state should evaluate high quality professional development offerings as a means of being authorized to teach computer science.  For a limited time, make exceptions to the General Education Limited Authorization Program requirements for teachers working towards an authorization to teach computer science by extending the period of validity to five years and without requiring annual application fees. | Increasing number of teachers pursuing authorization to teach computer science (either the supplementary authorization or one of the single-subject credentials authorized to teach computer science). | Immediately |
| ES.B2 | CCTC | Develop a computer science strand in the Industrial and Technology Education (ITE) single-subject credential (which could be renamed Information Technology Education) | Increasing number of ITE credentialed teachers qualified (not just authorized) to teach computer science. | 1–2 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.B3 | CCTC | Develop and pass legislation to fund the CCTC to develop a computer science single-subject credential.  CCTC should develop a California Subject Examination for Teachers for the computer science credential (which could extend what was done for a computer science strand in ITE) or consider adopting a forthcoming new PRAXIS exam in computer science from the Educational Testing Service. | Increasing number of teachers pursuing and then holding a computer science teaching credential, leading to increasing number of computer science course offerings. | 2–3 years |
| ES.B4 | Legislature, CCTC, and IHEs | Provide funding to incentivize collaborations between computer science and education departments at community colleges, CSUs, UCs, and other IHEs to develop programs for computer science teacher preparation. Computer science professors and instructors should recruit for future K–12 computer science teachers. | Increasing number of computer science graduates planning a career path in teaching K–12 computer science. | 2–3 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.B5 | Legislature | Establish and fund a grant program for IHEs to develop programs that satisfy the supplementary authorization in computer science and future computer science teaching credentials. | Increasing numbers of IHEs offering computer science teaching preparation programs. | 2–4 years |
| ES.B6 | CCTC | Update performance expectations for teacher and specialist credentials to include foundational understanding of the computer science standards and how to teach them. | All teacher preparation programs for multiple-subject and single-subject credentials include computer science content and pedagogy. | 3–5 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.B7 | Technology Industry and CCTC | Engage industry in understanding the challenge of developing computer science teaching capacity and how that interacts with industry’s need for computing talent.  Create bridge programs where computer scientists in industry can obtain pedagogical training to teach computer science. For example, create a visiting faculty permit, which would allow someone in industry to teach for a year and then apply for a CTE credential.  Recruit and train industry professionals from the ICT sector to become CTE/ICT teachers for computer science. | Industry forms partnerships with local districts to encourage industry members to support computer science education and participate in pre-service teacher education programs. | 2–3 years |
| ES.B8 | CCTC | Reevaluate subject matter requirements for computer science and determine which existing credentials and supplementary authorizations may authorize teachers to teach computer science. | Revised list of credentials and supplemental authorizations necessary for single-subject teaching of computer science (e.g., through CCTC coded correspondence).  Increased number of teachers authorized to teach computer science. | 1 year |

1. **Expanding scholarship eligibility and loan forgiveness programs for computer science teachers in low-income and underserved school districts and rural and urban school districts [EC 53311.1c]**

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| ES.C1 | Legislature | Establish a grant program for teachers to support the completion of course work for the computer science supplementary authorization, with additional incentive for teachers who work in schools identified in statute. | Increased number of teachers awarded the computer science supplementary authorization in schools identified in statute. | 2–3 years |
| ES.C2 | Legislature | Establish a loan forgiveness program to incentivize clear credentialed teachers to teach computer science in schools identified in statute. | Increased number of teachers awarded the computer science supplementary authorization in schools identified in statute. | 2–3 years (in conjunction with establishing the computer science credential) |

### Scaling Up K–12 Computer Science Education in California

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
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| SI.1 | Legislature/  CDE | Designate funding for a multi-faceted campaign to communicate the California K–12 computer science standards and implementation plan to LEAs, families, and other stakeholders with an emphasis on the future of work, labor demand, and career opportunities requiring computer science. | Political leaders speak out about the importance of computer science education and how it can be implemented. Deliverables from communication campaign will be evident. Stakeholder organizations develop their own communications toolkits, based on state-provided materials, to conduct further outreach within communities. | 1–2 years |
| SI.2 | Legislature/  CDE | The state should provide sustained funding to LEAs for the initial implementation period (eight years) and to support the professional development of teachers and school leaders to learn about the California K–12 computer science standards and to effectively integrate or offer as standalone computer science courses in K–12 education. | Funding will be available, with a priority for schools serving low-income students, to build capacity of teachers and administrators to implement computer science education in their schools. Stakeholder organizations will help amplify the state-provided communications toolkits, based on state-provided materials, to conduct further outreach within communities. | 1–2 years |
| SI.3 | SBE | State should develop criteria for local evaluation of computer science instructional materials. | Criteria for computer science instructional materials are available. | 2 years |
| SI.4 | CDE | The CDE should convene stakeholders to review computer science standards every seven years to evaluate whether or not they should be refreshed. If revision is recommended, legislative authority to update standards will be sought. | Stakeholders are convened to review standards for potential revision. | 7 years |
| SI.5 | Districts | Create four-year implementation and evaluation plans for helping all students achieve the K–12 standards (core for 9–12). Plans should be educator-driven and educator-focused, leveraging interest among teachers to pilot materials and disseminate information to colleagues rather than top-down mandates for all teachers to participate from the beginning. | Support for computer science education is written into district LCAPs under Priority 7: Course Access (Pupil enrollment in a broad course of study that includes all of the subject areas). Plans developed by early adopter districts are used as models for other districts and/or legislation to support computer science education implementation. | 2 years |
| SI.6 | Districts, COEs, and the CDE | State will identify model districts and schools that highlight successful implementation of the standards and best practices and share with the larger education community. | Recognition for early adopters and current successful models of California computer science implementation are highlighted on a statewide interactive map with symbolic recognition by CDE. | 2–3 years |

| **#** | **Responsible Entity** | **Strategy** | **Evidence of Success** | **Timeframe** |
| --- | --- | --- | --- | --- |
| SI.7 | Legislature, the CDE, with the University of California Office of the President | Dedicate funding for creation of integrated computer science courses through the University of California Course Integration (UCCI) program.  Prioritize funding and opportunities for computer science and ICT integrated with other academic subject areas. | Creation of new UCCI courses that integrate both ICT and other academic subject areas. | 2–5 years |